



DEPARTMENT OF TOURISM

GOVERNMENT OF UTTAR PRADESH

NCB Contract Package NO. 03/Agr/Pro-Poor/UPT/W/2016

**ENVIRONMENTAL ASSESSMENT REPORT FOR
VISITOR CENTER AND PARKING REHABILITATION
AT TAJ MAHAL WEST GATE, AGRA**

Project	:	Uttar Pradesh Pro-Poor Tourism Development Project
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ABBREVIATIONS

ASI	Archaeological Survey of India
ADA	Agra Development Authority
BOQ	Bill of Quantity
CFU	Colony Forming Unit
CEC	Cation Exchange Capacity
CPPCB	Central Pollution Control Board
CURE	Centre for Urban and Regional Excellence
DPR	Detailed Project Report
EA	Environmental Assessment
ECS	Equivalent Car Space
ESMP	Environmental and Social Management Plan
ESMF	Environmental and Social Management Framework
FGD	Focus Group Discussions
Gol	Government of India
GoUP	Government of Uttar Pradesh
IPT	Intermediate Public Transport
KLD	Kilo Liter Per Day
MoEF&CC	Ministry of Environment, Forest & Climate Change
NEERI	National Environmental Engineering Research Institute
PAP	Project Affected Person
PAF	Project Affected Family
RAP	Resettlement Action Plan
SIA	Social Impact Assessment
SPCU	State Project Coordination Unit
TSU	Technical Support Units
UNESCO	United Nations Educational, Scientific and Cultural Organization
UP	Uttar Pradesh
UPPCL	Uttar Pradesh Power Corporation Limited
UPPTDP	UP Pro-Poor Tourism Development Project
UPTDC	U.P. Tourism Development Corporation
VMS	Variable Messaging System

Executive Summary

Executive Summary
Please include table of contents and executive
summary before disclosure

CHAPTER-1

INTRODUCTION

1.1 PRO-POOR TOURISM DEVELOPMENT PROJECT (Project)

Country context

India has some of the greatest wealth in tangible and intangible heritage. As a powerful economic driver, its heritage has had undeniable positive implications. From subsistence practices and handlooms to precision engineering and a reputable steel industry, India's economy has long relied essentially on its cultural assets, expressed through the creativity and adaptation of its indigenous industries, traditional skills and built heritage. As a socially invaluable endowment, heritage also has vast noneconomic development impacts. Women's empowerment—as sources and transmitters of much local knowledge and cultural practices – and youth employment are at the core of associated creative industries. They are instrumental in leading to appreciation of differences and a renewed sense of identity and stronger social compacts, thereby increasing communities' inclusion and generating economic vitality for heritage towns and historic areas. As endogenous assets, India's heritage has provided essential services to areas, towns and communities – including reliable rainwater harvesting systems (kunds), shelter and places of worship, to mention a few. Most ancient Indian towns were planned and built applying what are considered today as advanced notions of “sustainable urban growth” by designing walk able and compact use of land through mixed-use development, and promoting the preservation of natural and cultural resources and open spaces at the core of their strategies for cities' livability and socioeconomic vibrancy. Despite its wealth and strong related socioeconomic impacts, the reality is that India has been unable to harness the power of its heritage in a way that drives inclusive growth and reduces poverty. In practice, the economic benefits that have been generated from its heritage, especially linked to tourism – one of the main economic sectors associated to heritage – has had little trickle-down effect on host communities and the assets themselves. Much of the value from tourism expenditure is retained by transport and accommodation service providers, who tend to both be located outside the heritage-rich tourism attractions they explore, and insulate their clients from the surrounding communities. At the broader level, the World Economic Forum's Travel and Tourism Competitiveness Report for 2011 ranked India 68th out of 139 countries on overall tourism competitiveness despite being ranked 19th in terms of touristic resources. India's tourism, in spite of its assets, only ranked 36th globally in terms of international arrivals, 39th in international tourism receipts, and 54th in terms of expenditure per visitor. The state of Uttar Pradesh best exemplifies this paradox.

State context

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Uttar Pradesh – India’s biggest tourist draw, containing some of the country’s most iconic heritage and annually attracting millions of devotees and visitors – remains one of India’s most lagging states. UP is the fourth largest and most populous state with over 199 million inhabitants, and is home to the emblematic Taj Mahal, to the second ancient living city in the world – Varanasi – located on the banks of the sacred Ganges, and to two of the world’s four most sacred Buddhist sites – Sarnath and Kushinagar, to mention a few of its heritage assets visited and worshipped by millions annually. In 2011, the state attracted 155 million domestic and 1.8 million international visitors out of 748 million domestic and 6.2 million international tourists visiting India, who contributed a total of USD 6 billion to Uttar Pradesh’s economy in the same year. Despite this unique endowment, Uttar Pradesh remains India’s third most lagging state, with a 37.7 poverty rate. Currently, over 50 million people live below the poverty line. The state has one of the lowest per-capita incomes at US\$445 per annum compared to the national average of US\$922 per annum. It also lags behind most Indian states across a number of human development indicators, such as literacy and infant mortality. Specifically in terms of tourism, despite its staggering numbers, the majority of earnings have been captured by airlines, travel agencies and tour operators.

Closer site-level data indicates that Agra, the Braj region and the Buddhist Circuit, which contain some of India’s and Uttar Pradesh’s prime tourist destinations and greatest wealth of heritage assets, have some of the state’s highest poverty rates. For instance, its most iconic heritage asset and India’s most significant tourism draw, the Taj Mahal in Agra, is surrounded by more than 20 slums with crumbling infrastructure and services, and associated low living standards – a lost opportunity for inclusive poverty reduction.

The challenge

A combination of ineffective approaches and practices are inhibiting Uttar Pradesh’s tourist destinations from leveraging their unique cultural and natural assets as endogenous sources of inclusive growth and poverty reduction through pro-poor tourism development. This is due to:

- A tourism vision mostly centered on serving the needs of international tourists.
- Ad-hoc planning, investments and institutional fragmentation.
- Poor site management, threatening heritage and reducing visitor satisfaction and retention.
- Policy approaches hindering communities from reaping the benefits of tourism

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development.

- Infrastructure gaps as well as subpar connectivity, affecting visitors and poorer segments of the population to a greater extent.
- An ineffectively developed and restrictive regulatory, business and investment climate, stunting private sector investment.

Project Objective

The Project Development Objective is to increase tourism-related benefits for local communities in targeted destinations.

Project Components

The project has four proposed components:

Component 1: Destination Planning and Governance aims to test new approaches and establish the institutional structures, policies and coordination mechanisms necessary for bringing together the public and private sectors and local communities for effective destination-level tourism planning and governance. It will achieve this by providing a combination of advisory and technical assistance and financing for (i) the formulation of integrated destination-level tourism development plans for the Project target areas; (ii) the refinement and implementation of branding and promotion strategies for the target areas; (iii) the strengthening of public, private and community institutions involved in the tourism sector for coordinated destination management; (iv) the improvement of the state visitor management and information systems; (v) the review of the state tourism policy based on inclusion and sustainability principles; (vi) support to public-private dialogue; and (vii) training of individuals and groups employed in the tourism sector.

Component 2: Tourist Products Development and Management aims to enhance the tourist experience while simultaneously contributing to improving local living conditions and livelihood opportunities by transforming existing tourist “attractions” into tourist “products” that incorporate local communities both physically and economically. Activities under this component include advisory and technical assistance and financing for (i) the enhancement of existing attractions and their surroundings (e.g. crowd management, illumination, landscaping); (ii) the provision of interpretation and information at monuments and sites of interest, including interpretation centers, signage and information kiosks; (iii) the development/rehabilitation and diversification of destination-level products, services and

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activities, such as museums and heritage walks; (iv) the provision of facilities and services for tourists and local communities alike, such as drinking water, rest areas, toilets; and (v) the improvement of access and transportation to main sites and tourist products and their adjacent communities.

Component 3: Support to Local Economic Development aims to improve the linkages of those involved in the productive and creative economies with the tourism value chain in the Project target areas by providing advisory, technical assistance and financing for (i) mapping of local productive and creative industries and support to business development and tourism service providers; (ii) the provision of training, information, tools and infrastructure for business development, production and marketing within the tourism value chain; (iii) enhancement and/or diversification of skills; and (iv) branding and promotion of locally produced goods linked to tourism products.

Component 4: Project Management aims to provide the necessary technical, advisory and financial support for the adequate implementation, management and coordination of the Project through (i) the establishment and operation of a State Project Coordination Unit (SPCU) at the state Department of Tourism in Lucknow and Technical Support Units (TSU) at the local Development Authorities in selected Project target areas; (ii) project monitoring and information system; and (iii) project communication.

1.2 Visitor Center and Parking Rehabilitation at Tajmahal West Gate (Sub-Project)

The project title is “Uttar Pradesh Pro-Poor Tourism Development Project (UPPTDP) for Consultancy Services for Visitor Center and Parking Rehabilitation Sub Project at Tajmahal West Gate”. This assignment is a part of Agra region sub project of Uttar Pradesh Pro-Poor Tourism Development Project.

M/s. U.P. Tourism Development Corporation (UPTDC), Lucknow has proposed to develop Visitor Center and Parking Rehabilitation at West Gate of the Taj Mahal, under the proposed UPPTDP to be financed by The World Bank.

The preparation of DPR of above sub-project was awarded to M/s ANB Consultant, Lucknow. In line with the Environmental and Social Management Framework (ESMF) for UPPTDP, the scope of DPR preparation also includes Environmental Assessment (EA) of the proposed sub-project. This report presents the analysis carried out and the result of the EA study for the sub-project.

Need of the study

As envisaged in the project design and the Environmental and Social Management Framework (ESMF), main streaming environmental and social aspects is one of the important objectives of UPPTDP. In order to achieve the above objective and considering the sensitive nature of the proposed sub-project, especially project its nearness to World Heritage site i.e. Taj Mahal and the nature of the sub-project activities it is essential to assess environmental impacts and design necessary mitigation/ management measures.

Objective

To identify, assess and quantify positive and negative impacts of the proposed sub-project on various environmental components and recommend measures to mitigate and manage identified impacts.

Report Layout

The EA for the sub-project is organized in ten chapters as summarized below-

- **0.0 Executive Summary-** This chapter describes summary of the project EA report.
- **Chapter-1: Introduction:** This chapter describes summary of the project EA report .
- **Chapter-2: Project Description:** This chapter contains detailed description of the proposed sub-project of UPPTDP, such as the type of the project, need of the project, project location, land availability, utilities and infrastructure facilities.
- **Chapter-3: Approach & Methodology:** This chapter describe summary of the study method and its producer of writing.
- **Chapter-4: Legal & Administrative Frame work:** This chapter describes the legal frame work of Government of India & Government of Uttar Pradesh.
- **Chapter-5: Base line Environment Profile-** Description of the Environment, Primary & Secondary Data along with Analysis
- **Chapter-6: Assessment of Environment Impacts & Mitigation Measures:** Anticipated positive and negative impacts as a result of the construction and operation of the proposed project are covered as a part of this section. The section attempts to forecast the future environmental conditions of the project area that might be expected to occur as a result of the construction and operation of the proposed project.
- **Chapter-7: Analysis of Alternatives:** This chapter includes the options, details of alternatives considered for the sub-project and analysis presenting chosen alternative.
- **Stake holder consultations**

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- **Chapter-8: Environment Management Plan**
- **Chapter-9: Environment Monitoring Program:** This chapter comprehensively presents the technical aspects of monitoring the effectiveness of mitigation measures.
- **Chapter-10: Cost of Environment Management Plan & Environment Monitoring**
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CHAPTER-2

PROPOSED PROJECT DESCRIPTION

2.0 DESCRIPTION OF SUB PROJECT AND PROJECT AREA

2.1 Project Background

The city of Agra is synonymous with the Taj Mahal in the minds of the national and international community. Being a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site, the Taj is the biggest attraction for visitors to the country and the monument, eventually drawing up to 70,000 visitors on a peak day. Numerous measures have been taken by national and international statutory bodies to streamline the visitor experience and enable city-level up gradation in the context of flourishing heritage tourism, but these objectives are still far from being realized.

This World famous monument attracts from 2 to 4 million visitors annually, with more than 200,000 from overseas. Most tourists visit in the cooler months of October, November and February. Polluting traffic is not allowed near the complex and tourists must either walk from parking lots or catch an electric bus to reach the entry gates. There are three gates to this monument, the East gate, West gate and South gate, for the tourist movement. East gate is accessed by visitors, mostly international tourists, staff, gardeners, cleaners, nursery staff, etc. West gate and Southern gate is mainly used for entry to the domestic tourists. West gate is connected by the West gate road which stretches from Jhalkari bai crossing around 1.5 km from Taj mahal compound on the west and culminates on West gate of Taj Mahal compound. Taj Ganj, located in the southeast part of Agra right adjacent to Taj Mahal south gate, is exposed to an extensive tourists circulation due to the proximity to the heritage monument. It roughly extends from the southern boundary of the present complex, to Fatehabad road. Part of the original Taj complex (bazaars and caravan serais) used to exist in this area in earlier times. Currently, it comprises both residential and commercial areas.

The prime area of intervention shall be the entire stretch of the west gate road and the relative area for assessment shall be the surrounding area of the Taj Mahal. As far as the parking is concerned, the subject area for the project is the Taj Mahal West Gate Parking which is situated on the west gate road connecting the Agra Fort to the Taj Mahal from west side of the Taj. The site situated between the conserved natural terrain on the west of the monument is being used to accommodate the vehicles of the visitors approaching the monument from the older city side (west of the Taj Mahal). The site acting as the first halt point for the visitors, gradually became a focal point of various activities related to the tourist activity, and at the same time a subject of unmanaged activities and unplanned movement pattern all circling around the visitor to the site. In the process, the primary requirements of the visitor

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approaching the site had been never holistically planned. The site has grown itself as per the requirements and activities of the tourist and simultaneously raised issues which needs to be addressed as a part of the project. The prime focus shall remain to develop this parking area as a facilitated visitor hub.

The Visitor Center and Parking Rehabilitation At Taj Mahal (The Project), West Gate is a sub project of The Uttar Pradesh Pro-Poor Tourism Development Project. The existing west gate parking premises is an important area under the study, as the site has potential for revitalization and up-gradation of facilities. Therefore, the major interventions in the proposal shall focus on this existing parking area and the immediate surroundings. The area is referred to as the TajMahal West gate parking, also known as the Amrood-ka-teela parking as there used to be a mound in the area which was leveled to give space to the parking facility. The parking area is defined by a physical boundary noticeable on the site, however the issues related to disorganized movement and under-developed facilities are scattered all around the parking site.

There have to be various related aspects attributes prevalent in the surrounding area, which shall give a rational approach to the project. The project being a pro-poor tourism development initiative, makes it even more strategic, culture and community oriented.

2.2 PROJECT INFLUENCE AREA

Visitor/Interpretation Center and Parking Rehabilitation Sub Project at Tajmahal West Gate of Uttar Pradesh Pro-Poor Tourism Development Project is proposed at Ammrod ka Tila parking near west gate of Taj Mahal. This place is presently used as a parking space for visitors near west gate of Taj Mahal. Parking space have concrete flooring with scattered trees. Two community toilets are present with septic tanks for sewage disposal. These community toilets have own bore well for water supply. One side of the proposed site have a drain of approximately 01 meter width. Solid waste generated from parking is stored in bin of municipal corporation Agra. Site is surrounded by green belt more than 50 meter length except few areas along the Yamuna river side. A small market is present in front of proposed site. The proposed sub project site is approximately six hundred meters away from Taj Mahal west gate. The approach road to the site is from Agra Fort. The location map is given in the base line chapter of the report.

2.3 Land ownership

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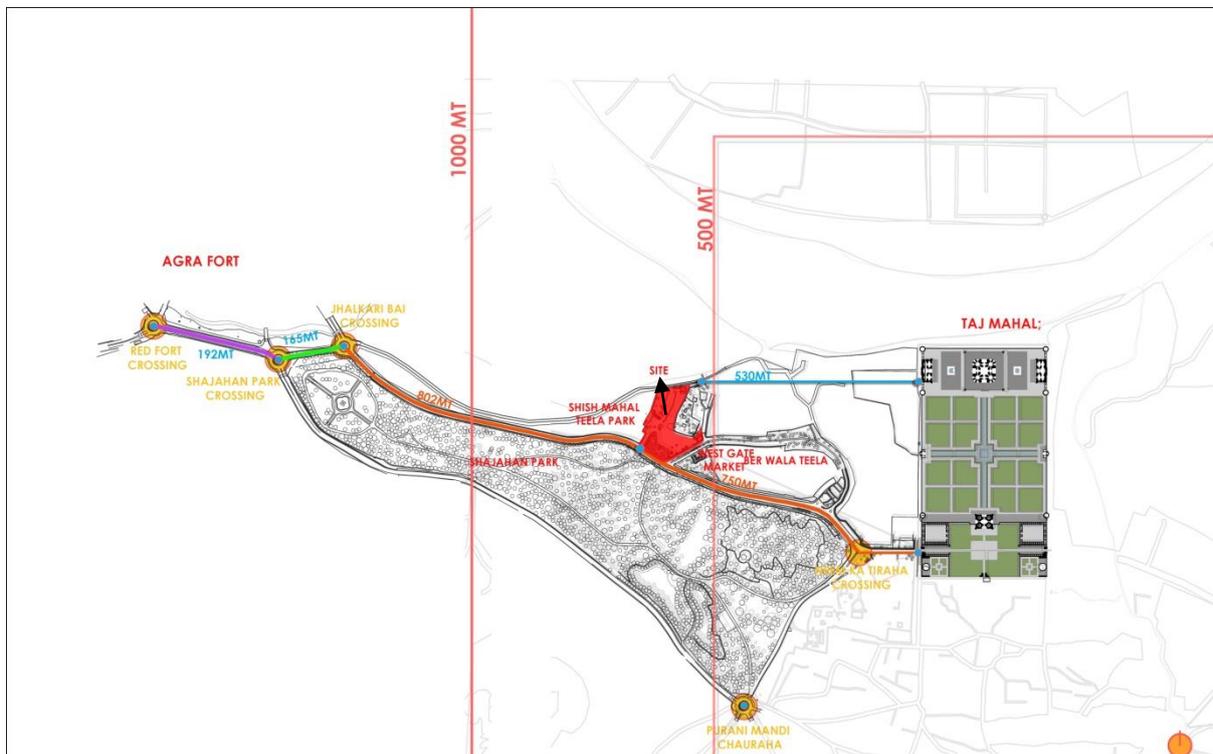
The land belongs to Department of Horticulture Government of Uttar Pradesh and managed by Agra Development Authority.

2.4 Project Cost

The cost of the Project is estimated to be about Rs 1074.80 million.

2.5 Nature and Location of the Project

The proposed project is urban infrastructure project aimed at decongesting the traffic scenario around Taj Mahal. The Taj Mahal west gate is accessible from the Jhalkaribai Chowk, via 14 meters wide carriageway, as indicated in below figure. The west gate parking location is more than 0.5 km away from Taj Mahal.



Map Showing Location of the Site

2.6 Surrounding Features of the proposed project site:

S. No	Particulars	Details	Approximately distances from the proposed project site
1.	Nearest National Highway	Yamuna expressway	06 Km.

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2.	Nearest Railway Station	Agra Fort	02 Km.
3.	Nearest Airport	Kheria Airport (air-force station), Agra	14 Km.
4.	River Body	Yamuna river	Adjacent of the proposed project site
5.	Site Topography	Flat	-
6.	Archaeologically Important Site	Taj Mahal Agra Fort Etmadut Daula	0.6 Km. 1.5 Km. 02 Km.

2.7 Project Details

The project can be classified on land basis in two sections:

- Existing parking having area 14737.64 m².
- Ber Ka Tila having area 4923.19 m²
- The total buildup area of the proposed project is 18702.57 m².

S. No.	Description of Area	Proposed Area		Unit
1.	Total Plot area	Parking	14737.64	Sq. m
		Ber Ka Tila	4923.19	
2.	Total built up area	18702.57		Sq. m
3.	Floor wise built up area is given below:			
	Ground Floor	2306.70		Sq. m
	Basement 1	8126.12		Sq. m
	Basement 2	8269.75		Sq. m
4.	Proposed green area	2420.00		Sq. m

The Proposed Project has six components:

- Vehicle Parking
- Visitor facilities Centre
- Up gradation of existing market with civic amenities
- Vehicular management
- Improvement of the street corridor connecting Jhalkari Bai crossing and the West gate parking
- Shahjahan park entrance area opposite the West gate parking

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As mentioned above component 1 and 2 i.e. Vehicle Parking and Visitor Facilities Centre are proposed on the existing parking covering land 14737.64 m². Component 3 i.e. Up gradation of existing market are proposed on Ber Ka Tila land, covering land 4923.19 m². Component 4 i.e. vehicular management is about the management and control of the movement around the site and does not require any land. Component 5 is about the revitalization of the road connecting Jhalkari bai crossing and the west gate parking(part of west gate road). Component 6 comprises of an entrance gate on the boundary of the Shahjahan garden opposite the west gate parking and the area shall be 140 m² .

COMPONENT-1 (Vehicle Parking):

Due to limitations in building's height, as per Zonal master plan of Agra Development Authority and water table of the proposed project site, the proposed project is limited in two basements and one ground floor. Proposed project is designed for parking facility of five hundred sixty seven (ECS) equivalent car space. The parking provision in respect of ECS is given below:

S. No	Description	Proposal	Unit
1.	Parking proposed	567	ECS
2.	Proposed Podium Parking (Standard Buses)	142	ECS
3.	Proposed Podium Parking (Midi Buses)	142	ECS
4.	Proposed basement parking-1	219	ECS
5.	Proposed basement parking-2	231	ECS

Parking Provision:

- Cars = 402
- Buses = 19 Standard buses, 7 Midi Bus
- TW = 286 TWs
- Others (E-rickshaw/golf carts/animal carts) = 40 spots (holding area has been provided)

Proposed Parking Concept:

Double Basement Parking Complex with open parking at ground level

Ground Level – Open Bus Parking and Facility Centre

Basement 1 – Car Parking & Two wheeler Parking

Basement 2 – Car Parking & Two wheeler Parking

COMPONENT -2 (Visitor Facilities Centre):

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Following visitor facilities are proposed at the ground floor of the proposed project:

1. Information counter
2. Waiting Lobby
3. Ticket counter
4. Prepaid counter for non-polluting vehicles plying in 500 MT Zone
5. Locker room
6. Toilets (Male, Female & Physically challenged)
7. Maternity Room
8. Drinking Water spout
9. Administration room
10. Security Room
11. Passenger Lift- 4 nos.
12. Car Lift – 1No
13. ATM

COMPONENT -3 (Up gradation of existing market with civic amenities):

Up-gradation of existing market at Ber Ka Tila with civic amenities are proposed to improve the socio economic condition of the 71 shopkeepers.

COMPONENT - 4 (Vehicular management):

To Facilitate the visitors, a Variable Messaging System (VMS) for the space availability in parking of the proposed project is proposed at all the entry point of the major roads. The proposed points for VMS are as under:

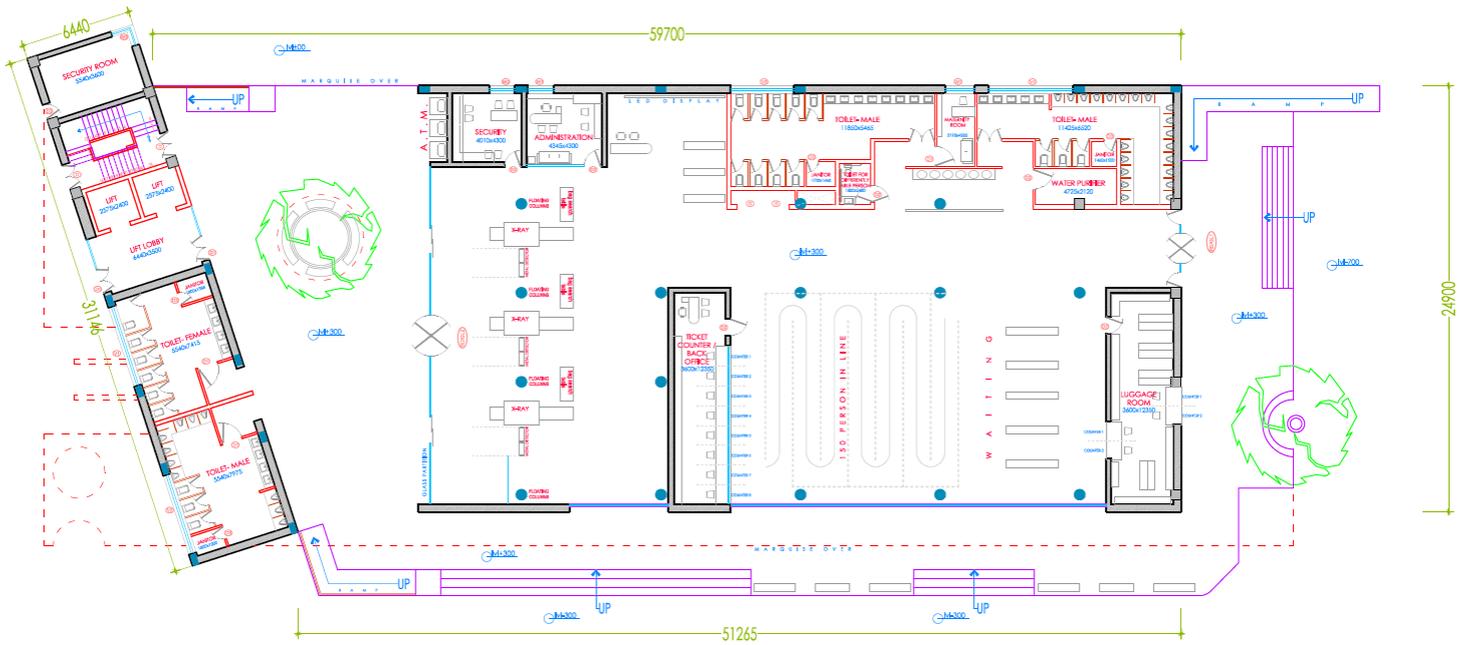
- Yamuna Expressway
- NH-2 (Kanpur Highway)
- Jhalkari Bai Crossing
- Inner Ring Road (Fatehabad Road Junction)

COMPONENT -5 (Street Improvement):

This comprises of the up-gradation and revitalization of the street connecting the Jhalkari bai crossing and the west gate parking. It includes the widening of pathway, horticultural intervention on the boundary, street lighting, providing drop-off point and waiting lay-by on the road near the west gate parking area.

COMPONENT -6 (Entrance Gate-Shahjahan Park):

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GROUND FLOOR PLAN (VFC BLOCK)

Map Showing the layout plan (Ground Floor) of the Proposed Project

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BASEMENT-1 PLAN

Map Showing the layout plan (Basement-1) of the Proposed Project

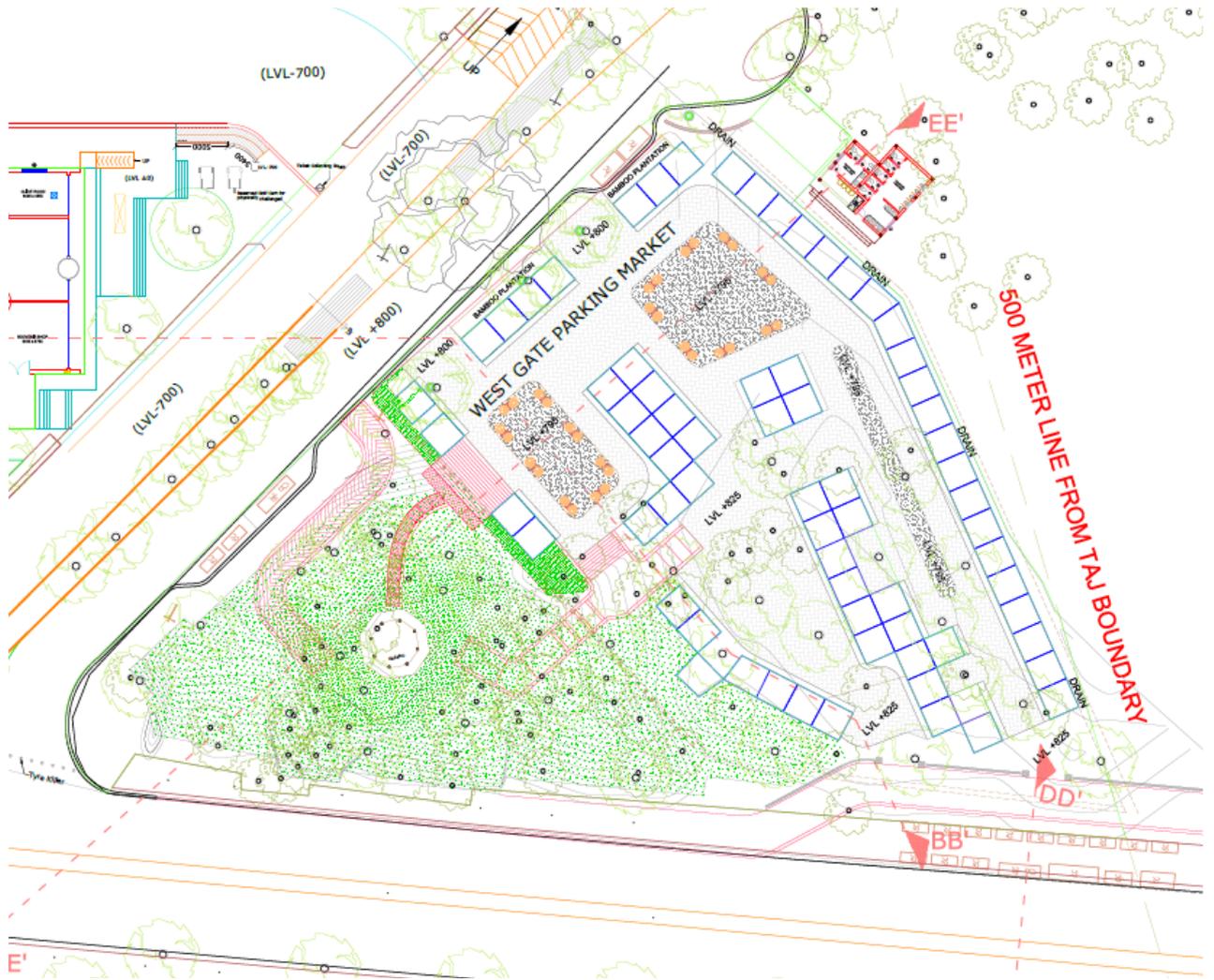
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BASEMENT-2 PLAN

Map Showing the layout plan (Basement-2) of the Proposed Project

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Map showing the Layout plan of West Gate Market

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2.8 Major Construction Phase:

The major Construction phases can be listed as under:

Phase I: Demolition of existing structure, floor & Excavation for sub-structure: This will include earth excavation and soil works.

Phase II: Construction of sub-structure: This will include Pre-stressed Cement Concrete (PCC) and waterproofing works, foundation reinforcement, footing formwork and foundation concreting. It will also include reinforcement, formwork and concreting work for retaining wall/column up to the basement levels.

Phase III: Construction of superstructure: This will include providing formwork, reinforcement, concreting Stone masonry and plastering.

Phase IV: Provision of utilities will include: External painting completion, Plumbing completion (both external and internal), external plumbing comprising of sewerage lines/manholes, surface drainage lines/manholes and storm water drainage and internal plumbing comprising of rains water pipes, internal soil lines, internal GI lines, installation of fixtures and fittings. Electrical completion comprising of installation of breakers/RMUs, substation works, HT cabling, bus ducting, LT panel installation, installation of fixtures/fittings/invertors, installation of floors panels/boards, earthing systems and their testing and commissioning.

2.9 The required quantity of Basic Raw Material is as under:

S. No.	Item	Quantity (Tones)
1.	AAC Blocks/ Stone	630000 nos
2.	Sand	1485.00 cum
3.	Cement	88398 bags
4.	Metal	9828.00 qtl
5.	Diesel	50000 ltr

2.10 Power Demand and Supply

The power supply shall be sourced from Uttar Pradesh Power Corporation Ltd (UPPCL). The estimated electrical demand load & proposed power back to be used during power failure shall be as per details given in below table:

S. No.	Power Demand	Detail
1.	Maximum demand load	550 KVA
2.	Power back up	750 KVA
3.	Number of Generator sets	2 * 380 KVA
4.	Generator Sets stack Height	As Per CPCB Norms

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2.11 Requirement of Man Power During Construction Phase Of The Project

Total Man Power Requirement estimated for the project is:

Total requirement of Labors is 115000 nos.

$115000.00 / 18 \text{ Month} = 6389.00 \text{ Labors in a month}$

$6389.00 / 30 \text{ day} = 212.00 \text{ Labors Per Day}$

This states that at any given day labors and technicians combined present on the site would be – 213 or say 215 people

2.12 Requirement of Man Power During Operational Phase Of The Project

During the operational phase, the combined figure including the operating staff and the tourists, on an average day will be approximately 14,570 nos, out of which approx. 530 nos. of operating staff shall be stationed throughout and remaining will be tourists.

2.14 Detail of Water Requirement During Construction Phase And Operation Phase:

a. Water Requirement During Construction Phase

S.N.	Construction Phase	Purpose/Uses	Quantity	Source
1.	During Main Structure Construction Phase (12 Month Period)	Curing of Civil Structure	20 KLD	Treated water taken from Dhandhupura STP of Jal Nigam, Agra by Road Tankers up to the proposed project site.
		Domestic (215 labours)	10 KLD	Ground Water
		Miscellaneous	06 KLD	Ground Water
		Total	36 KLD	-
2.	During Sub-Structure Construction & Finishing Phase (06 Month Period)	Domestic (215 labours)	10 KLD	Ground Water
		Miscellaneous	06 KLD	Treated water taken from Dhandhupura STP of Jal Nigam, Agra by Road Tankers up to the proposed project site.
		Total	16 KLD	-
Note: Requirement of Water in a day (only working hour) for domestic purpose by considering 45 Liter/Capita.				

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b. Water Requirement during Operation Phase

PROJECT - "PARKING REHABILITATION AND VISITOR'S FACILITY CENTRE" AT TAJ MAHAL, AGRA									
WATER REQUIREMENT CALCULATIONS									
Sl. no.	Description	No. of Car/ Bus	No. of passenger/car	No. of Shift per day	Population	Unit Water Consumption	Total Water Required	Recycle Water Requirement	Total Recycle Water
				(Nos.)	(persons)	(liters)	(liters)	(liters)	(liters)
1	Cars	402	5	3	6030	15	90450	5	30150
2	Buses								
	i) MIDI	7	22	3	462	15	6930	5	2310
	ii) Normal	19	50	3	2850	15	42750	5	14250
3	2-Wheelers	286	2	3	1716	15	25740	5	8580
5	Staff, Admin & Drivers				514	45	23130	15	7710
6	Other (Transportation)				2800	15	42000	5	14000
7	Filter Backwash						5000		
8	Horticulture	8500				5	42500	100%	42500
	TOTAL				14372		2,78,500		1,19,500
SUMMARY OF WATER REQUIREMENT									
Total Permanent Population						=	14400	persons	
Total Domestic Water Requirement						=	2,78,500	lit/day	
Total Recycle Water Requirement						=	1,19,500	lit/day	
<u>Net Domestic Water Requirement (Fresh Water)</u>						=	1,59,000	lit/day	
Total Sewage Load						=	2,31,000	lit/day	
Net Sewage Flow - 80% of total sewage load						=	1,84,800	lit/day	
Sewage Treatment Plant capacity						=	180	KLD	200
Total recycle water required						=	1,19,500	liters	
Net water balance (to be use for Irrigation near by area)						=	65,300	liters	
UGT Capacity (for Domestic Use) = 1 day storage						=	1,59,000	liters	175 KL
UGT Capacity (for Fire Fighting)						=			200 KL
Total UGT Capacity (Domestic + Fire)						=			375 KL

CHAPTER-3

APPROACH AND METHODOLOGY

3.0 APPROACH AND METHODOLOGY

The Environment Assessment study has been carried out as per the safeguard policies of The World Bank, ESMF for the UPPTDP and relevant acts, rules, manual and guidelines of Government of India, such as the following:

1. Environment Impact Assessment Guidance manual for Building, Constructions, Townships and area development projects by Ministry of Environment & Forests Government of India, New Delhi.
2. Environmental Impact assessment Notification 2006 as amended up to date.
3. Office orders/memorandums issued from Ministry of Environment, Forest and Climate Change.
4. Central Pollution Control Board's (CPCB) manuals for Air monitoring and water analysis etc.
5. World Bank Safe Guard Policies

METHODOLOGY

As per Environmental and Social Management Frame work and considering associated environmental and social impacts, an environmental and social assessment with corresponding management plans for the proposed project of Visitor center and Parking Rehabilitation at Taj Mahal west gate has been conducted using the following methodology:

Environmental Assessment Report for Visitor Center and Parking Rehabilitation at Taj Mahal West Gate, Agra

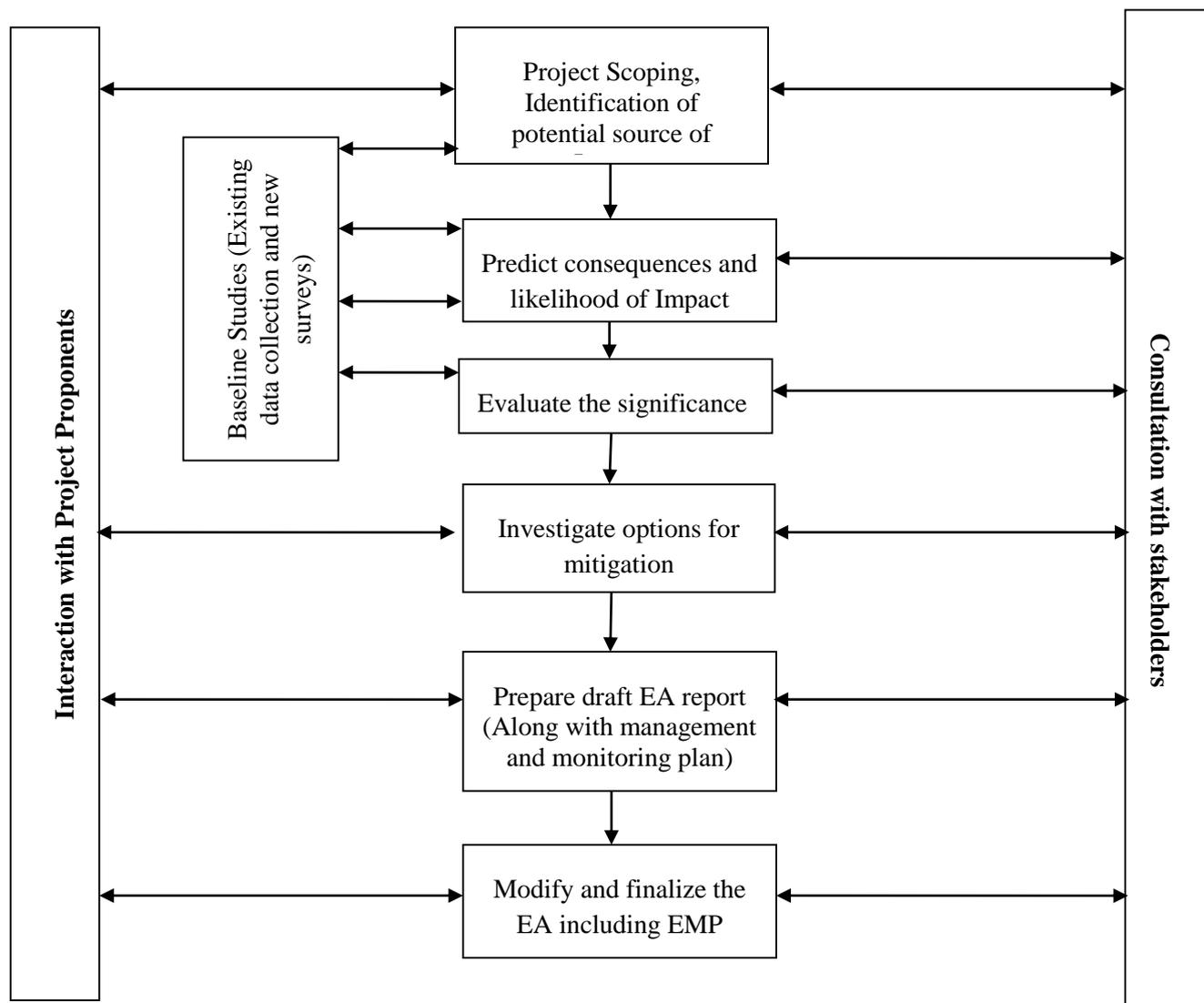


Figure showing the EA Methodology

The detail description of methodologies is as under:

a. Secondary Data- Sources & Data Collection

Apart from the data collected from the primary surveys, secondary data has also been collected from the concerned authorities related to the present project in vicinity of site. This part deals with the secondary sources, data collected, and their purpose. The information collected includes published reports, statistical data, technical studies The Authorities / Organizations contacted for data collection related to the project are as follows:

- Central Pollution Control Board (Agra Office)
- Indian Metrological Department, Lucknow

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- Horticulture Department, Agra, Uttar Pradesh
- U.P Pollution Control Board & Regional Office, UPPCB, Agra (UP)
- Jal Nigam, Agra (UP)
- Forest Department, Agra (UP)
- Department of Tourism (UP)
- Municipal Corporation, Agra (UP)
- Archaeological Survey of India & Agra Office, Agra (UP)
- Agra Development Authority, Agra (UP)
- Shopkeepers of Meena Bazar near proposed project
- Vendors and hawkers near proposed project

The secondary information / data / studies / proposals reviewed are as follows:

S.NO	TITLE	TYPE OF DOCUMENT	DEPARTMENT/ ORGANIZATION	RELEVENCE
1.	Environmental study before and after the proposed Urban Conservation and Tourism development Project of area around the World Heritage Site, Taj Mahal, Agra	Report	National Environmental Engineering Research Institute (NEERI) Nagpur	Similar type of study it is very useful to tool for secondary data analysis.
2.	Assessment of Basic Services and Infrastructure	Report	Centre For Urban and Regional Excellence (CURE)	For secondary data analysis
3.	Master Plan of Agra Development Authority	Document	Agra Development authority	For secondary data analysis
4.	Environmental Monitoring & Analysis report	Reports	Central Pollution Control Board, Agar Project office	For secondary data analysis
5.	Meteorological data	Reports	Indian Metrological Department	For secondary data analysis
6.	Status Of Groundwater Quality in India	Report	Central Pollution Control Board (Ministry of Environment , Forest & Climate Change)	For secondary data analysis
7.	Comprehensive Environmental Management Plan (CEMP) For Taj Trapezium Zone (TTZ) Area	Report	CSIR-National Environmental Engineering Research Institute (NEERI), Nehru Marg, Nagpur and Maharashtra, India	For secondary data analysis

- **Review of Legislations, policies and regulations are as follows -**

S.No	HERITAGE	ENVIRONMENT	SOCIAL
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Environmental Assessment Report for Visitor Center and Parking Rehabilitation at Taj Mahal West Gate, Agra

1	<ul style="list-style-type: none"> • Operational Guidelines for the Implementation of the World Heritage Convention 2013 • Ancient Monuments and Archaeological Sites and Remains Act 1958, amended in 2010. • The Development Control rules of the ADA. • The Agra Master Plan etc. 	<ul style="list-style-type: none"> • Environment Protection Act 1986 • Environment Protection Rule 1986 • Environmental Impact Assessment Notification 2006 as amended up to date • Water (Prevention and Control of Pollution) Act-1974 • Air Pollution (Prevention) Act 1983 declared the Taj Trapezium Zone (TTZ) etc. 	Street Vendor Policy
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• **Review of on-going/proposed projects around the Site-**

S.NO	PROJECT	DEPARTMENT	STATUS
1.	Urban Conservation and Tourism development project of the area around the world heritage site, Taj Mahal Agra	U.P Tourism Development Corporation	Under going
2.	Shahjahan Park Walkway& Landscaping Project.	World Bank	Under going
3.	Agra Ring Road Proposal	Agra Development Authority	Proposal stage

b. Conduct Screening:

Screening is undertaken in the very beginning stages of project development. The purpose of screening is to screen out “no significant impacts” from those with significant impacts and get a broad picture of the nature, scale and magnitude of the issues. Team conducted screening process using the screening checklist format provided in ESMF report .

c. Defining the project area and carrying out scoping in the field

Team undertook the field survey and transect walk of the proposed sub project area to develop the understanding of the proposed project. Environmental Monitoring of the study area was also conducted for mapping environmental issue. Field visits helped to understand the local knowledge and were valuable in finding alternatives that help avoid or at least reduce the magnitude and severity of adverse impacts.

d. Survey of the host population

With the help of questionnaires, local people were interviewed in groups. A wide range of potentially affected people were interviewed in proposed sub project area including street vendors, shop keepers, visitors and guide etc. Both men and women were interviewed from different sections of the society. Team undertook field visits to carry out the survey and understand the ground situation. The interviewees were asked about their awareness of the project, their response to it and if the project is affecting them (during construction phase) and how it will affect them (after completion phase). Also they were asked about the mitigation plans they have adopted or are planning to adopt, suggestions for improvement and any public grievances. Surveys were conducted around the proposed sub-project site.

e. Discussion with the key stakeholders

Most of the interactions with important key stakeholders were through both informal and formal discussions with them. All the associated government departments were visited to collect the relevant data and their feedback on the project activities.

f. Identify and assess the impacts

Based on the analysis of the data gathered from field survey, stakeholder interaction/consultation and secondary sources, issues related to the environmental and social sectors were been identified. The impacts so identified were compared with the existing baseline environmental and social condition of the study region.

g. Develop a mitigation plan

Based on the environmental and social issues identified, measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance were recommended. The mitigation plans is suggested in all three stages: designing phase, construction phase and, operation and maintenance phase.

CHAPTER-4

REGULATORY AND ADMINISTRATIVE FRAMEWORK

4.1 Project Level Legal Framework

This framework describes the policy, principles, and approach to be followed in minimizing and mitigating adverse social and economic impacts by the sub projects. The ESMF document is intended to help manage the environmental impacts through appropriate measures during the planning, design, construction and operation of various sub-projects of UP Tourism Development Corporation . The framework identifies the level of safeguard due-diligence required for all categories of subprojects of UP Tourism Development Corporation and provides specific guidance on the policies and procedures to be followed for environmental assessment along with roles and responsibilities of the implementing agencies.

4.2 National Law

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.

Categories A projects require Environmental Clearance from Ministry of Environment , Forests & Climate Change (MoEFCC) Gov. of India. The proponent is required to provide preliminary details of the project in the Form-1 of a EIA Notification, after which an Expert Appraisal Committee (EAC) of the MoEFCC prepares comprehensive Terms of Reference (ToR) for the EIA study, which are finalized within 60 days. On completion of the study and review of the report by the EAC, MoEFCC considers the recommendation of the EAC and provides the EC if appropriate.

Category B projects require environmental clearance from the State Environment Impact Assessment Authority (SEIAA) & District Environment Impact Assessment Authority. 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 & DEIAA 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.

4.3 Key Environmental Laws and Regulations

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The key environmental laws and regulations as relevant to the projects are given in below table:

SN	Act/Rules	Purpose	Applicable to project	Reason for Applicability	Authority
			Yes/No		
1.	Environmental Impact Assessment Notification 14th Sep-2006	To provide environmental clearance to new development activities following environmental impact assessment	Yes	As per latest amendment in the EIA Notification. This sub-project not required clearance. The clearance is required from concerning development authority.	-
2.	Taj Trapezium Zone Pollution (Prevention & Control) Authority	To protect Taj Mahal from pollution	Yes	Project fall under TTZP Authority, hence take the permission of the project before commencement of construction.	Taj Trapezium Authority
3.	Environment Protection Act-1986	To protect and improve overall environment	Yes	As all environmental Notifications, rules and schedules are issued under this	MoEFCC, Gol, DoE, State Gov. CPCB, SPCB
4.	Air (Prevention and Control of Pollution) Act, 1981	To control air pollution by controlling emission of air pollutants as per the prescribed standards.	Yes	This act will be applicable during construction and operational phase. To required consent to establish and consent to operate.	SPCBs
5.	Water Prevention and Control of Pollution) Act1974	To control water pollution by controlling discharge of pollutants as per the prescribed standards	Yes	This act will be applicable during construction and operational phase. To required consent to establish and consent to operate.	SPCBs
6.	The Noise Pollution (Regulation and Control) Rules,	To control the noise pollution	Yes	This act will be applicable during construction and operational phase.	SPCBs

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	2000				
7.	Manufacture, Storage and Import of Hazardous Chemical Rule 1989 & amended up to date	To ensure safety of hazardous chemicals	No	Due to use of hazardous chemical	SPCBs
8.	Municipal Solid Wastes(Management and Handling) Rules, 2016	To manage the collection, transportation, segregation, treatment, and disposal of municipal solid wastes.	Yes	This notification is applicable only for Municipal Solid waste Treatment facility investments	SPCBs
9.	E-Waste (Management) Rules, 2016	To safe disposal of electronic waste.	Yes	E-waste shall be collected and stored at isolated location in proposed sub-project . It shall be disposed through approved recyclers only.	SPCBs
10.	Batteries (Management & Handling) Rules, 2001 As Amended Up To Date	To safe disposal of discarded Batteries.	Yes	Discarded Batteries will be disposed through authorized recycler only.	SPCBs
11.	Plastic Waste (Management and Handling) Rule 2016	To safe disposal of plastic waste.	Yes	Plastic waste shall be collected and stored at demarcated place in proposed sub-project . It shall be disposed as per guideline.	SPCBs
12.	Hazardous Wastes (Management and Handling) Rules, 1989	To safe disposal of Hazardous waste	Yes	The Rules govern handling, movement and disposal of hazardous waste.	SPCBs
13.	Construction and Demolition Waste Management Rule, 2016	To manage the collection, segregation, recycling, treatment and disposal of construction and demolition waste in an environmental sound manner.	Yes	Construction and Demolition Waste shall be collected and stored at isolated location in proposed sub-project . It shall be disposed as per guideline.	SPCBs
14.	The Land	Set out rule for	No	This act will not be	Revenue

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	Acquisition Act 1894 (As amended in 1985 and 2013)	Acquisition. of land by government		not applicable as land acquisition is not required.	Department State Government
15.	The Forest (Conservation) Act 1980	To check deforestation by restricting conversion of forested areas into non forest area and regulate the forest related issues.	No	In this case the project entirely in same land use. Requiring tree cutting permission.	State Forest Department.
16.	Wild Life Protection Act 1972	To protect wildlife	No	This act is will be applicable, if there are any points of Wildlife framed	Chief Conservator Wildlife, Ministry of Environment, Forests & Climate Change, Government of India
17.	Ancient Monuments And Archaeological Sites and Remains Act 1958	Conservation of cultural and historical remains found in India	Yes	This act will be applicable due to heritage area.	Archaeological Department Gol, India Heritage Society and Indian National Trust for Art and Culture Heritage (INTACH).
18.	Explosive Act 1984	Safe transportation, storage and use of explosive material	No	In this project it is not applicable as no blasting work is required.	Chief Controller of Explosives
19.	Central Motor Vehicle Act 1988	To check vehicular air and noise pollution.	Yes	This rule will be applicable to vehicles deployed for construction	State Transport, UP

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				activities and construction Machinery	
20.	National Forest Policy, 1988	To maintain ecological stability through preservation and restoration of biological diversity.	No	This policy will be applicable if any eco sensitive feature exists in and around the project.	Forest Department, State Government and Ministry of Environment and Forests,
21.	U.P. Minor Minerals (Concession) Rules, 1963 As Ammended Up To Date	To regulate minor minerals.	Yes	Take permission for earth mining from Directorate of Geology & Mining, Govt. of Uttar Pradesh.	District Magistrate & Directorate of Geology & Mining, Govt. of India.
22.	The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996	For welfare of workers	Yes	All the establishments who carry on any building or other construction work and employs 10 or more workers are covered under this Act; 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.	Department of labour Government of UP

Other Legislations applicable to Construction Projects under U.P. Tourism Development Corporation:

Construction stage generally involves equity, safety and public health issues. The construction agencies therefore will be required to comply with laws of the land, which include inter alia, the following:

1. Workmen's Compensation Act 1923 (the Act provides for compensation in case of injury by accident arising out of and during the course of employment);
2. Payment of Gratuity Act, 1972 (gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years);

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3. Employees PF and Miscellaneous Provision Act 1952 (the Act provides for monthly contributions by the employer plus workers);
4. Maternity Benefit Act, 1951 (the Act provides for leave and some other benefits to women employees in case of confinement or miscarriage, etc.);
5. Contract Labor (Regulation and Abolition) Act, 1970 (the Act provides for certain welfare measures to be provided by the contractor to contract labour);
6. Minimum Wages Act, 1948 (the employer is supposed to pay not less than the Minimum Wages fixed by the Government as per provisions of the Act);
7. Payment of Wages Act, 1936 (it lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers);
8. Equal Remuneration Act, 1979 (the Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees);
9. Payment of Bonus Act, 1965 (the Act provides for payments of annual bonus subject to a minimum of 83.3% of wages and maximum of 20% of wages);
10. Industrial Disputes Act, 1947 (the Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment);
11. Industrial Employment (Standing Orders) Act; 1946 (the Act provides for laying down rules governing the conditions of employment);
12. Trade Unions Act, 1926 (the Act lays down the procedure for registration of trade unions of workers and employers. The trade unions registered under the Act have been given certain immunities from civil and criminal liabilities);
13. Child Labour (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 labour is prohibited in Building and Construction Industry);
14. Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979 (the inter-state migrant workers, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, travelling expenses from home to the establishment and back, etc.);
15. The Factories Act, 1948 (the Act lays down the procedure for approval of plans before setting up a factory, health and safety provisions, welfare provisions, working hours and rendering information-regarding accidents or dangerous occurrences to designated authorities)

CHAPTER-5

BASE LINE ENVIRONMENT PROFILE

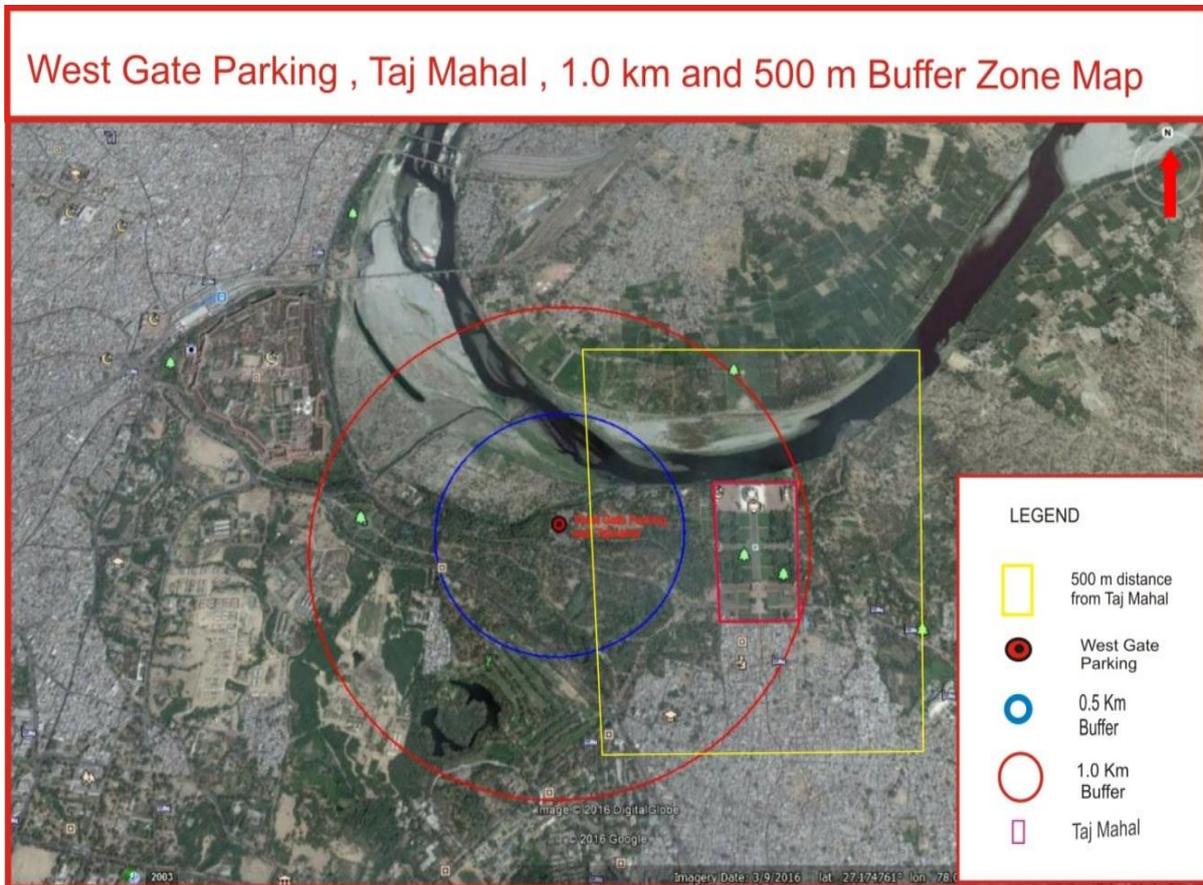
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5.1 INTRODUCTION

After the screening of proposed sub-project identified the probable significant impacts on different environmental components. On the basis of significant impacts baseline data were collected. The detail of primary and secondary baseline data is are described below-

5.2 Project Study Area

Study region comprises of area (01 Km Circular shape) in and around the proposed sub-project near west gate of Taj Mahal.



Location Map Of The Proposed Project

5.3 Baseline Condition of Project Surrounding Area

5.3.1 Topography

Essentially the area, Agra comprises a fertile alluvial plain. The plain is part of the Indo-Gangetic alluvial plain. The elevation of the plain falls from 183 m above mean sea level in NNW to about 161 m in SSE part. The master slope of the plain is towards SSE. There is threefold physical division of the district viz.1. the Trans-Yamuna, 2. the Cis- Yamuna and 3. the trans-Utangan. In simple language, the Agra is mostly covered by a thick pile of quaternary sediments with restricted patches of rocks of Vindhyan Super Group. The proposed project site is plane.

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5.3.2 Climate

The study area is a characterized by semi-arid area bounded by Thar Desert on its southwest, west and northwest peripheries. The maximum temperature is attained upto 47°C in summer

Months	2013			Year 2014			Year 2015			Year 2016		
	Temp (°C)			Temp (°C)			Temp (°C)			Temp (°C)		
	Max	Ave	Min									
Jan	26	8.76	-1	23	10.93	0	24	10.29	3	27	13	3
Feb	32	13.71	4	27	14.46	4	30	17.21	6	32	17.03	5
Mar	35	19.58	8	35	20	8	37	19.79	8	39	23.74	13
Apr	42	26.58	16	44	26.46	16	42	26.46	16	43	30.66	19
May	46	31.35	19	46	30.90	22	46	32.12	21	46	32.45	21
Jun	44	30.46	24	47	33.9	23	46	31.9	24	45	32.76	26
July	37	28.70	25	43	30.96	24	40	29.61	24	37	29.74	24
Aug	36	27.9	23	39	29.16	24	38	29.64	24	36	29.29	24
Sept	37	28.28	22	37	28.58	22	39	29.76	21	37	29.46	24
Oct	33	23.62	14	38	25.58	15	39	26.74	15	37	26.64	14
Nov	32	17.75	7	33	19.26	7	32	20.7	10	32	19.83	9
Dec	32	13.74	1	38	12.54	2	27	14	2	27	13.74	6

months (May to June) and minimum temperature as low as 3°C in winter. The average rainfall in the region is 685 mm. The city experiences extreme hot summers and extreme cold winter. The climate of the city experiences a typical extreme climate as of the plains of Uttar Pradesh. All seasonal climatic changes e.g. temperature; rainfall, wind-pattern etc. are observed throughout the year, particularly high temperature during the summer, cold weather during winters and sufficient rains in the monsoon.

The Maximum, Minimum & average data of Temperature & rain fall from the year 1993 to 2002 is given in below table:

Months	Temperature(°C)			Rain fall (mm)		
	Maximum	Average	Minimum	Maximum	Average	Minimum
January	24.786	15.1435	6.858	23.872	8.5571	0
February	27.112	18.2781	9.321	13.537	6.2674	0
March	33.495	23.8953	13.36	14.058	4.5012	0
April	39.874	30.0525	20.277	15.489	5.9185	0
May	42.825	34.3869	24.651	37.033	13.32.7	0.339
June	41.905	33.9483	26.056	136.795	76.5416	14.005
July	37.315	30.8736	25.557	594.308	224.6954	26.958
August	34.105	29.2562	24.389	342.545	249.5065	149.869
September	34.667	28.7414	22.765	270.853	130.9135	14.394
October	35.105	26.898	17.92	52.831	18.0266	0.332
November	31.126	21.8083	12.68	40.257	4.8353	0
December	25.45	16.457	6.432	14.12	2.1262	0

Source: India Meteorological Department

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The Maximum, Minimum & average data of Temperature from the year 2013 to 2016 is given in below table:

Source: Wunderground Website

The Maximum, Minimum & average data of Humidity from the year 2013 to 2016 is given in below table:

Month s	Year 2013			Year 2014			Year 2015			Year 2016		
	Humidity%			Humidity%			Humidity%			Humidity%		
	Max	Aver	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min
Jan	100	73.4 3	24	100	91. 77	36	100	91. 19	29	100	77. 64	20
Feb	100	72.8 2	11	100	74. 17	22	100	63. 89	23	100	16. 48	4
Mar	100	53.0 64	10	100	56. 25	11	100	60. 77	12	86	37. 32	6
Apr	88	26.0 33	5	100	28. 86	4	100	42. 26	4	100	18	4
May	81	18.3 8	4	98	24. 80	4	100	23. 38	4	84	30. 74	4
June	100	54	16	96	30. 96	4	100	38. 96	4	97	48	11
July	100	81.2 2	53	100	64. 41	12	100	70. 51	26	100	86. 06	6
Aug	100	86.9 6	48	100	74. 45	31	100	73	34	100	92. 16	65
Sep	100	66.9	30	100	63. 53	23	100	51. 4	17	100	79. 6	24
Oct	100	76.5 4	20	100	50. 64	16	100	42. 80	10	100	55. 09	13
Nov	100	64.6 3	20	100	48. 06	14	100	55. 63	14	100	58. 56	16
Dec	100	77.8 0	22	100	75. 57	15	100	68. 09	17	100	80. 41	27

Source: Wunderground Website

5.3.3 Geology

The soil of Agra is loose, sandy and calcareous. The river Yamuna is the only river flowing through the metropolitan city of Agra. The river enters the city on its northern boundary and takes U-shape while crossing through the heart of the city. The area is characterized by alluvium, which is an admixture of gravel, sand, silt and clay in various proportions, deposited during the Quaternary period. The study area is a part of Indo-Gangetic alluvium of quaternary age and is made up of recent unconsolidated fluvial formations comprising sand, silt, clay and kankar with occasional beds of gravel. There are some underground rocks of quartzite and sand stone of Vindhyan-series, in the west and south west of Agra. The topsoil is coarse

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and angular sand with small clay fraction. The sub-soil is sandy throughout. The stabilized topsoil is reddish brown with sand and clay mixed. The minimum depth of topsoil layer is 60 cm. Sand and silts are slightly alkaline to saline. The topography of the area is flat. Saline soils are generally brown. Alkaline soils are grey and get sticky on wetting and hard on drying, acquiring a clotted structure.

5.3.4 Mineral Resources

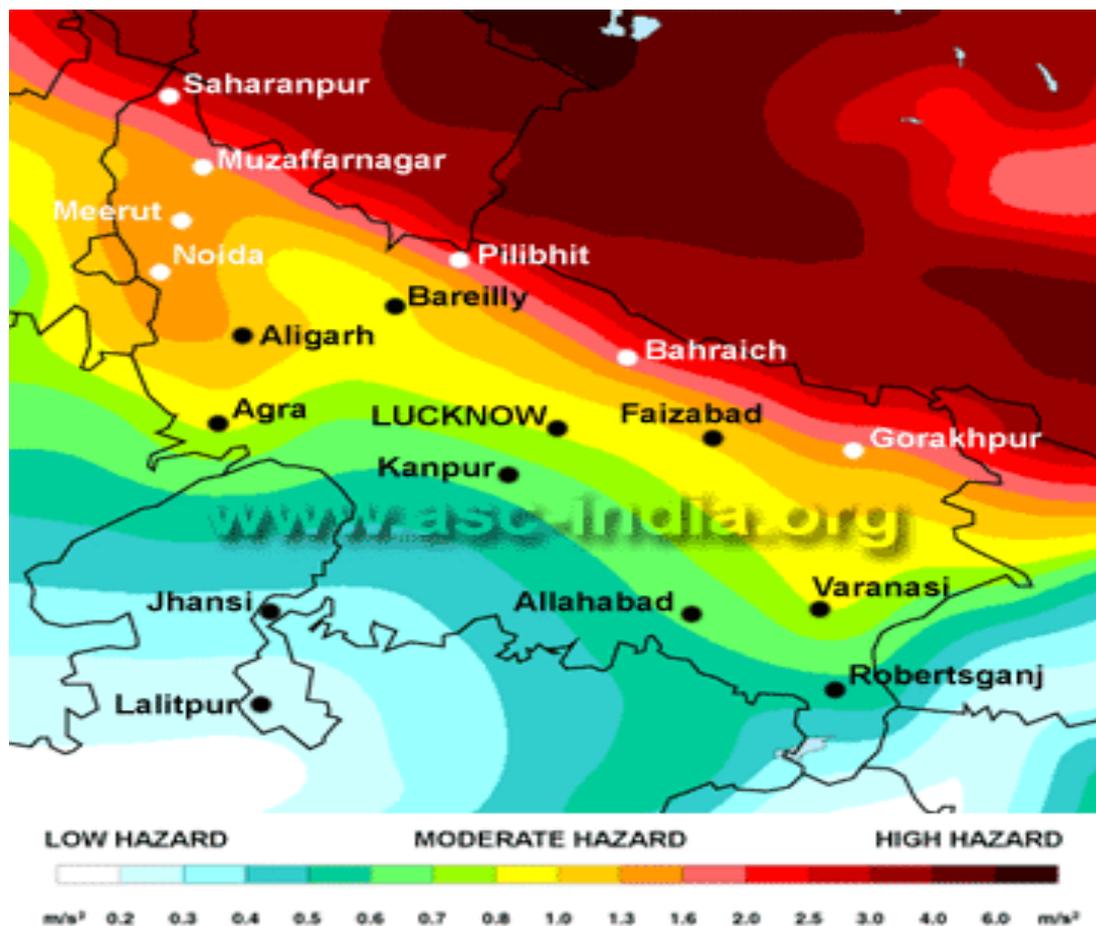
The project influence area does not have any sources of minerals except sand in the Yamuna river.

5.3.5 Land Use

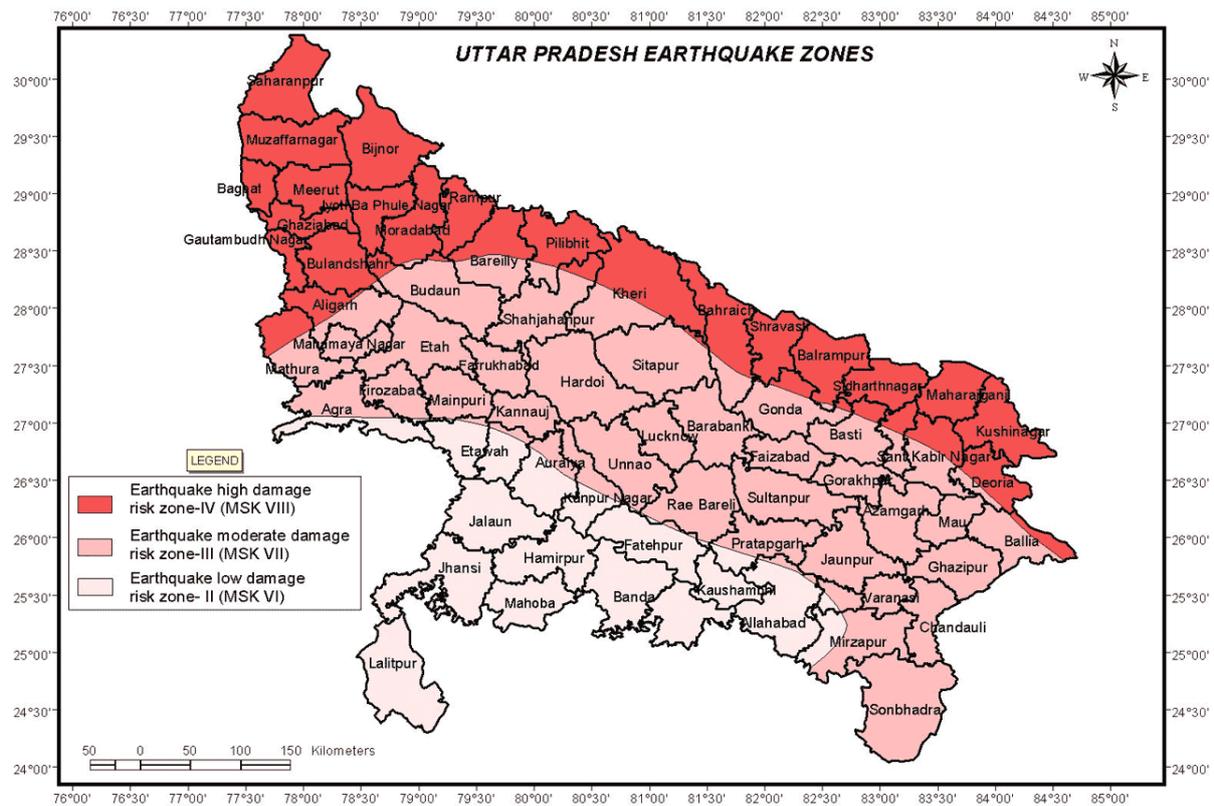
The land use of the project is parking as per the master plan of Agra Development Authority.

5.3.6 Seismicity Identification of Natural Hazard Prone Areas

Agra has been identified in Zone III, which means the area is categorized as moderate damage risk zone with potential of MSK VII earthquake. The IS code assigns zone factor of 0.16 for Zone III. Intensities of VII or more on Modified Mercalli intensity or MSK intensity are considered moderate to high areas under seismic zone III, IV and V as specified in IS 1892. Therefore, all areas in these three zone will be considered prone to earthquake hazards. The earthquake prone area maps of Uttar Pradesh and Agra. Seismic Zone area is given below:



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5.4 Soil

The soils are basically an outcome of landform, climate, land use, topography, time and parent material, which have been well considered during the pedological investigation. The role of soil as natural asset of ecosystem is viewed through three angles (i) supporting agriculture & forest (ii) Supporting engineering installation and (iii) Constituting the medium to regulate the storage and accumulation of subsurface water.

In the proposed sub-project no requirement of any land acquisition. The proposed sub-project is limited in a defined same land use. The soil analysis were conducted in the view of structural engineering installation.

5.4.1 Primary Data Analysis

Three locations were identified within the study area for collection of soil samples.

Below Table representing the Soil Sampling Locations:

S. No	Location	Depth
1.	B. H. - 1	Project site located in map
2.	B. H. - 2	Project site located in map
3.	B. H. - 3	Project site located in map

Below Table representing Particle size distribution

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S. No	Sample Location							
1.	B. H. - 1 (Taj - Mahal West Gate, Agra)							
	Sample depth	Sample No	Clay (%)	Silt (%)	Fine Sand (%)	Med Sand (%)	Coarse Sand (%)	Gravel (%)
			<0.002 MM	0.002-0.075	0.075-0.425	0.425-2.00	2.00-3.75	>3.75 MM
	2.25-2.55	UDS-1	22.6	39.3	21.7	5.6	3.2	6.6
	5.25-5.55	UDS-2	19.3	36.9	26.2	6.9	3.8	5.9
	8.25-8.55	UDS-3	12.2	29.8	40.3	10.4	3.8	3.5
	11.25-11.55	UDS-4	9.9	23.3	43.8	16.5	2.8	1.7
13.25-13.55	UDS-5	6.6	22.1	47.3	18.2	3.3	2.5	
2.	B. H. - 2 (Taj - Mahal West Gate, Agra)							
	Sample depth	Sample No	Clay (%)	Silt (%)	Fine Sand (%)	Med Sand (%)	Coarse Sand (%)	Gravel (%)
			<0.002 MM	0.002-0.075	0.075-0.425	0.425-2.00	2.00-3.75	>3.75 MM
	2.25-2.55	UDS-1	28.3	33.9	19.8	7.3	5.4	5.3
	5.25-5.55	UDS-2	25.6	30.8	23.6	8.9	5.4	3.7
	8.25-8.55	UDS-3	13.6	26.3	38.7	13.6	6.3	1.5
	11.25-11.55	UDS-4	9.2	23.5	45.3	17.2	3.8	1.0
13.25-13.55	UDS-5	5.6	20.1	48.2	20.6	3.2	1.3	
3.	B. H. - 3 (Taj - Mahal West Gate, Agra)							
	Sample depth	Sample No	Clay (%)	Silt (%)	Fine Sand (%)	Med Sand (%)	Coarse Sand (%)	Gravel (%)
			<0.002 MM	0.002-0.075	0.075-0.425	0.425-2.00	2.00-3.75	>3.75 MM
	2.25-2.55	UDS-1	32.6	36.2	18.2	7.3	3.0	2.7
	5.25-5.55	UDS-2	27.6	32.5	23.4	11.1	3.2	1.2
	8.25-8.55	UDS-3	15.3	28.7	33.2	15.9	6.3	0.6
	11.25-11.55	UDS-4	10.2	25.1	40.4	18.9	5.4	0.0
13.25-13.55	UDS-5	7.3	22.8	46.9	15.7	7.3	0.0	

Below Table representing Physical Characteristic of Soil

S. No	Sample Location			
1.	B. H. - 1 (Taj - Mahal West Gate, Agra)			
	Sample depth	Sample No	Bulk Density (gm./cm ³)	Water Holding Capacity (%)
	2.25-2.55	UDS-1	1.686	8.2
	5.25-5.55	UDS-2	1.668	7.6
	8.25-8.55	UDS-3	1.699	6.9
	11.25-11.55	UDS-4	1.702	6.5
	13.25-13.55	UDS-5	1.709	6.1
2.	B. H. - 2 (Taj - Mahal West Gate, Agra)			
	Sample depth	Sample No	Bulk Density (gm./cm ³)	Water Holding Capacity (%)
	2.25-2.55	UDS-1	1.687	7.9
	5.25-5.55	UDS-2	1.694	7.6

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	8.25-8.55	UDS-3	1.696	7.0
	11.25-11.55	UDS-4	1.700	6.4
	13.25-13.55	UDS-5	1.705	5.9
3.	B. H. - 2 (Taj - Mahal West Gate, Agra)			
	Sample depth	Sample No	Bulk Density (gm./cm³)	Water Holding Capacity (%)
	2.25-2.55	UDS-1	1.672	8.5
	5.25-5.55	UDS-2	1.690	8.1
	8.25-8.55	UDS-3	1.703	7.2
	11.25-11.55	UDS-4	1.709	6.8
	13.25-13.55	UDS-5	1.716	6.3

5.4.2 Secondary Data Analysis

The secondary data of soil analysis is taken from *EA Study around the Taj Mahal by NEERI (Nagpur) in Nov-2014*. The location of soil sample is "Near West Gate of the Taj Mahal", the Latitude of the soil sample location is N 27° 10.246' & the Longitude is E 78° 02.782'. The soil characteristic is given in below table:

Particle Size Distribution (%)					
Coarse Sand	Fine Sand	Silt	Clay	Textural Class	
6.80	33.96	33.04	26.20	Loam	
Physical Characteristics of Soil					
Bulk Density (gm/cm³)		Water Holding Capacity (%)		Porosity (%)	
1.14		46.20		45.60	
Chemical Characteristics of Soil					
pH	EC dS/m	Calcium	Magnesium	Sodium	Potassium
		Mg/l			
7.30	0.26	1.60	1.63	0.46	0.11
Cation Exchange Capacity (CEC) of the Soil in the Study Area					
Ca⁺⁺	Mg⁺⁺	Na⁺	K⁺	CEC	ESP
cmol (p+) kg ⁻¹					(%)
13.80	10.20	0.79	1.20	24.60	3.20
Relationship of CEC with Productivity					
CEC	Range (cmol (p+) kg⁻¹)			Productivity	
Moderate	20 – 50			Moderate	
Relationship of CEC with Adsorptivity					
CEC	Range (cmol (p+) kg⁻¹)			Adsorptivity	
High	20 – 30			High	
Fertility Status of Soil					
Organic Carbon	N	P₂O₅		K₂O	

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(%)		Kg/ha						
1.55		238.34			9.80		39.64	
Heavy Metals Content in Soil Samples								
Cd	Cr	Co	Cu	Fe	Mn	Ni	Pb	Zn
Mg/kg								
1.1	39.1	12.3	47.7	15120	294.2	26.7	28.7	223.3
Microbiological Characteristics of Soil								
CFU/g of Soil								
TVC		Fungi		Actinomycetes		Rhizobium		Azotobacter
76 x 10 ⁶		27 x 10 ⁴		36 x 10 ⁴		18 x 10 ⁴		23 x 10 ⁴

Source: EA Study around the Taj Mahal by NEERI (Nagpur) in Nov-2014

5.5 Ambient Air Quality

The major sources of air pollution in study area are emissions from vehicles and present construction related activities. The lack of fuel efficiency in vehicles, congestion in movement and ill-maintained vehicles are major cause of vehicular emissions.

5.5.1 Primary Data Analysis:

Analytical Instrumentation

Various sophisticated instruments were used for sampling (**Table 5.3.10**) and monitoring the air quality in terms of particulate and various gases viz. Fine Particulate Sampler (Envirotech APM 550), Respirable Dust Sampler (Envirotech APM 460) were used for monitoring of ambient air pollution.

Below Table representing the Instruments/Equipment used for Ambient Air Quality Monitoring and Analysis

S. No	Parameter	Instruments
1.	PM ₁₀	Respirable Dust Sampler (Envirotech APM 460)
2.	PM _{2.5}	Fine Particulate Sampler (Envirotech APM 550)
3.	Sulphur dioxide (SO ₂)	Respirable Dust Sampler (Gas Sampling Kit)
4.	Nitrogen oxide (NO ₂)	Respirable Dust Sampler (Gas Sampling Kit)

Below Table representing the Technique used for Ambient Air quality Monitoring and Analysis

S. No	Parameter	Technique	Technical Protocol	Minimum Detectable Limits
1.	PM ₁₀	Gravimetric	IS-5182 & CPCB	1 µg/m ³
2.	PM _{2.5}	Gravimetric	IS-5182 & CPCB	1 µg/m ³

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3.	Sulphur dioxide	Modified west and Gaeke	IS-5182 & CPCB	6 $\mu\text{g}/\text{m}^3$
4.	Nitrogen oxide	Jacob & Hochheiser	IS-5182 & CPCB	3 $\mu\text{g}/\text{m}^3$

Location & Period of Monitoring

The existing ambient air quality data required to assess impacts is collected through a well-designed air quality monitoring network. To establish the baseline status of air quality in the study region, three locations were selected for monitoring of air quality during 14 June to 20 June 2016. The monitoring sites locations are tabulate in below table. The sites were identified depending upon their importance and prevailing meteorological conditions. The monitoring was carried out for the parameters Particulate Matter (PM_{10} and $\text{PM}_{2.5}$), Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2). One air quality monitoring sites is shown in below Exhibit.

Below Table representing the Ambient Air Quality Monitoring Locations

S. N.	Location	Direction of Taj mahal w.r.t. monitoring station	Latitude	Longitude
1.	Water Booth (Near Meena Bazar)	North-East	27°10'23.63"	78°02'6.08"
2.	Sulabh Toilet at the Back Side Parking	North-East	27°10'27.64"	78°02'5.07"
3.	Near Entry Gate of Parking	North -east	27°10'23.85"	78° 2'1.93"



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*Photograph showing the location of Air Quality Monitoring station Near Entry Gate of
Parking*

Below Table representing the Air Quality Status

Location	Date	Time	PM ₁₀	PM _{2.5}	SO ₂	NO _x	Remark	
Water Booth (Near Meena Bazar) near west gate of Taj Mahal	14-15 th June 2016	06:00 to 14:00	141.04	52.6	BDL	9.12	-	
		14:00 to 22:00	153.47	63.8	BDL	15.2	-	
		22:00 to 06:00	91.48	35.96	BDL	10.2	-	
	16-17 th June 2016	06:00 to 14:00	113.88	45.6	BDL	15.53	-	
		14:00 to 22:00	116.47	52.2	04	19.47	-	
		22:00 to 06:00	55.86	22.04	BDL	13.83	-	
	-	-	Min.	55.86	22.04	BDL	9.12	-
	-	-	Max.	153.47	63.8	04	19.47	-
	-	-	Avg.	112.2	45.53	0.67	13.06	-
	-	-	SD	±35.11	±13.89	±1.63	±3.81	-
Sulabh Toilet at the Back Side of Parking near west gate of parking	15-16 th June 2016	06:00 to 14:00	171.42	62.8	BDL	9.8	-	
		14:00 to 22:00	122.38	45.36	04	12.9	-	
		22:00 to 06:00	88.15	36.2	BDL	8.6	-	
	17-18 th June 2016	06:00 to 14:00	138.43	52.34	BDL	17.04	-	
		14:00 to 22:00	127.5	45.68	06	18.5	-	
		22:00 to 06:00	139.23	48.82	BDL	16.72	-	
	-	-	Min.	88.15	36.2	BDL	8.6	-
	-	-	Max.	171.42	62.8	06	18.5	-
	-	-	Avg.	131.185	48.53	1.67	13.93	-
	-	-	SD	±27.13	±8.81	±2.66	±3.12	-
Near Entry Gate of Parking near west gate of parking	18-19 th June 2016	06:00 to 14:00	108.05	38.46	BDL	16.08	-	
		14:00 to 22:00	120.63	50.4	BDL	18.65	-	
		22:00 to 06:00	86.18	29.24	BDL	13.04	-	
	19-20 th June 2016	06:00 to 14:00	163.24	62.57	BDL	12.64	-	
		14:00 to 22:00	108.12	46.15	BDL	9.38	-	
		22:00 to 06:00	112.6	43.92	BDL	9.2	Drizing Rain Partially	

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-	Min.	86.18	29.24	BDL	9.2	-
-	Max.	163.24	62.57	BDL	18.65	-
-	Avg.	116.47	45.12	BDL	13.33	-
-	SD	±25.60	±11.24	±BDL	±3.73	-

24 hourly average ambient air quality data from 14th June 2016 to 20th June 2016.

Primary Data	PM₁₀	PM_{2.5}	SO₂	NO_x
Minimum	55.86	22.4	BDL	8.6
Maximum	171.42	63.80	06	19.47
Average	119.90	46.39	0.7	13.77
Standard Deviation	29.03	10.98	1.78	3.53

5.5.2 Secondary Data Analysis

Below Table representing the Hourly Average Ambient Air Quality Data Taj Mahal Station From 2002 to 2015

Year	SO₂ µg/m³	NO_x µg/m³	PM 10 µg/m³	SPM µg/m³
2002	05	22	147	376
2003	04	22	145	352
2004	05	18	133	309
2005	09	22	147	306
2006	06	22	133	316
2007	06	23	167	396
2008	07	22	167	304
2009	06	20	157	334
2010	05	20	167	333
2011	04	20	149	390
2012	05	18	178	332
2013	04	17	153	275
2014	04	15	152	277
2015	04	18	166	298

(Source:CPCB)

Below Table representing the 24 Hourly Ambient Air Quality Data for SO₂ January to December 2015, Taj Mahal Station

SO₂	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Min	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

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Max	04	05	05	05	04	04	04	04	05	BDL	04	04
Avg	BDL	BDL	BDL	BDL	BDL	0.84	0.3	BDL	BDL	BDL	BDL	0.3
SD	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

(Source: CPCB)

Below Table representing the 24 Hourly Ambient Air Quality Data for NOx January to December 2015, Taj Mahal Station

NOx	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Min	9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	11	BDL
Max	41	64	58	27	33	16	40	21	23	29	62	58
Avg	17.29	21.18	19.8	10.39	11.0	5.54	3.16	6.1	6.8	11.8	27.68	25.76
SD	6.64	13.09	12.39	8.38	7.94	6.16	9.28	3.6	7.03	7.02	13.50	12.39

(Source: CPCB)

Below Table representing the 24 Hourly Ambient Air Quality Data for (PM₁₀) January to December 2015, Taj Mahal Station

PM ₁₀	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Min	136	118	54	51	72	29	22	28	42	72	149	177
Max	349	240	184	307	501	222	203	102	199	350	399	461
Avg	225	178	113	148	209	120	58	53	124	197	268	288
SD	48.3	30.7	43.20	68.48	109.97	41.28	42.99	19.86	45.89	68.40	81.30	61.43

(Source: CPCB)

Below Table representing the Ambient Air Quality Data 24 Hourly June 2016 Taj Mahal Station

CPCB	SO ₂	NOx	PM 2.5	PM 10
Min	BDL	BDL	10	29
Max	4	15	120	219
Avg	BDL	2.76	51.35	106.68
SD	BDL	5.03	37.78	46.35

(Source: CPCB)

Below Table representing the Ambient Air Quality Data near proposed site 2016 from 14-06-2016 to 20-06-2016 (West gate parking area at 03 locations)

Primary data	SO ₂	NOx	PM _{2.5}	PM ₁₀
Min	BDL	8.6	22.4	55.86

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Max	06	19.47	63.80	171.42
Avg	0.7	13.77	46.39	119.90
SD	1.78	3.53	10.98	29.03

Below Table representing the National Ambient air Quality Standard

Standard	SO ₂	NO ₂	PM ₁₀	PM _{2.5}
Annual average AAQ Standard For Sensitive Area	20	30	60	40
24 Hourly Average AAQ Standard for Sensitive Area	80	80	100	60

(Source: CPCB)

Results & Analysis

The ambient air quality monitored at 03 locations in the study area (West gate parking area) from 14 June to 20 June 2016 is summarized during study period SO₂, NO_x, PM_{2.5}, PM₁₀ where monitored 08 hourly and result compiled average 24 hourly. The concentration of pollutants on 24 hourly basis PM₁₀ & PM_{2.5} where found in the range 55.86 to 171.42 µg/m³ and 22.04 to 63.80 µg/m³. The average value of PM₁₀ & PM_{2.5} particles 119.90 to 46.39 µg/m³ respectively. On comparing primary data with data collected from CPCB during study period for PM₁₀ (52 to 136 µg/m³) and PM_{2.5} (10 to 103 µg/m³). The average data of PM₁₀ particle size are identical with to our primary data with 91 and 119 µg/m³. While monthly PM₁₀ values for the month of June-2016 CPCB 106.68 and primary data 119.93 and PM_{2.5} CPCB 51.35 µg/m³ and primary data 46.39 µg/m³. The 24 hourly SO₂ and NO_x CPCB data BDL to 4 µg/m³ and primary data data BDL to 6 µg/m³ our data close related to CPCB data. The observation of NO_x monitoring BDL to 15 µg/m³ of data observed by CPCB. The primary data found 8.6 to 19.47 15 µg/m³ NO_x during 14 to 20 June 2016.

The concentration of SO₂, NO_x, PM_{2.5}, PM₁₀ comprising from standard SO₂, NO_x are always in the limit prescribed by NAAQS while particle PM₁₀ and SPM are higher than the prescribed limit. The CPCB started of PM_{2.5} monitoring from 2016.

5.6 Noise Quality

5.6.1 Primary Data Analysis

The baseline environmental monitoring for noise quality was conducted through primary survey to at strategic locations. The baseline noise levels helps in understanding the existing noise level so that necessary monitoring mechanism and safeguard measures can be formulated for the possible impacts from the project on noise quality during the construction and operation stages of the project. The existing baseline noise level is presented in below table:

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Below Table representing the Location of Noise Monitoring

S. No	Location	Latitude	Longitude
1.	Meena Bazar near west gate Parking	27°10'23.16" N	78°2'6.07" E
2.	West Gate of Taj Mahal	27°10'15.69" N	78°2'25.74" E
3.	West Gate Parking Area	27°10'24.85" N	78°2'1.93" E
4.	Police Check Post near west gate parking	27°10'22.32" N	78°2'3.48" E
5.	Shahjahan Garden	27°10'21.93" N	78°2'0.56" E

Below Table representing the Monitoring of Noise Level during day Time

Location	Date	Time (Day) In between 6:00 to 22:00 Hr	Noise Level, dB (A) Leq	Standard dB (A) Leq
Meena Bazar near west gate Parking	16-Jun-16	10:30 to 10:45 Hr	70.34	65
	16-Jun-16	12:30 to 12:45 Hr	73.35	
West Gate of Taj Mahal	17-Jun-16	11:15 to 11:30 Hr	63.83	50
	17-Jun-16	15:15 to 15:30 Hr	62.23	
West Gate Parking Area	18-Jun-16	14:00 to 14:15 Hr	67	65
	18-Jun-16	16:15 to 16:30 Hr	69.39	
Police Check Post near west gate parking	19-Jun-16	11:45 to 12:00 Hr	66.11	65
	19-Jun-16	15:15 to 15:30 Hr	70.78	
Sahjahan Garden	20-Jun-16	10:45 to 11:00 Hr	70.03	65
	20-Jun-16	15:00 to 15:15 Hr	73.58	

Below Table representing the Monitoring of Noise Level during Night Time

Location	Date	Time (Night) In between 22:00 to 6:00 Hr	Noise Level, dB (A) Leq	Standard dB (A) Leq
Meena Bazar near west gate Parking	16-Jun-16	23:30 to 23:45 Hr	64	55
	16-Jun-16	04:00 to 04:15 Hr	51.74	
West Gate of Taj Mahal	17-Jun-16	23:15 to 23:30 Hr	53.46	40
	17-Jun-16	03:00 to 03:15 hr	51.7	
West Gate Parking Area	18-Jun-16	00:15 to 00:30 Hr	49.93	55
	18-Jun-16	04:00 to 04:15 Hr	50.17	
Police Check Post near west gate parking	19-Jun-16	00:15 to 00:30 Hr	42.26	55
	19-Jun-16	04:00 to 4:15 Hr	45.41	
Sahjahan Garden	20-Jun-16	23:00 to 23:15 Hr	58.65	55
	20-Jun-16	05:00 to 05:15 hr	58.12	

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Photograph showing the location of Noise Monitoring (Police Check Post near west gate parking)

5.6.2 Secondary Data Analysis

Secondary data of Noise quality of the area were taken from Environmental Assessment (EA) Study Before and After the Proposed Urban Conservation and Tourism Development Project of Area Around the World Heritage Site, Taj Mahal, Agra. This study was conducted by National Environmental Engineering Research Institute (NEERI) Nagpur, India in November 2014.

Below Table representing the Location of Noise Quality Monitoring

S. No.	Location	Latitude E	Longitude N	Category of area /zone
1.	West side parking facility	27°10' 23.3"	78° 2' 2.9"	Commercial
2.	Market area (near cloak room)	27°10' 19"	78° 2' 16"	Commercial
3.	West gate of Taj Mahal	27°10' 15.6"	78° 2' 25.6"	Silence

Below Table representing the Monitoring Location and Noise Level during Day Time

S. No.	Location	Date	Time	Observed Leq	Applicable limits
1.	West side parking facility	22-02-2013	2:25 to 2:40 pm	67.3	65
		23-02-2016	1:45 to 2:00 pm	76.6	
2.	Market area (cloak room)	22-02-2013	2:00 to 2:15 pm	60.2	65
		23-02-2016	1:20 to 1:35 pm	68.6	
3.	West gate of Taj Mahal	22-02-2013	1:30 to 1:45 pm	63.7	50
		23-02-2016	1:00 to 1:15 pm	75.7	

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Below Table representing the Monitoring Location and Noise Level during Night Time

S. No.	Location	Date	Time	Observed Leq	Applicable limits
1.	West side parking facility	23-02-2013	12:20 to 12:35 am	57.2	55
		23-02-2016	10:00 to 10:15 pm	60.3	
2.	Market area (cloak room)	23-02-2013	12:00 to 12:15 am	48.6	55
		23-02-2016	10:20 to 10:35pm	50.7	
3.	West gate of Taj Mahal	22-02-2013	11:40 to 11:55 pm	61.9	40
		23-02-2016	10:40 to 10:55 pm	57.4	

(Source – Environmental Assessment (EA) Study before and after Proposed Urban Conservation and Tourism Development Project of area around the World Heritage Site, Taj Mahal, Agra by National Environmental Engineering Research Institute (NEERI) Nagpur-November 2014)

Below Table representing the Reference noise level of different construction machinery, equipment and vehicles:

Description	Typical Noise level Range, dB (A)	Reference Distance, m
Front loaders	72-84	1.0
Backhoes	72-93	1.0
Tractors	76-96	1.0
Scrapers, Graders	80-93	1.0
Pavers	86-88	1.0
Trucks (>cc)	82-94	1.0
Concrete mixers	75-88	1.0
Concrete pumps	81-88	1.0
Crane (Moveable)	75-86	1.0
Crane (Derrick)	86-88	1.0
Pumps	69-71	1.0
Compressors	74-86	1.0
Air compressor	111	1.0
Back Hoe/Loader	105	1.0
Concrete Mixer truck	109	1.0
Concrete Pumper	94	1.0
Concrete Vibrators	101	1.0
Cranes- mobile	105	1.0
Dump truck	107	1.0
Generator	75	1.0
Hammering	110	1.0
Jackhammer	112	1.0
Pile Driver	124	1.0
Radial Arm Saw	104	1.0

Result & Analysis

Noise levels during day hours in the study area are slightly higher from standard values. Hence need to take noise control measures in the project.

5.7 WATER QUALITY

5.7.1 Primary Data Analysis

a. Source of Ground Water

- Agra Jal Nigam is implementing water supply project in the entire city. In the project area the main source of water is ground water except Tajganj area where protected water is supplied by the Jal Nigam, Agra.
- Three bore wells of diameter four inch are located in the project site. While one is used for the drinking water purposes, the other two are used by the public toilet located at the site.
- Additionally there are three nos. of bore wells present in the surrounding area of the site. While one bore well is located next to the Meena bazaar, the other is located near Baba Bodhidas Asharm and the other near Hazrat Syed Jalal Shah Bukhari Alahay Dargah..
- In addition to the above, number of bore wells are present in the Shahjahan park, and Sheesh Mahal park of Horticulture Department, both of which are close to the project site.
- The water table of the site is 12 meter below ground level.

b. Source of Water Pollution

The main source of waste water generation in the study area is:

- Waste water generation from Baba Bodhidas ashram
- Waste water generation from Hazrat Syed Jalal Shah Bukhari Alahay Dargah
- One no. of RO plant, which generates some quantity of Ro reject water and spillage during use.
- The waste water generated from two nos of community toilets is disposed in the own septic tanks and the overflow of septic tank goes to the adjacent drain of the site.
- Above generated waste water disposed in the adjacent drain of the site.
- One open nallah comes from Tajganj area is flowing towards site which is intercepted near Meena bazaar by Jal Nigam and send through underground sewage line to Dhandhupura STP for their treatment.

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- Two another source of water pollution in the study area are –
 - a. A Nallah is flowing from Khairati Tola to Yamuna river via Shahjahan garden and Sheesh Mahal ka tilla, which is approximate 400 meter away from the proposed site.
 - b. A large nallah is flowing from city area to Yamuna River via Motilal Nehru crossing which is approximate 900 meters away from the proposed site.

Below Table representing the Ground Water Quality Of The Proposed Site

The ground water quality is given in below table:

SN	Parameter	Unit	Reference Method	Bore Well Water Results	BIS Standard IS 10500:2015	
					Requirement (Acceptable Limit)	Permissible limit in the absence of alternate source
1.	Colour	Hazen	2120 B	Clear	5	15
2.	Odour	-	2150 A	Odorless	Agreeable	Agreeable
3.	Taste	-	-	Tasteless	Tasteless	Tasteless
4.	Temperature	^o C	-	27 ^o C	-	-
5.	pH	-	4500 H+B	8.5	6.5-8.5	NR**
6.	Turbidity	NTU	2130 B	0.5	1	5
7.	Conductivity	µmhos/cm	2510 B	3540	-	-
8.	TDS	mg/l	2540 C	1752	500	2000
9.	Hardness as CaCO₃	mg/l	2340 C	620	200	600
10.	Alkalinity	mg/l	2320 B	892	200	600
11.	Chloride as Cl	mg/l	4500 Cl,B	319	250	1000
12.	Sulphate as SO₄	mg/l	4500- SO ₄	240.7	200	400
13.	Fluoride	mg/l	4500-F,C	0.9	1.0	1.5
14.	Calcium as Ca	mg/l	3500 Ca,	241	75	200
15.	Magnesium as Mg	mg/l	3500 MG,E	149	30	100
16.	Sodium as Na	mg/l	3500- Na,D	78	-	-
17.	Potassium as K	mg/l	3500- K,D	03	-	-

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18.	Copper as cu	mg/l	3500Cu,B	<0.001	0.05	1.5
19.	Chromium as Cr	mg/l	3500- Cr,B	<0.003	0.05	NR**
20.	Cadmium as Cd	mg/l	35000Cd,B	<0.0008	0.003	NR**
21.	Iron as Fe	mg/l	3500-Fe,D	<0.28	0.3	NR**
22.	Manganese as Mn	mg/l	3500-Mn,D	<0.001	0.1	0.3
23.	Nickel as Ni	mg/l	3500-Ni,D	<0.006	0.02	NR**
24.	Lead as Pb	mg/l	3500-Pb,B	<0.0015	0.01	NR**
25.	Zinc as Zn	mg/l	3500-Zn,D	<0.001	5	15
26.	Mercury as Hg	mg/l	3500-Hg,B	BDL**	0.001	NR**
27.	Arsenic as As	mg/l	3500-As,B	BDL**	0.1	0.5
28.	Nitrate as NO₃	mg/l	4500- NO ₃ -D	8.0	45	NR
29.	Total Coliforma	MNP 100 ml	9221	Absent	Should be absent in any 100/ml sample	
30.	Faecal coliforma	MNP 100 ml	9221	Absent		

Note: BDL** - Below detection Limit, NR** - No relaxation

5.7.2 Secondary Data Analysis

The source of water supply in the study area is mainly ground water. Drop in ground water table has been reported in the last decade; with depths ranging from below ground level given in below table:

Year	Pre Monsoon			Post Monsoon		
	Min.	Max.	Avg.	Min.	Max.	Avg.
2007	8.77	33.37	21.1	8.91	33.02	18.43
2008	9.39	33.87	21.64	7.84	32.94	21.03
2009	8.81	34.63	22.05	8.54	34.12	22.28
2010	9.57	35.34	22.99	8.69	31.97	22.67
2011	9.55	33.95	23.5	9.15	33.76	23.21
2012	10.0	34.24	23.56	8.65	33.94	23.4

Units: meters Source: UP Jal Nigam

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The result of ground water quality of Agra city is taken from Ground Water Year Book of Uttar Pradesh (2014 – 2015) released by Central Ground Water Board. The ground water quality of Agra is given in below table.

S. No	Parameters	Result
1	pH	8.41
2	EC $\mu\text{s/cm}$ At 25 ⁰ C	3250
3	CO ₃	24
4	HCO ₃	300
5	Cl	490
6	F	1
7	NO ₃	55
8	So ₄	450
9	TH	500
10	Ca	44
11	Mg	117
12	Na	470
13	K	5.9
14	SiO ₂	34
15	PO ₄	ND
16	TDS	2178
17	RSC	-4.6
18	SAR	8.4

Result and Analysis:

The water table of proposed project site is 12 meter and the hardness of ground water is high.

5.8 Biological Environment

5.8.1 Primary Data Analysis

Baseline status of flora and fauna was analyzed through extensive field survey and plot less sampling method was used in and around the study area was carried out during the month of May-June 2016, for assessment of flora and fauna Secondary data has been collected from Forest department & Horticulture Department and interaction with officials of both departments.

Below Table representing the numbers of trees in the project affected area (except green patch).

S.No	Name of Trees	Botanical Name	Numbers of Trees
1.	Kadam	Neolamarckia cadamba	02 nos.

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2.	Eucalyptus	Eucalyptus globu	14 nos.
3.	Kat Sagon	Haplophragma adenophyllum (wall) Dop.	15 nos.
4.	Neem	Azadirachta indica	12 nos.
5.	Date Palm	Phoenix dactylifera	13 nos.
6.	Goolar	Ficus racemosa	01 nos.
7.	Shisham	Dalbergia Sissoo Roxb.	01 nos.
8.	Total		58 nos.

Below Table representing the number of trees available in Green patch near the entrance of the site

S.No	Name of Trees	Botanical Name	Numbers of Trees
1.	Kadam	Neolamarckia cadamba	01 nos.
2.	Eucalyptus	Eucalyptus globu	06 nos.
3.	Kat Sagon	Haplophragma adenophyllum (wall) Dop.	20 nos.
4.	Neem	Azadirachta indica	14 nos.
5.	Copper Pod	Peltophorum pterocarpum	06 nos.
6.	Babool	Vachellia nilotica	13 nos.
7.	Chill Bill	Holoptelea integrifolia	03 nos.
8.	Bombax Ceiba	Bombax Ceiba	05 nos.
9.	Indian Bel	Aegle marmelos	01 nos.
	Total		69 nos.

Map showing the Green Patch and other trees available on the Proposed Project Site:

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5.8.2 Secondary Data Analysis

At present three sides of the Taj Mahal is protected with about more than 100 m dense green belt for protection of Taj Mahal from Air pollution. The entire green belt is planted and maintained by Horticulture & Forest Department of Uttar Pradesh.

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Result & Analysis

Massive forestation operations have been undertaken by forest department of Uttar Pradesh. One major initiative in this direction was development of green belt at Shahajahan Park. The plantations under this activity were carried out around the study area. The flora in the Shahajahan Park is a greenbelt (planted on suggestion by NEERI, 2000) for combating the air pollution from western side and protecting the Taj Mahal from its hazardous effect. Total area of park is 242 acre with total plantation of 15,190 trees having girth of more than 1 foot. The park is managed by Horticulture Department, UP tourism, Agra. Some of the dominant trees in the park are *Holoptelea integrifolia* (Papdi), *Azadirachta indica* (Neem), *Polyalthia longifolia* (desi Asoka) Putranjeeva, along with 240 plants of economically important chandan trees.

5.9 Fauna

To study the diversity of fauna, survey methods were adopted. The survey was mainly carried out at dawn and at dusk to study animal behavior and habitat. This study period is mainly selected as animals are most active.

Secondary data was collected from the forest department and interaction with the local peoples was also conducted to establish baseline study for distribution of wild animals in the study area.

5.9.1 Domestic animals:

Domestic animals like cow, buffaloes, goat, dogs, camels etc are found in the study area.

5.9.2 Wild animals:

The study area being a residential and commercial area lacks any wild fauna however monkeys are found to be dominant in the study area. However the Shahajahan Park has provided a suitable habitat for indigenous avifauna like Peacocks, Pigeons, Babblers etc and also the mammals like monkeys and squirrels.

5.9.3 Avi fauna

Checklist of birds was prepared based on visual observations. Birds commonly observed included Cattle Egret (*Bubulcus ibis*), Parrots (*Pistta culakrameri*), House swift (*Apusaffinis*), Common pigeon (*Columba livia*) common mynah (*Acridotho rostustos*), Domestic geese (*Anseranser domesticus*) and Peacocks (*Pavovistatus* sp.) Peacock is an endemic bird species of this region and was frequently observed in the study area. A large number of resident and migratory birds' species have been reported inside the Taj Nature Walk.

Result & Analysis

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The diversity and distribution of avifauna in the study area however is indicative of insignificant impact. In local context, there is no any evidence of hunting or poaching in the area. Though, there are less evidences of fire in this area, but sometimes the shelters of animals are destroyed by public interference.

5.10 Protected Area:

There is no protected area in and around the study area as per the biological aspect.

5.11 Solid Waste Management

Solid waste management (SWM) includes all activities that seek to minimize health, environmental, and aesthetic impacts of solid wastes if disposed off unscientifically. The study related to solid waste generation, collection and its disposal was prompted by the flourishing tourism over the year at World Heritage Site Taj Mahal at Agra. Increasing tourism has resulted in an increase in the tonnage of Municipal solid waste (MSW) generated, posing serious challenges in its collection, storage, transport processing and disposal. The methodology employed in this study included physical observations and the secondary data and facts from different reports.

Over the years, the local population of Tajganj Area has increased. The tourist population has increased from 32, 00,638 (in the year 2008) to 65,13,543 (in the year 2015).

Sources of Solid Waste around proposed project:

- The main source of solid waste in the study area are from visitors, vendors, shopkeepers, construction and commercial activities.
- Approximately 30,000 number tourists move towards Taj Mahal from the proposed site on peak time in a day.
- Approximately 100 vendors are performing activities in and around proposed site area.
- Total 71 shops are existing in the vicinity of proposed site area.
- Approximately 100 to 200 pilgrims visit daily adjacent Ashram and Dargah. Approximately 500 to 700 pilgrims visit on Thursday of every week.
- Approximately 30 camel carts are moving around the site.
- Approximately 75 e-ricksaw are moving around the site.
- Approximately 24 golf carts are moving around the site.
- Approximately 23 tanga are moving around the site.

Result & Analysis

Agra Municipal Corporation is responsible for the solid waste collection, transportation and disposal from the study area. The type of bins used in and around Project site is mainly dumper

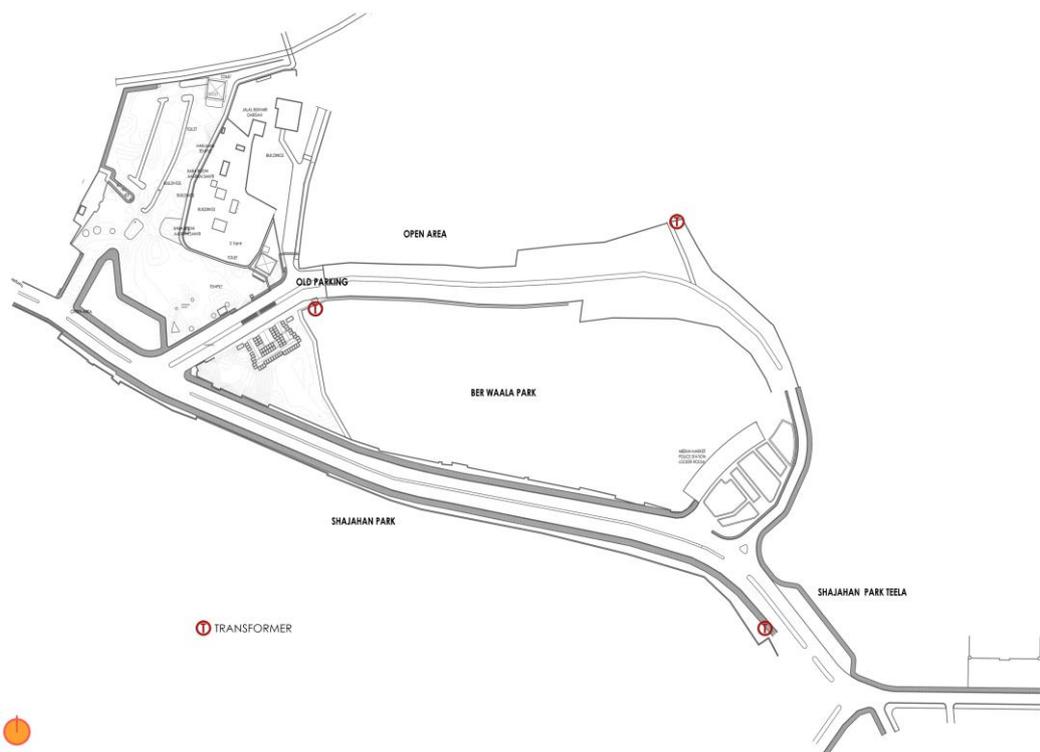
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placer bins, besides there are a number of roadside dumps spread all over the study area. For primary collection of wastes, handcarts, wheel barrows and tricycles are used. Vehicles used for transportation of waste from collection point to disposal site are mainly ordinary trucks, tipper trucks, tractor and trailer, dumper placer and autotype vehicles.

5.12 Electrical Infrastructure

Project site has electrical infrastructure which provides transmission and power to the various activities on the site. The electrical infrastructure present on site is listed as here under.

- The electrical power is received at 11 KV with under-ground cable system, which is further stepped down through distribution transformer (Compact Sub Station of capacity 500 KVA).
- The HT line is present on the cremation ghat near the bank of the river, in north-east direction of the site and is approximately 400 mts from the site.
- LT Distribution – Electrical supply feeds into Feeder pillar from Compact Substation through underground cable. Existing 43 nos. of shops, 2 nos. of toilet blocks, two nos. of parks & Street lights etc. is feeding the power through feeder pillar. All cables for shops are laid underground.
- Energy Meters for Shops are installed outside at the wall of Shops.
- Three transformers are existing in the surroundings of the site, the location of transformers are indicated in below diagram:



5.13 Socio-Economic Profile

The social profiling includes the profile of the community living in the vicinity of the site or directly/indirectly linked to the site- hawkers/vendors/vendors, shopkeepers, parking contractors, Tonga, camel cart, rickshaw and golf cart drivers. A sample survey was undertaken to generate data about demography, socio-economic profile, level of literacy, livelihoods, access to infrastructure and services (physical and social), linkages to the monument, etc. using a structured questionnaire format. This data has been analyzed:

- i) To get a baseline for the site, identification of the DPR components and assessment of impact for preparation of mitigation measures.
- ii) To identify the Project affected peoples whose livelihood is dependent upon the project area.

The various stakeholders of the project identified through the reconnaissance survey, discussions, informal and unstructured interviews and to a extent participatory observation were grouped into two main categories: institutional and non-institutional. The institutional category consists of the departments of Tourism, Archaeology, Jal Nigam, Electricity, Water Supply and Sewerage, Security Agencies and ADA. The non-institutional stakeholders comprise the petty shopkeepers, hawkers/vendors/vendors, parking attendants, owners/drivers of camel carts, horse carts, e-rickshaws, golf carts and guides. From the social point of view, the latter are more important as they are the ones who will face the hardships; immediate and/or permanent. A study of the symbiotic relationship between the Taj and the local community within the defined sub-project area brought to the fore the dependence of the stakeholders on tourist flow. This project will ensure that the concerns of these stakeholders, earning their livelihood from within the defined sub-project area, will be addressed in the final plan for development. The methodology of participatory planning through stakeholder consultation and regular interactions has been adopted to address the issues of working conditions, livelihood, skill enhancement training, capacity building and gender. The social fabric of the project area is predominantly composed of two religious groups, Hindus, followed by Muslims; the economic activities also show a clear cut divide with the Hindus engaged in trading and Muslims largely engaged as Guides, with each group accounting for 75.5 and 13.5 percent respectively

A review of the demographic profile of the project area and census survey of the PAPs has put the number of project affected persons at 336. The social impact of the project may be also assessed in terms of viewing the occupational pattern of the project area. The economic profile of the project area reveals that there is dominance of business activities comprising

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mainly of small and petty traders followed by guides, hawkers/vendors and operators/drivers of local modes of transport like horse carts, e-rickshaws, golf-carts etc. Details of the baseline survey and the tourist profile will form a part of the concept plan but a list and number of all the non-institutional stakeholders identified through the reconnaissance survey has been prepared to support our study.

Below Table representing the Number of Non-Institutional Stakeholders

S. No.	Category (Particulars)	Quantity (Nos.)
1.	Hawkers/Vendors	
	Within Parking Lot	19 Nos.
	Outside the parking lot up-to West gate	79 Nos.
	Hunter sellers (HH Industry: 3 families)	10 Nos.
2.	Shopkeepers of Ber-ka-Tila Market	71 Nos.
3.	Employees of Ber-Ka-Tila Market	28 Nos.
4.	E-rickshaws	75 Nos.
5.	Golf carts (private)	11 Nos.
6.	Horse carts	23 Nos.
7.	Parking attendants	20 Nos.
Total		336 Nos.

Below Table representing the Commercial properties affected due to sub-project

Details	Unit	Quantity (Nos.)
Total Affected (shops at Ber-ka-Tila market)	Number	71 Nos.
Title Holders (shops at Ber-ka-Tila market) (allottees)	Number	71 Nos.
Non-Titleholders – Encroachers	Number	00 Nos.
Non-Titleholders – Squatters	Number	00 Nos.
BPL Families losing Commercial Properties	Number	00 Nos.

Below Table representing the Other PAPs of the sub-project

Details	Unit	Quantity (Nos.)
Hawkers/vendors (selling factory made goods within the parking lot)	Number	19 Nos.
Hawkers/vendors (selling factory made goods outside the parking lot)	Number	89 Nos.

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Hawkers/vendors (selling HH Industry goods)(three families)	Number	10 Nos.
Private Golf Cart owners/ Drivers	Number	11 Nos.
Horse cart owners/drivers	Number	23 Nos.
e-rickshaw owners/drivers	Number	75 Nos.
Employees of shops at Ber-ka-Tila Market	Number	28 Nos.
Parking attendants	Number	20 Nos.

Below Table representing the Common Property Resources Affected

Type	Unit	Quantity (Nos.)
Civic utilities/Sulabh Complex	Number	02 Nos.
Borings/submersible pumps for water	Number	07 Nos.
Drinking water tank/taps (RO unit)	Number	01 Nos.
Others (Police outpost)	Number	01 Nos.

CHAPTER - 6

ASSESSMENT OF ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

6.0 PREDICTION AND EVALUATION OF IMPACTS DUE TO PROPOSED ACTIVITIES:

This section identifies and predicts the potential impacts on different environmental components due to the construction and operation of the proposed project. It details all the potential impacts on biophysical and socio-economic components of the local environment due to the proposed activities and sub-activities.

Prediction of impacts is the most important component in the Environmental Impact Assessment studies. Several qualitative and quantitative techniques and methodologies are used to conduct analysis of the potential impacts likely to occur as a result of the proposed development activities on physical, ecological and socio-economic environments. Such predictions are superimposed over the baseline (pre-project) status of the environmental quality to derive at the ultimate (post-project) scenario of environmental conditions. The prediction of impacts helps to minimize the adverse impacts and maximize the beneficial impacts on environmental quality during pre and post project execution.

The proposed project would create impacts on the environment in two distinct phases:

- During the construction phase which may be regarded as temporary or short – term
- The other during the operation stage which would have long – term effects

The negative impacts of the project will be mitigated/prevented/controlled through appropriate measures.

IMPACT DUE TO PROJECT LOCATION

6.1 Displacement of People

Since the project and its associated activities are limited to acquired and approved area of horticulture department and currently supervised by Agra Development Authority and is free from encroachment, and ready for development of project in all respect, 71 shops are proposed to be rehabilitated. The rehabilitation and resettlement related issues are only in small area of market. No portion of the site from under forest/reserve forest or agriculture land.

Mitigation:

Rehabilitation and Resettlement plan for seventy-one shopkeepers by proposing new shops on the *ber-ka-teela* area, as a haat type facility to in order to improve the conditions for the existing shopkeepers developed as part of Social Impact Assessment Report.

6.2 Change of Land Use

The development in the entire project area is as per approved Master Plan of Agra Development Authority, hence no land use change is involved.

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6.3 Impact on Utilities During Construction Phase

The proposed site is used as per approved parking plan of Agra Development Authority. The existing site has two community toilets (sulabh Complex), out of which one toilet will be dismantled which is situated on the northern end of the site. The Drinking Water kiosk with RO plant located on the eastern end of the site will be retained during the construction phase and will be dismantled once the proposed facility is complete.

Mitigation (Construction Phase):

Temporary toilets have to be provided for working time use near the site to be used by the construction workers.

The existing retained toilet near the eastern exit point cannot be used by the workers on the site as it is a paid facility and is to be reserved for the visitors coming to the site or around.

Existing Drinking Water facility with RO plant can be used during the construction work. (as per 215 workers requirement)

Mitigation (Operation Phase):

The removed toilet facilities will eventually be compensated to nearly twice that of existing number, by the toilet proposed at the same location. The new proposed facility shall be having even more number of toilet units provided as per the applicable standards.

The incorporated facility in place of reduced utilities is as under:

		Standard as per Museum /Library (A)	Existing Toilet (Sulabh International)(B)	Required Fixtures	VFC Block(C) provided	In side Taj Mahal (D)	Balance Requirement(E=A-B-C-D)	Staff Toilet Provided	Taj West Gate Market Shops
Male									
1	WC	10	5	5	6	7	-8	10	5
3	Urinal	36	4	32	32		0	11	5
4	Bath		2	0			-2	2	
5	Wash Basin	10	3	7	9		-2	10	5
				0					
1	Handicap	1	1	0	1		-1	1	0
2	Drinking Water Taps	26		26	6		-8	18	2
Female									
1	WC	7	15	-8	7	5	-20	7	2
2	Bath	0	1	1			-1	1	0
3	Wash Basin	7	12	-5	7		-12	6	2
				0					

6.4 Impact on Tourist Vehicle and Public Transport During Construction

On one part, new traffic will be generated for construction activities (for transportation of excavated earth and construction material) and at the same time, tourist vehicles population

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will be substantially reduce due to the temporary shifting of parking facility during construction. Considering these facts there will be no significant increment in traffic volume in the proposed project area.

Mitigation:

1. Existing Parking Facilities will be shifted to the existing Red Fort parking area & also at the Land Parcel on Purani Mandi Road.
2. The tourists may either use the Purani mandi crossing entry gate or may go through the Shahjahan garden during the construction phase, minimizing the tourist traffic on the west gate parking site.
3. To facilitate tourist movement E- rickshaws/other non- polluting vehicles will be allowed from Red Fort Parking & Purani Mandi Road to Taj Mahal.
4. All vehicles related to the construction work going towards the parking site shall carry PUC certificate (Pollution under check). Checking of the vehicles for the certificate on the site shall be a practice

6.5 Impact on Tourist Activities during Construction Phase

The site is a significant halt point for parking, refreshments and waiting for the tourists, who are approaching west gate of Taj Mahal, and due to the construction work these tourist activities may be affected.

Mitigation:

1. All the Major construction vehicles will be moved in non peak time to minimize the impact on tourist activities.
2. Significant proportion of the tourists may have diverted to the Mandi crossing entry gate or through the shahjahan park to move towards the West gate, which will let the parking site to bypass.

6.6 Impact Due to Excavation of Site:

Total area is 9550.075 Square meter which is proposed to be cut/digging and the depth of digging is proposed 7.65 meter. The proposed project soil has Sandy-type soil. Total 73535.00 cu.m will be excavated.

Mitigation:

1. Approx. 73535.00 cu.m will be excavated out of which 7500.00 cu m of top soil excavated will be stored within site and will be used for gardening and landscaping purpose, 7500.00 Cu.m of soil excavated will be used for Sabzi ka tilla fro landscaping and tree plantation.

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43535.00 Cu.m of soil will be transferred to site of proposed ring road being developed by Agra Development Authority for proper disposal/Landfill. 15000.00 cu m for leveling Ground for temporary parking.

2. Excavation activity of soil will be performed as per duly approved mine plan from Directorate of Geology & Mining, U.P. and mine plan will be prepared by Registered Qualified Person under "Grant of Recognition Under Rule 22 (C) of Mineral Concession Rules, 1960".

6.7 Impact on Drainage Pattern:

A Drain of average 1.5 meter width is flowing along with the proposed project site (about 220 meter length) and discharges storm water of the catchment to Yamuna River. It also carries the storm water of the Taj Ganj area. During construction phase flow of existing drain will be effected.

Mitigation

- In the rainy reason this existing sewer line will not be able to handle the overflow as the size of sewer line passing near the site is only 300mm dia and can take only 1 MLD load. It can take the load of west gate drain only in dry weather. But it cannot further take the load of the storm water of the west gate Drain during monsoon. Therefore to control the flow of the drain in the monsoon season a Concrete Hume Pipe having Dia 450 mm shall be installed, so that the over flow of storm water coming from Taj Ganj Area. There is a location near Meena Bazaar where the drain is tapped and a mechanical screen will be installed to remove the floating material.

6.8 Aesthetic and Landscape effect

During the construction phase, curtain barriers of 4.5 mt ht. shall be put on the entire site periphery which will visually obstruct the ongoing construction work. The length of the site which will be exposed to the West gate road from where the tourists will be passing, will only be 70 mts which will be completely screened-off by curtain barriers, therefore there would not be much impact in the aesthetic sense.

The proposal has been designed carefully considering the importance of the skyline of the area from across the river Yamuna in aesthetic sense and the very presence of the Taj Mahal. It was imperative to maintain the skyline of the area without introducing an imposing intervention in the area. As of now, only a small part of the parking site is visible from across the river and the rest remains hidden with the vegetation on and around the site. Therefore, the proposal has designed such as the no imposing structure is visible on the site from across

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the river. The single story visitor facility on the ground level has been kept on the southern part of the site, which shall also be least visible from across the river.

Keeping the proposed construction low-profile also reduces the dominance of the built structure within the green vegetated area in the precincts. Apart from this the site will also be treated with landscape design on the available setbacks and the green patch in the front art of the site so as to keep connected with the green and natural environment. The shops on the ber-ka-teela area have been designed with traditional and raw approach to gel with the natural setting, following the natural contours and physical characteristics of the site. The trees in the ber-ka-teela area shall be completely retained.

6.9 Cultural Heritage and Archaeological resources

Proposed project area falls in the buffer zone of two important world Heritage site. The construction site falls beyond the 500 mts restricted zone, which is why regulated construction has been proposed beyond the 500 mt line. It should be considered that the surroundings are archaeologically rich. Although, there are negligible chances to find any archaeological findings on the site as it is only 350 years old, however if any archeological remains are found during excavation, the remains shall be identified, preserved and conserved then and there and integrated with the proposal. Manual excavation is required in such a situation. For the protection of cultural and archeological remains standard guidelines should be followed.

6.10 Impact on Air Environment

Existing source of Air Pollution

- The main source of existing air pollution in and around the proposed site is vehicular emission and existing construction activities.
- Due to insufficient space in the existing parking vehicular congestion is common phenomenon. There is a reasonable rush at the peak times and queue of vehicles waiting to get into the parking site causing chaos and greater polluting effects. Bottlenecks and slow movement of vehicles is a major source of air pollution at the site.

6.10.1 Impact During Construction Phase

Potential impacts on the air quality during the construction phase will be fugitive dust and the exhaust gases generated in and around the construction site due to construction vehicular movement and construction machinery.

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Emission Estimation

In order to assess the overall impact of the identified sources of air emissions, due to various project activities, internationally recognized emission factors for each source/ activity have been used. Emission estimation for each source/ activity was being done by multiplying the emission factor with the activity details (e.g. travel distance of vehicles, open area likely to be prone for windblown dust, etc.). Emission estimation of each of the source/ activity has been presented in below table. Assumptions and sources of information used for estimation are provided below this table.

Table-1: Emission Estimation (Road and Area Sources):

Source	Activity	Emission Factor				
		PM ₁₀	PM _{2.5}	NOx	SO ₂	CO
Fugitive Dust*	Construction Grading and Earth Moving Activity	1.7 (tons)	0.89 (tons)			
	Construction Truck Travel on Facility Unpaved Roads	8.8 (tons)	0.88 (tons)			
Diesel Engine Criteria Pollutant**	Construction Diesel Engine Criteria Pollutant Emission Estimates	0.15 (g/bhp-hr)		3.4 (g/bhp - hr ²)	0.038 (g/bhp - hr ⁴)	2.6 (g/bhp-hr)
Criteria Pollutant***	Light moving Vehicle	0.7 (g/km)		0.08 (g/km)	.029 (g/km)	1.0 (g/km)

*Reference - AP-42, Section 11.9, Western Surface Coal Mining - Table 11.9-1, EPA July 1998.

*Reference - AP-42, Section 13.2.2, Unpaved Roads - Equation (1a), EPA November 2006.

**References - NSPS Subpart IIII (NOx, CO, VOC, and PM) and Mass Balance (SO₂).

***References –Auto Fuel Policy.

Prediction of Impacts

Impacts due to the fugitive emissions of the proposed parking project as well as tail pipe emissions from heavy vehicles to be used in the Project for transportation and fugitive dust due to traffic movement in the Project roads were assessed by modeling projected emission rate (Refer Table 1) of the proposed parking project. The assessment was performed by modelling projected emission rates in the ISCST3. The ISCST-3 model developed by US Environmental Protection Agency (EPA) is used to compute the ground level concentrations of the pollutant. This model has the capability to handle polar or Cartesian co-ordinates, simulate point, area and volume sources, considers wet and dry deposition, makes terrain adjustments, considers building downwash. The ISCST-3 model for continuous elevated point sources uses the steady-state Gaussian plume equation. The ISCST-3 model employs Briggs formulae to compute plume rise, Pasquill-Gifford curves for parameterising the horizontal and vertical dispersion parameters for rural background and empirical relations for urban

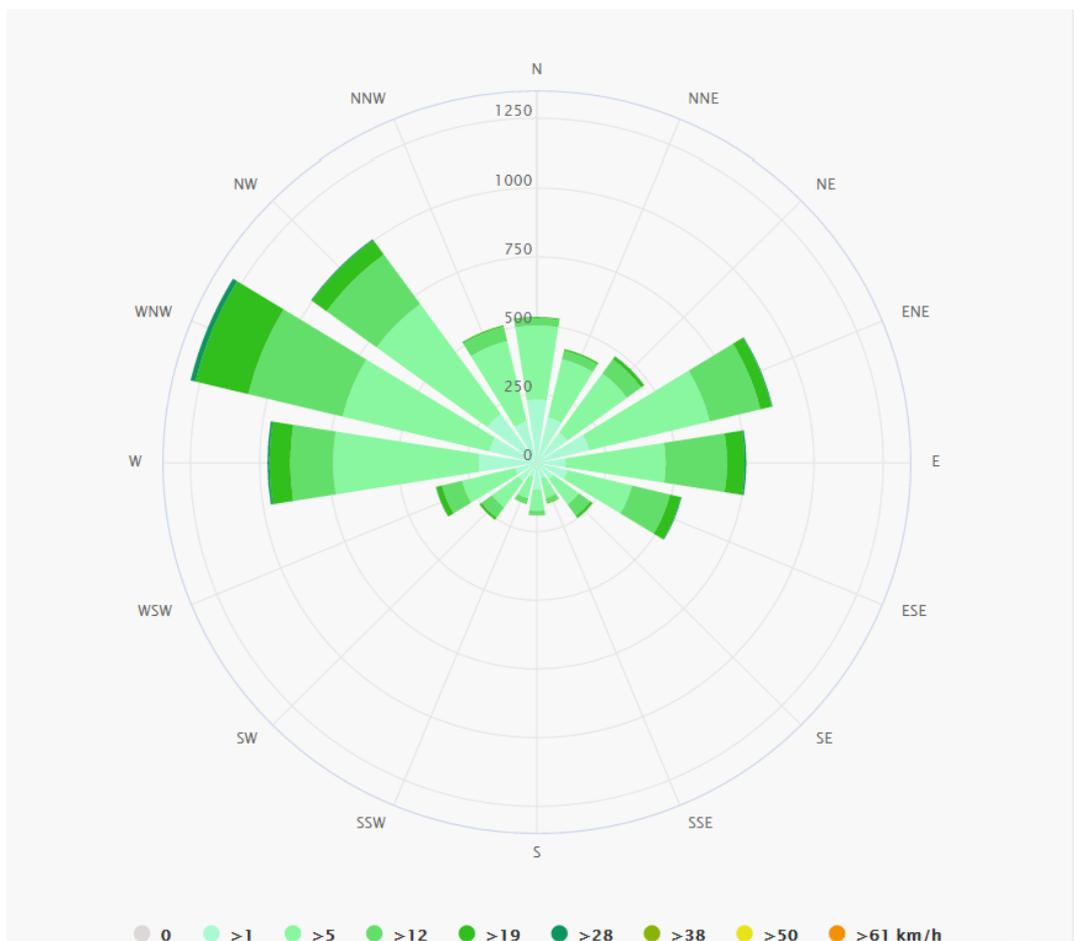
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background and it includes buoyancy-induced dispersion. This model has an option to use rural or urban background.

ISCST3 model directly reads the output files created by the pre-processing programs and along with source information and predicts ambient air concentrations for a variety of pollutants and averaging periods ranging from 1-hour to annual.

Meteorological Data:

Surface meteorological data recorded during baseline monitoring was used for the modelling exercise. The wind rose diagram of the study period has been presented in **below figure**. It illustrates the wind roses for the study period in post monsoon season. The predominant wind direction is from North-West to South-East.



Wind rose Diagram

Receptors:

The receptor grid or network, defines the locations of predicted air concentrations used to assess compliance with the relevant standards or guidelines. The following comprehensive fine and coarse receptor network was used for this analysis:

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- In this run 21 grids are taken each at interval of 500 m and range of grids are from (-5000, 5000) to (5000, -5000).

This network used Cartesian (X, Y) receptors coordinates. Base elevation of all the receptors were found using terrain elevations interpolated from *SURFER* software using Krigging method.

Emission Rates:

The emission factors recommended by NSPS, USEPA and CPCB were used in calculations to the extent possible. *Below table* provides summary of the total expected emissions from the proposed parking project during construction period and during operation period. For worst case scenario it is supposed that 9550.075 Sqm is to be excavated for 7.65 meters which is main source of pollution during construction phase. During operation phase for worst case scenario it is supposed that all vehicle 500 ECU arrived at same time and all are in on condition which leads to maximum pollution.

Analysis Results

For each criteria pollutant, the maximum predicted concentration is defined as:

1. PM₁₀, PM_{2.5}, NO_x and SO₂ short-term averaging (24-hour) – the highest high values (for each receptor) during construction phase; and
2. PM₁₀, CO, NO_x and SO₂ short-term averaging (24-hour) – the highest high values (for each receptor) during operation phase.

Predicted maximum criteria pollutant concentrations due to the proposed expansion and transportation in the study area have been presented in the following tables.

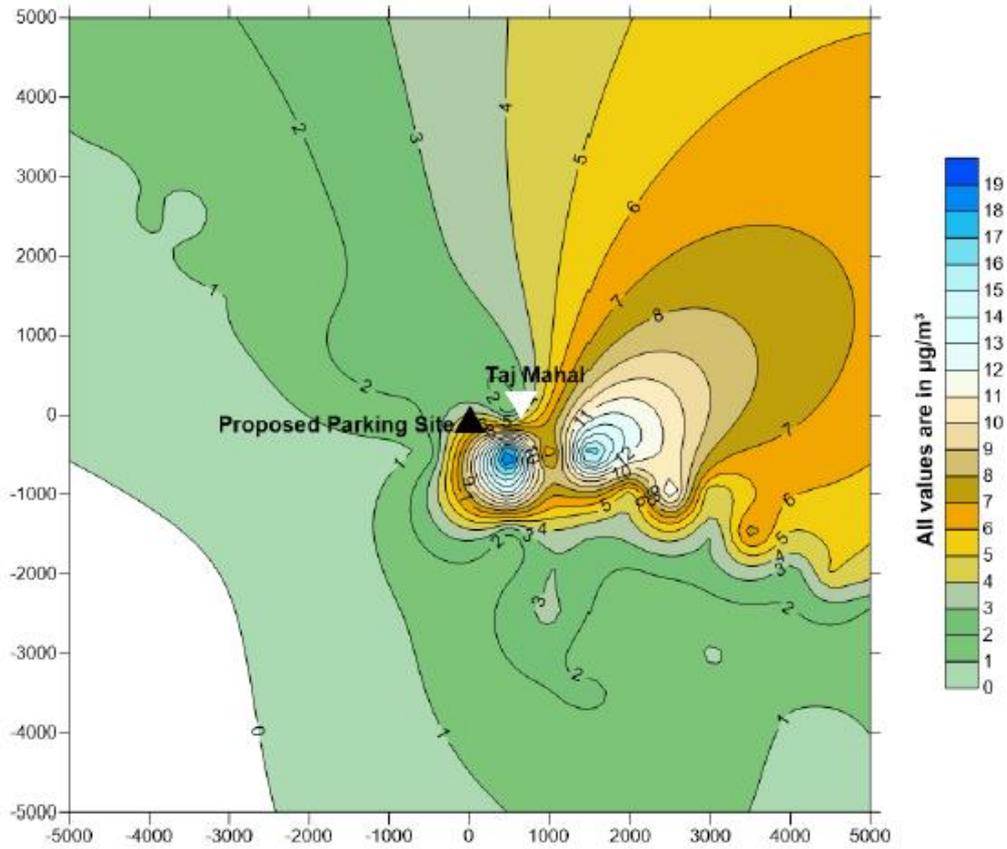
Table-2: Below table represent the 24 Hourly Maximum (Baseline + Predicted) Ground Level Concentrations During Construction

Receptor	Predicted 24 hourly Maximum Concentration (µg/m³)				Baseline 24 hourly Seasonal Average Concentration (µg/m³)				24 hourly Maximum Concentration (Predicted + Baseline) (µg/m³)			
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	PM ₁₀	PM _{2.5}	NO _x	SO ₂	PM ₁₀	PM _{2.5}	NO _x	SO ₂
(X,Y) (500,-500)	20.7	3.5	7.9	0.079	119.9	46.39	13.77	0.7	140.6	49.89	21.67	0.779
CPCB Standard									100	60	80	80

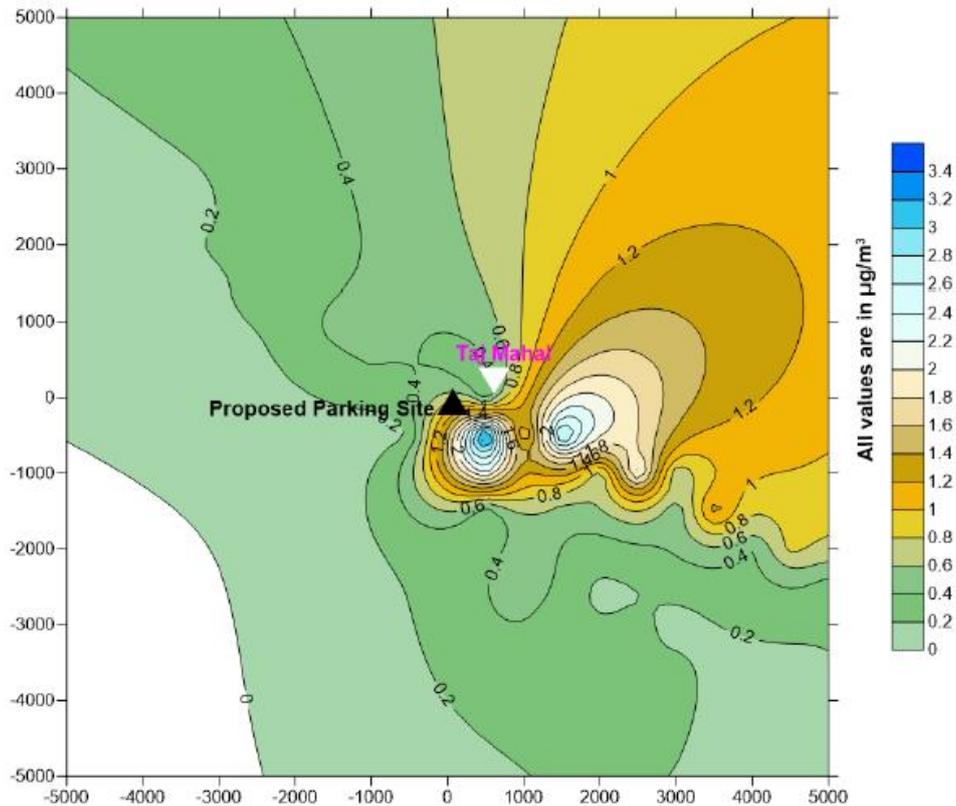
Table-3: Below table represent 24 Hourly Maximum (Baseline + Predicted) Ground Level Concentrations During Operation

Receptor	Predicted 24 hourly Maximum Concentration (µg/m³)				Baseline 24 hourly Seasonal Average Concentration (µg/m³)				24 hourly Maximum Concentration (Predicted + Baseline) (µg/m³)			
	PM ₁₀	CO	NO _x	SO ₂	PM ₁₀	CO	NO _x	SO ₂	PM ₁₀	CO	NO _x	SO ₂
(X,Y) (500,-500)	1.33	1.91	0.15	0.077	119.9	<200 0	13.77	0.7	121.3	2001. 91	13.92	0.777
CPCB Standard									100	4000	80	80

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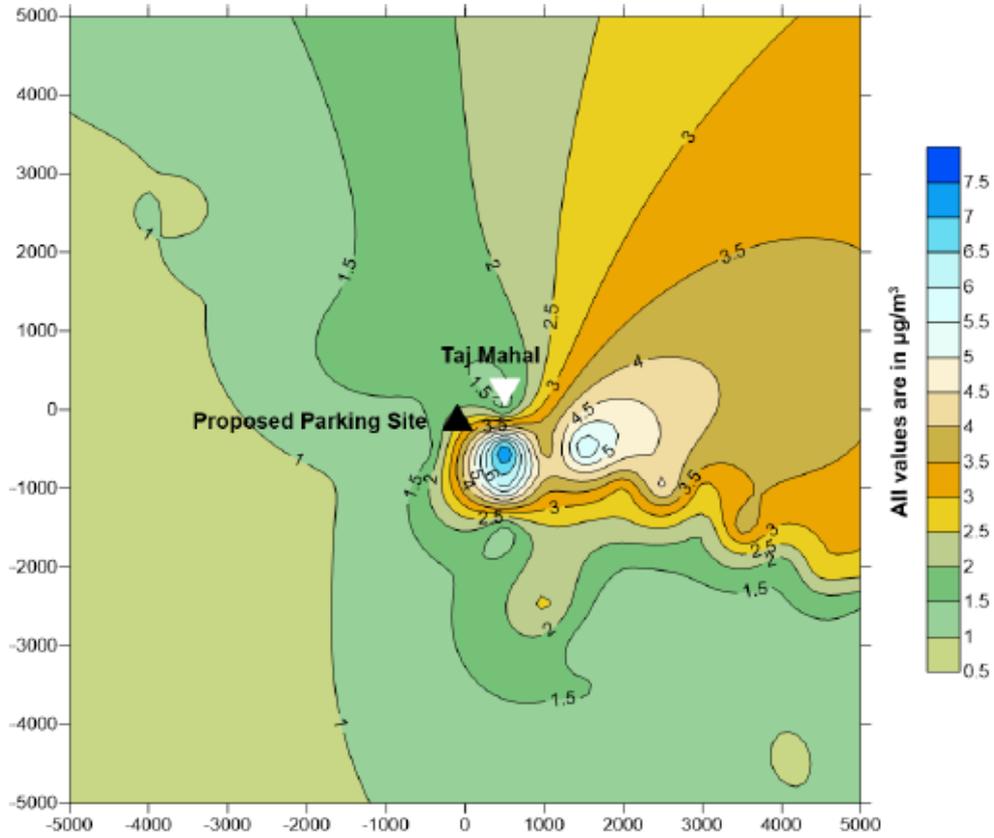


Isopleths of 24 Hourly Maximum PM₁₀ Ground Level Concentrations during Construction

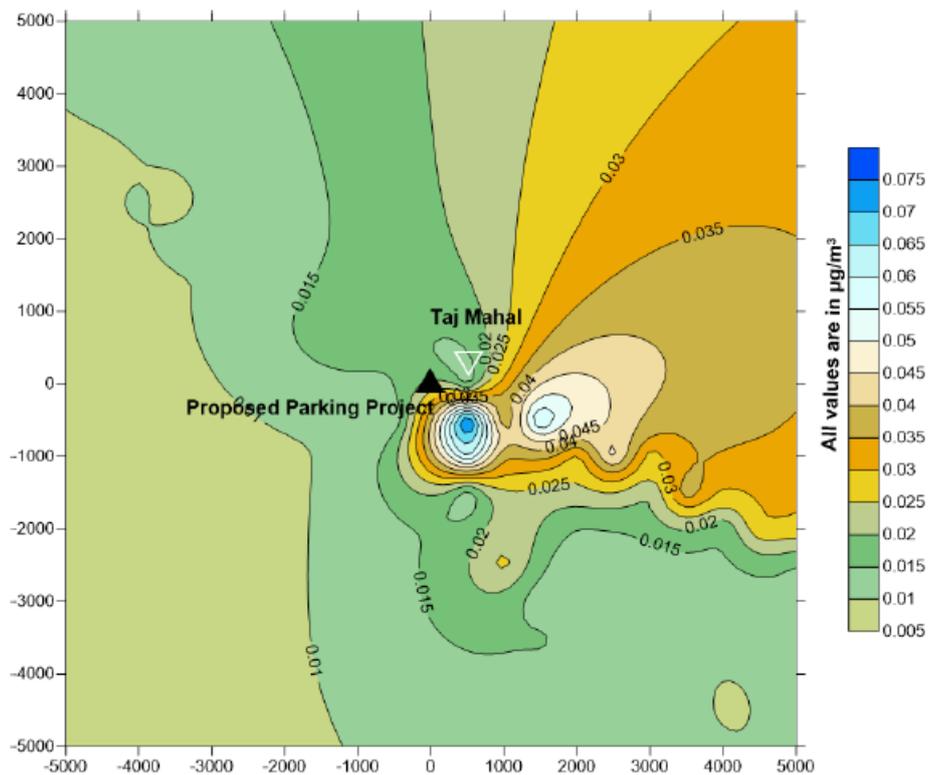


Isopleths of 24 Hourly Maximum PM_{2.5} Ground Level Concentrations during Construction

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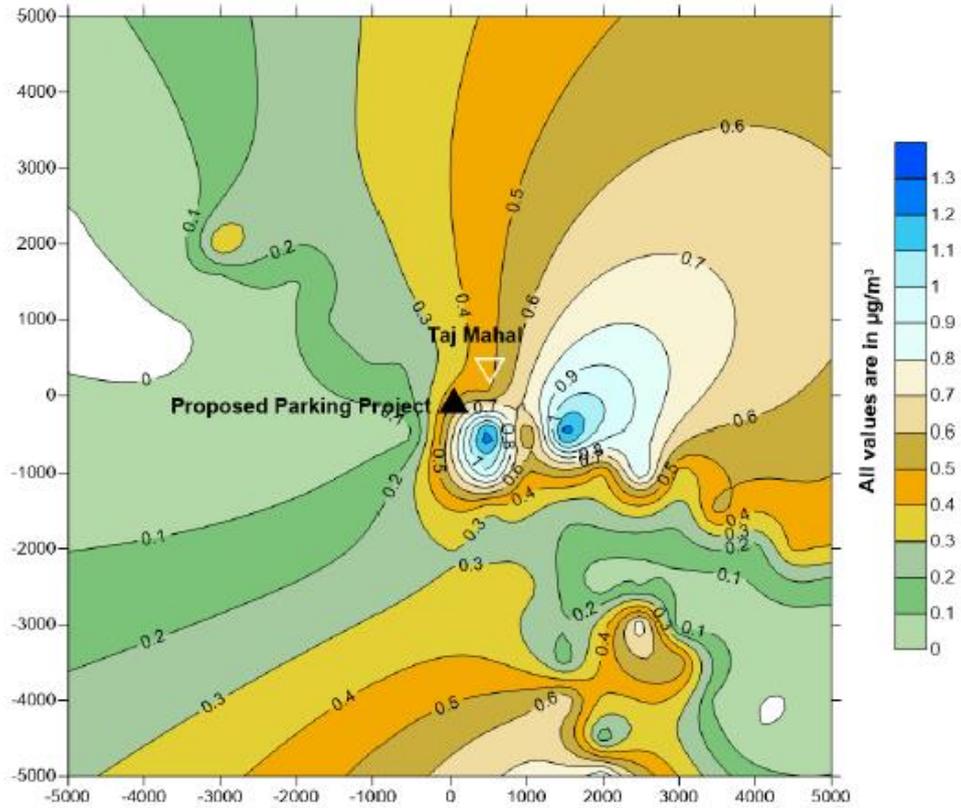


Isopleths of 24 Hourly Maximum NO_x Ground Level Concentrations during Construction

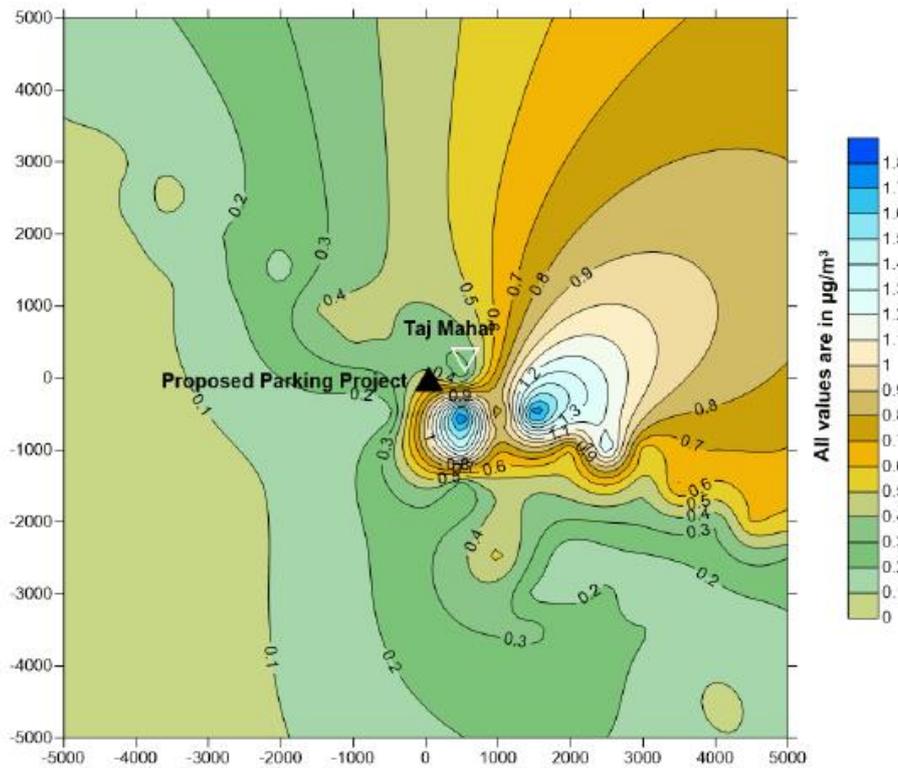


Isopleths of 24 Hourly Maximum SO₂ Ground Level Concentrations during Construction

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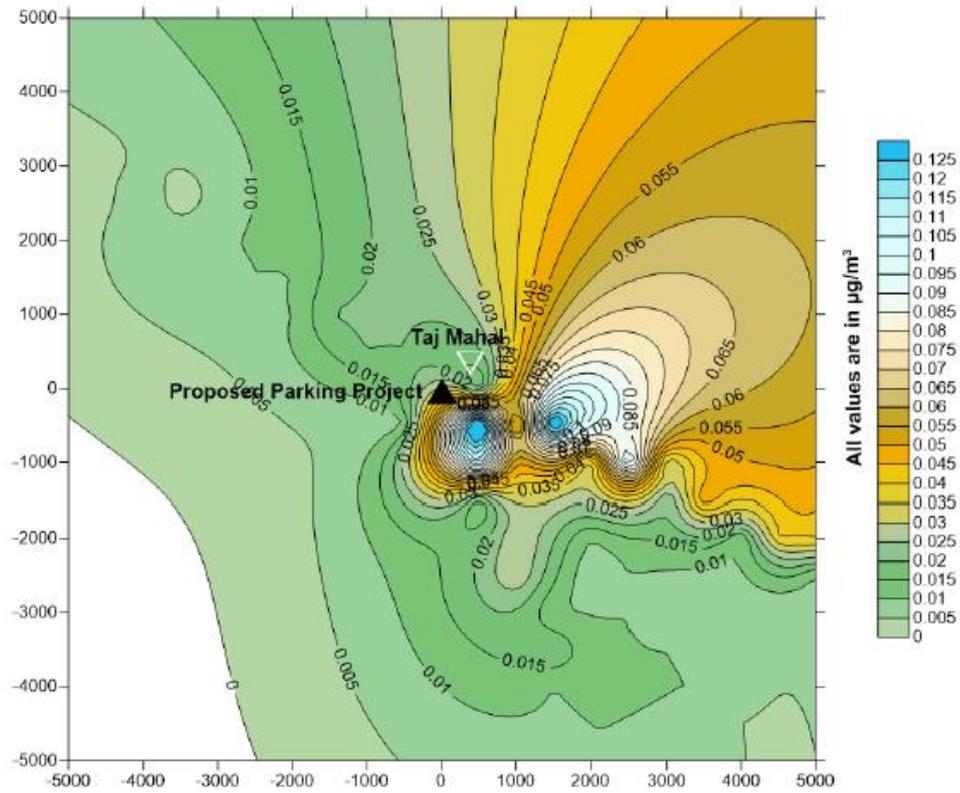


Isopleths of 24 Hourly Maximum PM₁₀ Ground Level Concentrations during Operation

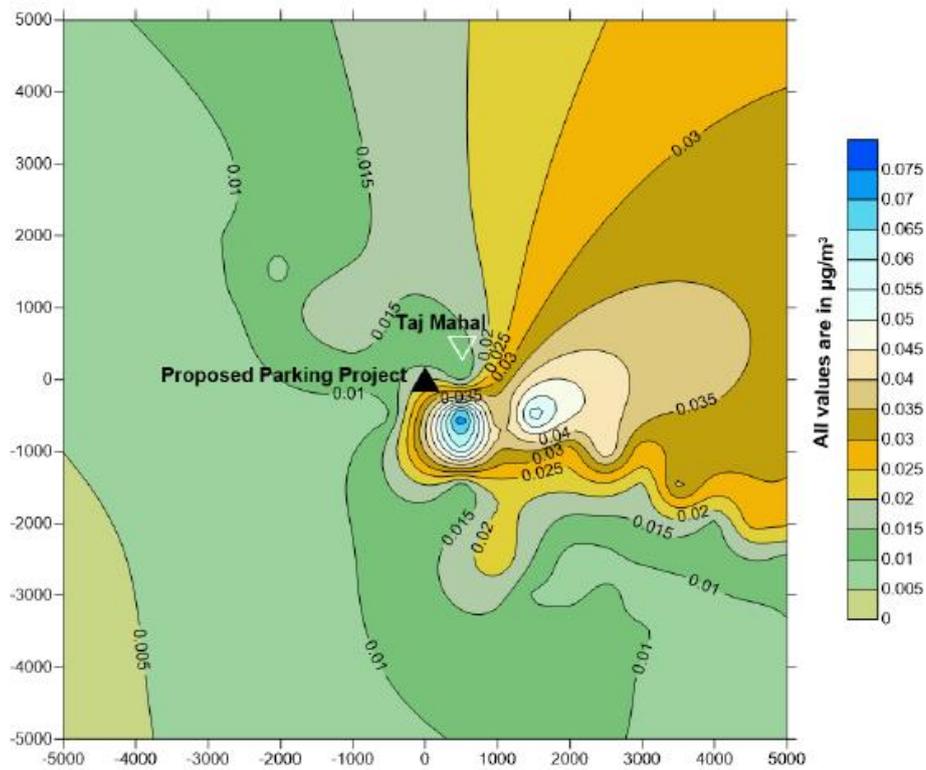


Isopleths of 24 Hourly Maximum CO Ground Level Concentrations during Operation

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Isopleths of 24 Hourly Maximum NO_x Ground Level Concentrations during Operation



Isopleths of 24 Hourly Maximum SO_x Ground Level Concentrations during Operation

Impact Significance

It is evident from **Table 2 and 3** that maximum 24 hourly concentrations (when predicted incremental concentrations at each receptor added with the average recorded concentrations during the study period) of PM_{2.5} and NO_x, SO₂, and CO concentrations either during construction or during operation will be within the stipulated CPCB standards. Whereas considering the worst case scenario (predicted incremental concentrations + maximum 24 hourly baseline concentrations during the study period), it is evident from **Table 2 and 3** that 24 hourly concentrations of PM₁₀ during construction and during operation was predicted to be slightly above the NAAQS, which are mainly resulting due to existing baseline conditions. It has further been noted from **Table 2** that the incremental ground level concentrations of PM₁₀ at the receptors during construction period varying from 0.0 to 20.7 µg/m³, whereas PM_{2.5} levels are varying from 0.0 to 3.5 µg/m³. This clearly reflects that the impact will be confined within and close to the project boundary and transportation route/s and it is of temporary nature. NO_x concentration of baseline as well as predicted were observed well within the applicable standards. Incremental ground level concentrations at all the receptors were observed between 0.0 to 0.15 µg/m³ during operation. Other parameters like SO₂ and CO are very negligible incremental value.

Therefore, it is evident that due to the proposed parking project the PM₁₀, PM_{2.5} and NO_x, CO, SO₂ concentration within the project boundary will be within the NAAQS for 24 hourly averages.

Due to lack of parking space, approx. 60-65 vehicles ply on road. This creates congestion on road resulting into idling conditions of vehicles. At idle condition, engine speed increases. Engine speed badly affects the environment too. For raising the engine speed from 600 to 1050 rpm, the NO_x, and CO₂ emission increases by 2.5, 2 & 5 times while idling. This situation will become manageable once the parking provision is made.

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Change in Air Quality

Table 4: Interaction Matrix during Construction

Impact	Change in air quality due to the proposed parking project				
Impact Nature	Negative		Positive	Neutral	
Impact Type	Direct		Indirect	Induced	
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local		Regional	International	
Impact Scale	Limited within 500 m around the boundary as well as 50 m around the transportation route.				
Frequency	Continuous				
Likelihood	Most likely				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Sensitivity	Low	Medium	High		
	Taj Mahal is the only sensitive receptors located within 1km of the project boundary. Out of which Taj Mahal is located in the upwind direction. Hence receptor sensitivity has been considered as Medium for Taj Mahal during construction period.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered Minor to Moderate				

Table 5: Interaction Matrix during Operation

Impact	Change in air quality due to the proposed parking project				
Impact Nature	Negative		Positive	Neutral	
Impact Type	Direct		Indirect	Induced	
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local		Regional	International	
Impact Scale	Limited within 500 m around the boundary as well as 50 m around the transportation route.				
Frequency	Continuous				
Likelihood	Most likely				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Sensitivity	Low	Medium	High		
	Taj Mahal is the only sensitive receptors located within 1km of the project boundary. Out of which Taj Mahal is located in the upwind direction. Hence receptor sensitivity has been considered as Low for Taj Mahal during operation period.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered Negligible				

Mitigation:

1. Generator Sets will be installed & operated by CNG fuel to reduce the emission from burning of other fuels available in current scenario. The provision of CNG line up to the site will be made prior to starting of construction works.
2. We will use all the equipments electrically driven except 01 nos. of Poclain/JCB. Proper maintained Poclain/JCB will be used & emission will be analyzed at every 15 days interval.
3. The Pollution under Control (PUC) certification will be ensured for the vehicles coming in the project premises at regular basis.

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4. Sprinkling of water and fine spray from nozzle to suppress the dust. Water sprinkler system will be provided for entire site.
5. Stone cutting process will be done in a separate enclosed area having arrangement of bag filters. Collected dust shall be used as a filler material for construction activity at site.
6. Use of covering sheets to prevent dust dispersion at project site. Sand storage will be covered by tarpaulin.
7. Use of covering sheets should be done for trucks to prevent dust dispersion from the trucks.
8. Demolition activity will be done in non peak time (before 11.0 am and after 4.0 PM)
9. Construction waste will be disposed as per the guideline of Construction & Demolition Waste Management Rules, 2016 and guidelines annexed to this document.
10. Material storage care should be taken to keep all material storage adequately covered and contained so that they are not exposed to situations where winds on site could lead to dust/particulate emissions. Fabrics and plastics for covering piles of soil and material is an effective means to reduce fugitive dust.

6.10.2 Impact During Operation Phase:

The major source of air pollution during operational phase is Emission from 402 numbers of Cars, 19 numbers of Buses, 07 numbers of Midi Buses & 286 numbers of Two Wheelers and considering maximum occupancy, which will increase the concentration level of air pollutants.

Mitigation:

1. Exhaust emission should trap and treat in wet scrubber along with water recirculation system for air pollution control and the sludge will be disposed through U.P. Waste Management Project.
2. Two generators sets are proposed on the site and one of them should be installed before the start of the construction work at site, so that all the equipments to be used on the site can be installed appropriately. All the equipments should be power-backed by the CNG based generators except the Poclain/JCB excavator.
3. Continuous gas supply should be ensured at the site by Green gas Ltd.

6.11 IMPACT ON NOISE ENVIRONMENT

6.11.1 Impact During Construction Phase:

1. Vehicular movement is the major source of noise pollution in and around the proposed site.
2. Another source of noise pollution is existing construction activities.

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Due to the various construction activities, there will be adverse noise impacts in the immediate vicinity of the project corridor. The construction activities include:

- i. Operation of construction machineries
- ii. Excavation for foundations with excavator
- iii. Heavy vehicle movement
- iv. Piling and Hammering activities

The areas affected are those close to the project site. At the peak of construction, marginal increase in the noise level is expected to occur.

Mitigation:

1. **Provision of Noise Barrier:** All around the construction activity area on the site periphery, about 4.5 meter high barrier (temporary) shall restrict the noise impact from the ground level construction activity by about 10 dB(A).
2. **Proper Maintenance of Construction Equipment/Vehicles:** Proper operation and maintenance of heavy equipment as well as transport vehicles shall also ensure lower noise emissions.
3. **Restriction of Time for Construction Work:** The heavy construction and transport activities shall be restricted to non peak time operation.
4. **Occupational & Passive Protection:** Personal protective equipments (PPEs) like Ear plugs, ear muffs, etc. will be provided to the workers who are handling high noise equipment or stone cutting operations shall protect them from high noise exposure.
5. Servicing of all construction vehicles and machinery shall be done regularly and during routine servicing operations, the effectiveness of exhaust silencers shall be checked and if found defective will be replaced. Vehicles hired for bringing construction materials at site shall conform to the noise emission standards and shall be operated during non peak hours.

6.11.2 Impacts During Operation Phase Of The Project

During operational phase, operation of CNG based generator sets will increase the noise level and parking vehicles will also increase the noise level.

Mitigation:

1. As regards CNG Based Gen sets, these shall be provided with acoustic enclosures ensuring maximum outside noise level of 70-75 dB (A) at 1.0 m distance
2. Trees with heavy foliage will be planted around the project site help slightly muffle the noise. Proper vehicular management will be adopted to avoid any congestion.

6.12 VIBRATION EFFECT BY CONSTRUCTION EQUIPMENTS

6.12.1 During Construction Phase:

As the construction process do not indulge any blasting or pyring operation and machinery being used for digging are light machineries like JCB/poclain, minor vibration may be generated during demolition and excavation.

Mitigation:

1. Vibration should monitor once before construction and subsequent on monthly basis.

6.12.2 During Operation Phase:

During operation phase minor vibration will generate from the operation of CNG based Generator Set.

Mitigation:

Provision of Adequate Structural Foundation to Minimize Vibration: The Gas based Gen sets foundation will be made up of heavy weight inertia concrete block. The Gas based Generator will be mounted on Cushy Foot mounting and the concrete block will be isolated from the adjoining floor. Thus no vibration impacts are expected from the Gas based Gen sets.

6.13 WATER ENVIRONMENT

Existing Source of Water:

1. Proposed site have three numbers bore wells of four inch diameter, and water table is 12 Meter below ground level. While one is used for the drinking water purposes, the other two are used by the public toilet located at the site.
2. Additionally there are three nos. of bore wells present in the surrounding area of the site. While one bore well is located next to the Meena bazaar, the other is located near Baba Bodhidas Asharm and the other near Hazrat Syed Jalal Shah Bukhari Alahay Dargah.
3. In addition to the above, number of bore wells are present in the Shahjahan park, and Sheesh Mahal park of Horticulture Department, both of which are close to the project site.
4. After augmentation these bore wells may used in the proposed construction and operation of the project.

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5. Agra Jal Nigam is implementing water supply project in the entire city. In the project area the main source of water is ground water except Tajganj area where protected water is supplied by the Jal Nigam, Agra.

6.13.1 Impacts During Construction Phase on Ground Water

There is no significant ground water requirement during construction phase of the project. No significant impact on ground water is anticipated. The detail water consumption is given in below table:

S.N.	Construction Phase	Purpose/Uses	Quantity	Source
1.	During Main Structure Construction Phase (12 Month Period)	Curing of Civil Structure	20 KLD	Treated water taken from Dhandhupura STP of Jal Nigam, Agra by Road Tankers up to the proposed project site.
		Domestic (215 labours)	10 KLD	Ground Water
		Miscellaneous	06 KLD	Ground Water
		Total	36 KLD	-
2.	During Sub-Structure Construction & Finishing Phase (06 Month Period)	Domestic (215 labours)	10 KLD	Ground Water
		Miscellaneous	06 KLD	Treated water taken from Dhandhupura STP of Jal Nigam, Agra by Road Tankers up to the proposed project site.
		Total	16 KLD	-
Note: Requirement of Water in a day (only working hour) for domestic purpose by considering 45 Liter/Capita.				

Mitigation:

1. During Main Structure Construction Phase (12 Month Period) 20 KLD and During Sub-Structure Construction & Finishing Phase (06 Month Period) 06 KLD water will be collected from Dhandhupura STP, it will be used in construction purpose mainly curing & miscellaneous pupose after tertiary treatment (to convert from 30 BOD to 10BOD) at the proposed site.
2. The wastewater generated during curing shall be collected in settling tank and recycle the same of tyre or dust suppression.

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6.13.2 Impacts During Operation Phase on Ground Water

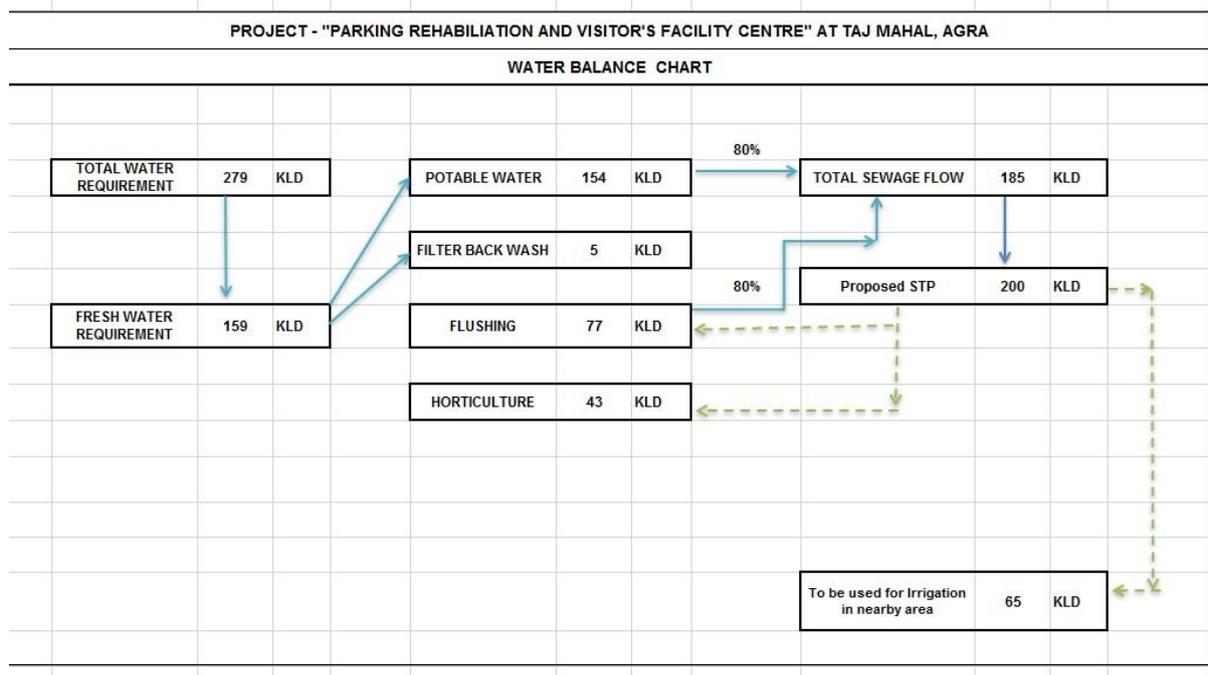
During operation phase 279 KLD water is required for operation purpose. The detailed water demand estimation is given below:

a. Water Requirement during Operation Phase

PROJECT - "PARKING REHABILITATION AND VISITOR'S FACILITY CENTRE" AT TAJ MAHAL, AGRA									
WATER REQUIREMENT CALCULATIONS									
Sl. no.	Description	No. of Car/ Bus	No. of pessen ger/car	No. of Shift per day	Populati on	Unit Water Consumpt ion	Total Water Required	Recycle Water Requirem ent	Total Recycle Water
				(Nos.)	(persons)	(liters)	(liters)	(liters)	(liters)
1	Cars	402	5	3	6030	15	90450	5	30150
2	Buses								
	i) MIDI	7	22	3	462	15	6930	5	2310
	ii) Normal	19	50	3	2850	15	42750	5	14250
3	2-Wheelers	286	2	3	1716	15	25740	5	8580
5	Staff, Admin & Drivers				514	45	23130	15	7710
6	Other (Transportation)				2800	15	42000	5	14000
7	Filter Backwash						5000		
8	Horticulture	8500				5	42500	100%	42500
	TOTAL				14372		2,78,500		1,19,500
SUMMARY OF WATER REQUIREMENT									
Total Permanent Population						=	14400	persons	
Total Domestic Water Requirement						=	2,78,500	lit/day	
Total Recycle Water Requirement						=	1,19,500	lit/day	
Net Domestic Water Requirement (Fresh Water)						=	1,59,000	lit/day	
Total Sewage Load						=	2,31,000	lit/day	
Net Sewage Flow - 80% of total sewage load						=	1,84,800	lit/day	
Sewage Treatment Plant capacity						=	180	KLD	200
Total recycle water required						=	1,19,500	liters	
Net water balance (to be use for Irrigation near by area)						=	65,300	liters	
UGT Capacity (for Domestic Use) = 1 day storage						=	1,59,000	liters	175 KL
UGT Capacity (for Fire Fighting)						=			200 KL
Total UGT Capacity (Domestic + Fire)						=			375 KL

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Water Balance:



Mitigation:

1. Rain water harvesting system should be implemented and obtain permission for ground water abstraction from Central Ground Water Authority.
2. Proposed Sewage Treatment Plant should ensure minimization of leakages of wastewater to ground (connections between pipes and tanks should be water-tight).
3. The system for the sludge production from STP should ensure minimization of leakages of sludge to ground (connections between pipes and tanks should be water-tight).
4. To provide water impermeable layer for the temporary storage and disposal of the sludge.

6.13.3 Impact On Surface Water

Existing source of waste water generation in the study area is:

1. Waste water generation from Baba Bodhidas ashram
2. Waste water generation from Hazrat Syed Jalal Shah Bukhari Alahay Dargah
3. One no. of RO plant, which generates some quantity of Ro reject water and spillage during use.
4. The waste water generated from two nos. of community toilets is disposed in the own septic tanks and the overflow of septic tank goes to the adjacent drain of the site.
5. Above generated waste water disposed in the adjacent drain of the site.
6. One open nallah comes from Tajganj area is flowing towards site which is intercepted near Meena bazaar by Jal Nigam and send through underground sewage line to Dhandhupura STP for their treatment.

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- Two another source of water pollution in the study area are –
- c. A Nallah is flowing from Khairati Tola to Yamuna river via Shahjahan garden and Sheesh Mahal ka tilla, which is approximate 400 meter away from the proposed site.
- d. A large nallah is flowing from city area to Yamuna River via Motilal Nehru crossing which is approximate 900 meters away from the proposed site.

6.13.3.a Impact During Construction Phase on Surface Water

Wastewater generation during site development and construction activities in following ways:

- Approximately 12 KLD Waste water will be generated during curing process.
- Approximate 08 KLD Domestic wastewater will be generated from the toilets constructed for the construction workers and other staff on-site.

The generation of above waste water contaminate the surface water.

Mitigation:

1. The waste water generated during curing should be collected in a collection tank along with settling tank and recycle the same.
2. Waste water generated from domestic activity will be stored in collection tanks at proposed project site and pump it to the existing sewer line. The size of sewer line passing near the site is only 300mm dia and can take only 01 MLD load. This sewer line connects to 1600 dia main line on Yamuna Bank road. It can take the load of west gate drain only in dry weather. But it cannot further take the load of west gate Drain during monsoon.
3. The required size of the sewer line shall be at least 01mt which will be adequate for the sewer line coming from the Tajganj.
4. It has been informed by Jal nigam that the sewage coming to this drain will be stopped once the Taj ganj area is properly connected with the already laid sewer. The time frame is only coming 06 months which means that after 6 months (the probable start time for our construction) the load on 300 dia sewer will be reduced by 40% that is 40 KLD.
5. Regarding the construction workers, employment preference would be given to local construction workers of the nearby areas. Temporary offices would be constructed at the site for the office staffs only and they will use existing community toilets.
6. The wastewater generated during curing shall be collected in settling tank and recycle the same of tyre or dust suppression.
7. Toilet water will be stored in collection tanks at proposed project site and pumped to the existing public sewer line available near the site.
8. Under good construction practices, construction wastewater shall be collected in construction pits and reused in construction activities e.g. wastewater from stone cutting, cleaning, curing, etc.

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9. Regarding the construction workers, employment preference would be given to local construction workers of the nearby areas. Temporary offices would be constructed at the site for the office staffs only and they will use existing public Toilet (Sulabh complex).
10. No labour camps shall be provided at site except temporary sheds for resting and toilets.
11. To prevent surface and ground water contamination by oil/ grease, leak proof containers shall be used for storage and transportation of oil/ grease. The floors of oil/grease handling area shall be kept effectively impervious. Any wash off from the oil/grease handling area shall be drained through impervious drains, Clarifiers or oil/water separators shall be constructed and effluent should be treated appropriately before releasing

6.13.3.b Impacts During Operation Phase On Surface Water

Wastewater Generation from Domestic Activities: Approximate 185 KLD Wastewater would be generated as sewage from the domestic activities of the tourist as well as operating staff and storm water during rainy season. These sources will be impacted on surface water.

Mitigation:

A Sewage treatment plant (STP) of 200 KLD capacity is proposed for treatment of wastewater & treated water will be use for flushing, horticulture etc. The treatment technology of Sewage Treatment Plant will be adopted as per recommended by Central Public Health & Environmental Engineering Organization(Ministry of Urban Development), Government of India.

About *185 KLD* of treated water from STP, which will be reused for gardening & flushing purposes. This will also reduce the domestic water demand efficiently. Regular maintenance check shall be carried out by the project proponent staff. Hence no major adverse impact on the surface water environment is envisaged.

6.13.4 Storm Water Drainage System

6.13.4.a During Construction Phase

A Drain of average 1.5 meter width is flowing along with the proposed project site (about 220 meter length) and discharges storm water of the catchment to Yamuna River. It also carries the storm water of the Taj Ganj area of Agra city hence it requires diversion to enable implementation of the sub-project.

Mitigation

1. A proper drainage system should be developed before the raining season at the proposed project site and connect with existing drain after realignment.
2. In the rainy season this existing sewer line will not be able to handle the overflow as the size of sewer line passing near the site is only 300mm dia and can take only 1 MLD load. It can take the load of west gate drain only in dry weather. But it cannot further take the load of the storm water of the west gate Drain during monsoon. Therefore to control the flow of the drain in the monsoon season a Concrete Hume Pipe having Dia 450 mm shall be installed, so that the overflow of storm water coming from Taj Ganj Area. There is a location near Meena Bazaar where the drain is tapped and a mechanical screen will be installed to remove the floating material.

6.13.4.b During Operation Phase

Most of the rain water produced on site will be harvested for ground water recharge, thus proper management of this resource is must to ensure that it is free of contamination. Contamination of storm water is possible from the following sources:

1. Spillage of used oil from operating machineries/equipment.
2. Waste spills in the Solid waste and waste lubricating oil storage area
3. Oil spills and leaks in vehicle parking lots
4. Silt from soil erosion in open/green belt areas.
5. Spillage of sludge from sludge drying area of sewage treatment plant.

Mitigation:

1. A detailed Rain Water Management Plan shall be developed which will consider the above sources. The plan will incorporate best management practices which will include following:
2. Storm water shall be treated in two ways, first of which is collected from the podium surface, contaminated with oil and grease content and it will be passed through grease trap before connecting to the kuccha tank for rain water storage, and the overflow will be connected to the storm water drain. The other source shall be the storm water collected from raw surface of the site(green area etc.), which will be directly diverted into the kuccha tank for rain water storage.
3. Regular inspection and cleaning of storm drains.
4. Cover waste storage areas if existing in open space.
5. Avoid application of pesticides and herbicides before wet season.
6. Secondary containment and dykes in oil storage facilities.
7. Conducting routine inspections to ensure cleanliness.

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8. Preparation of spill response plans, particularly for oil storage areas.
9. Provision of slit traps in storm water drains.
10. Good housekeeping in the above areas.

Rain Water harvesting system by considering three streams

Rain water shall be collected in three ways on the site, and shall be treated in a different manner for each of the case, based on the different levels of impurities in the water. The classification has been done on the basis of the different surfaces from where the catchment has been done.

1.	The roof top water shall be collected through adequate slopes and rainwater pipes and shall be directly diverted in the boring to recharge the underground water table. This collected rainwater shall be cleaner and using a normal waste separator can be directly used to recharge the ground water.	Total roof top area is 2035.86 m ² .
2.	The water collected from the podium surface shall be impure or greased due to the movement of vehicles on it. This water will be filtered through grease trap and then to be collected in the kuccha-tank for rain water collection.	Total podium area is 7360.7 m ² .
3.	Water from the raw surface on the site which includes the green area, landscaped area and other area on the site shall be collected in the kuccha tank for rain water storage.	Total raw area for water collection is 5260m ²

Recharge pits have been provided at two different location on the parking site and one at berka-teela market area. The net volume of water collected for the recharge will be based on the average annual rainfall in the area and the surface run-off coefficient of the respective surfaces.

6.14 IMPACT ON SOIL

6.14.1 During Construction Phase

Construction Phase of the Project, Chemical desegregations and pollution of soil would be on account of spillage of Lubricating oil, water Proofing Compounds, admixtures, sealants,

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adhesive solvents, paints, pigments dye & Primers, Pesticides, Tarpaulin oil used for construction purposes which may impact the soil environment.

Mitigation:

1. To avoid chemical spillage proper godown with impervious flooring along with sump and dyke wall.

6.14.2 During Operational Phase

In operation phase of the project, soil can be contaminated by leaching of waste water into the soil, dumping of municipal solid waste in open land and due to spillage of used oil from operational equipments.

Mitigation:

1. All solid and other wastes from the proposed project will be properly collected, stored and disposed. An integrated solid waste management plan will be developed.

6.15 BIOLOGICAL ENVIRONMENT

Existing Status of Flora

1. Proposed site has a pocket of one hundred five trees and fifty eight trees are scattered in the existing parking.
2. Entire site is surrounded by a thick green belt of more than 100 meters.
3. Site is surrounded by Sheesh Mahal tila garden, Shahjahan garden, Beer ka tila and Sabji ka tila green belt.
4. No endangered or rare species of the plants is present in the proposed project site.

Existing status of Fauna

- Domestic animals like cow, buffaloes, goat, dogs and camels are found in the study area.
- The study area being a tourist activity area lacks any wild fauna however monkeys are found to be dominant in the study area.
- However the Shahajahan Park has provided a suitable habitat for indigenous avifauna like Peacocks, Pigeons, Babblers etc and also the mammals like monkeys and squirrels.
- Birds commonly observed included Cattle Egret (*Bubulcus ibis*), Parrots (*Pisttacakramer*), House swift (*Apus affinis*), Common pigeon (*Columba livia*) common mynah (*Acridothoros tustos*), Domestic geese (*Anser anser domesticus*) and Peacocks (*Pavovistatus* sp.)
- Peacock is an endemic bird species of this region and was frequently observed in the study area.

6.15.1 Impact on Biological Environment

- Total thirty numbers of trees of different species will be proposed to cut for the proposed project. The detail of different species, which proposed to cut are as under:

S.No	Name of Trees	Botanical Name	Numbers of Trees
1.	Eucalyptus	Eucalyptus globu	12 nos.
2.	Date Palm	Phoenix dactylifera	10 nos.
3.	Neem	Azadirachta indica	08 nos.
Total			30 nos.

- Proposed site is surrounded by Sheesh Mahal tila garden, Shahjaha garden, Beer ka tila and Sabji ka tila green belt of more than 100 meter. Hence no significant impact on biological environment is anticipated due to proposed project.
- The diversity and distribution of avifauna in the study area however is indicative of insignificant impact.

Mitigation

1. Compensatory afforestation shall be done at Sabji ka tila, which has an ample of barren surface with minimum distance of 05 meter between each tree. In addition to this 220 trees are also being planted for landscaping purposes.
2. The total land area of Sabji Ka Tila which can be used for compensatory afforestation is 3.7 acre (15000 sqm).

6.16 LOSS OF NATURAL HABITATS

No loss of any natural habitat will occur due to proposed project.

6.17 SOLID WASTE MANAGEMENT

Existing Status and Management of Municipal Solid Waste

1. The main source of solid waste in the study area is visitors, vendors, shopkeepers, ongoing construction and commercial activities.
2. Approximately 30,000 tourists move towards Taj Mahal from the proposed site on a peak-time in a day.
3. Approximately 100 vendors are performing activities in the proposed site area.
4. Approximately 71 shops are available in the proposed site area.
5. Approximately 100 to 200 pilgrims are daily visited adjacent Ashram and Dargah.
6. Approximately 500 to 700 pilgrims are visited at Dargah on Thursday and Friday of every week.

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7. Nagar Nigam, Agra placed the 05 nos. of dumper placer bins (having volume 2 to 3 Cubic Meter) inside the existing parking area on different place and 02 nos. of dumper placer bins (having volume 4 to 5 cubic meter) outside of the existing parking area towards Meena Bazaar.
8. Inside the existing parking area, the responsibility of housekeeping belongs to Municipal Corporation of Agra.
9. Every day as the dumper placer bins fills, these dumper placer bins replaced by empty dumper placer bins through Municipal Corporation of Agra.
10. The collected Municipal Solid Waste (MSW) from the proposed site is disposed to Garbage transit point situated near P.A.C. crossing, Agra. This garbage transit point is situated approximate 02 Km. from proposed site.
11. As per Municipal Corporation Officials, Municipal Solid Waste (MSW) is transported to the segregation unit from this MSW transit point. The Municipal Solid Waste (MSW) segregation unit is situated approximate 15 Km. from the proposed site at Chhaleshar, Agra.

6.17.1 Impacts During Construction Phase

During construction phase three types of waste (Construction & demolition waste, Municipal Solid Waste and Hazardous Waste) will be generated from proposed project activities.

a. Construction & Demolition Waste

Construction and demolition waste will be generated from demolition of one number of community toilet, concrete floor existing parking and 71 numbers of shops at Ber Ka tila, therefore significant quantity of construction and demolition waste will be generated. The huge quantity of Construction and demolition waste will be impacted on land environment.

Mitigation:

1. Metal barricades of at least 4 m height shall be erected around the entire area of construction, to avoid hazards, construction nuisance and dust pollution to neighboring population, tourists and the monuments. The barricades should remain until the construction activity is completed.
2. No demolition activity shall be done during peak tourist hours of 11 AM to 4 PM.
3. Dust Suppression measures such as sprinkling of water (to wet the dust prone area/construction site) shall be done at regular intervals to control fugitive dust emissions during demolition activities.

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4. A major portion of construction and demolition waste would be used at the Temporary parking site for internal leveling, internal road construction etc. And excess waste will be disposed as per standard guidelines.
5. All Construction and demolition waste should be disposed as per the Construction and Demolition Waste Management Rules, 2016 of Government of India.

b. Municipal Solid Waste

During construction phase Municipal Solid Waste will be generated from domestic activities of 215 labours and staff of the proposed project. Approximate 25 Kg/Day (100 gm/capita/day) Municipal Solid Waste will be generated from the proposed site. Improper Storage and Handling may contaminate the soil of the proposed site.

Mitigation:

1. All the generated municipal solid waste should be collected in separate bins and disposed as per the “Municipal Solid Waste Management & Handling Rule, 2016” of Government of India.

c. Hazardous Waste

During construction phase small quantity of hazardous waste i.e. centering oil, formwork oil, water proofing compound, chemical admixtures, sealants, adhesive solvents, Paint pigments, dyes, primers, pesticides and batteries will be generated. Improper storage & disposal of hazardous wastes will be impact on soil and water quality.

Mitigation:

1. All the generated hazardous waste should be collected in separate bins and disposed as per the “Hazardous Waste (Management & Handling) Rule, 2016” of Government of India. The collection bins should be made up of durable material like metal, HDPE, fibre glass and masonry for each hazardous waste separately.

6.17.2 Impacts During Operation Phase

During operation phase three types of waste (Municipal Solid Waste, Hazardous Waste & E-Waste) will be generated from proposed project activities.

a. Municipal Solid Waste

During operation phase Municipal Solid Waste will be generated from domestic activities of tourists and project operating staff of the proposed project. As per the population estimation

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of the project Approximate 14570 persons will visit the site in a day. Approximate 1457 Kg/Day (100 gm/capita/day) Municipal Solid Waste will be generated from the proposed site. Improper Storage and Handling may contaminate the soil and diminish the house keeping of the proposed site.

Mitigation:

1. Adequate numbers of separate bins as per the category of waste should be provide at appropriate places in the proposed project site for the proper collection of Municipal Solid Waste.
2. All the generated municipal solid waste should be collected in separate bins and disposed as per the "Municipal Solid Waste Management & Handling Rule, 2016" of Government of India.

b. Hazardous Waste

During operation phase waste lubricating oil from Gen Set & other machineries will be generated. Improper storage and disposal may contaminate the soil and water.

Discarded/used batteries will be another source of hazardous waste.

Mitigation:

1. The generated waste lubricating oil should be collected in MS containers and stored in impervious floor along with dyke to prevent the spillage.
2. The waste lubricating oil should be disposed through authorized recyclers from Pollution Control Board.
3. Discarded/used batteries should be collected in impervious acid proof floor along with dyke to prevent the spillage.
4. The Discarded/used batteries should be disposed through authorized recyclers from Pollution Control Board.

c. E-Waste Management

Various types of electrical and electronics waste will be generate from the proposed project, which includes Personal Computer, Xerox Machine, Electronic Ballast etc.

A separate space should be provided for temporary collection of E-waste and disposed through authorized recyclers from Pollution Control Board.

6.18 POWER DEMAND AND SUPPLY

The power supply shall be sourced from Uttar Pradesh Power Corporation Ltd (UPPCL). The estimated electrical demand load & proposed power back to be used during power failure shall be as per details given in **Table 5.11 given below**

S. N.	Power Demand	Detail
1.	Maximum demand load	550KVA
2.	Power back up	750 KVA
3.	Number of Generator sets	2 * 380 KVA
4.	Generator Sets stack Height	As Per CPCB Norms

Proper electrical infrastructure is available near the site to cope the additional demand of the proposed project.

6.19 SOCIO-ECONOMIC ENVIRONMENT

6.19.1 Impact On Human Health

Human health may be impacted during the construction phase due to air, water & noise pollution.

Mitigation:

The erection of temporary enclosures around construction sites, to entrap some of the dust that is brought up during the excavation and construction phases thereby reducing air pollution; proper management and disposal of waste water, and erection of sound barriers around the construction site.

6.19.2 Impact on livelihood of shopkeepers of Ber-ka-Tila market

Civil construction works of the sub-project will adversely affect the shops of the Ber-ka-Tila market. The first priority is for the civil contractor to take necessary measures to ensure that pedestrians always have access to these shops during the period of construction of the parking facility. Restoration of the Ber-ka-Tila market complex will require about 8-9 months. The market will not be in a functional stage during this period causing temporary loss of livelihood.

Mitigation:

The shopkeepers will be provided alternate site on both sides of the road from the parking entry point on the main road to the police barrier where they will be allowed to sell their wares in a regulated way; on tables set up under canopies with daily rotation of place so that everyone gets a fair chance to sell their wares. The Department of Tourism will set up the required 71 canopies and it has to be assured that their number does not increase during the 8-9 months they will be functioning from this location.

6.19.3 Impact on livelihood of employees of shops at Ber-ka-Tila market

There are 28 persons employed by the shopkeepers of the Ber-ka-Tila market, all being employed in shops. It is likely that they will face loss of jobs during the construction phase because when the shops will be demolished for new structures, the owners, who will be allocated fixed places along the road from the parking entry point on the main road to the police barrier for the interim period, will not be able to sustain their employees. Hence, this group will lose its livelihood.

Mitigation:

All 28 employees are entitled to one-time rehabilitation assistance for 90 days of labour which translates to INR 31,500/- at the new minimum wages of INR 350 as notified by the Central Government recently. The date of Census survey conducted, recorded and reproduced in this report by the consultants will be deemed to be the cut-off date for inclusion into the list of employees entitled for one-time livelihood assistance.

6.19.4 Impact on livelihood of hawkers/vendors

Although the number of hawkers registered by the ADA in the sub-project area is 70, the situation at the site is quite different. The hawkers present within the area on the date of census have been categorized into three sub-groups: hawkers/vendors within the parking area and hawkers/vendors outside the parking area but within the sub-project area. During the construction phase of the project, there will be disruption in the business of hawkers/vendors/vendors due to closure of the existing parking facility and taking over of the spaces presently occupied by them.

Mitigation:

This will be mitigated by temporarily shifting them to other locations within the Taj complex during the period of construction/restoration and rehabilitation of existing facilities. The area near the Neem-ka-tiraha and the pathway from Shah Jahan Park has been identified for the purpose. All the 19 hawkers/vendors presently operating from within the parking area will be paid a resettlement allowance of INR 31,500/- each. The project area limits the number of hawkers that can be accommodated in the new design of the facility as they cannot be placed within the parking lot because of Supreme Court restrictions and also the shopkeepers do not want them to be located within the new market area as they would then be hindering the sales of the shops. The design team of the consultants could however, after much exercise, demarcate space for 50 hawkers/vendors to be resettled within the sub-project area. The

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space will be allotted to them through a draw of lots and the remaining 29 would be provided with a resettlement assistance grant of INR 31,500/-, equal to the other such stakeholders.

6.19.5 Impact on livelihood of sellers of household produced artifacts (whips/hats etc)

There are 10 hawkers under this category selling their products from within the sub-project area, mainly on the raised platform in front of the Ber-ka-Tila market. They are likely to face adverse impact on their livelihood as paucity of space during the construction period will not allow a large number of hawkers in the area. As the market will be temporarily relocated along the same road occupying most of the space, it will hit the livelihood of these people.

Mitigation:

The identified and listed 10 such hawkers, who are presently selling household made artifacts, are entitled to livelihood assistance equal to 90 days of wages which translates to INR 31,500/- each.

6.19.6 Impact On Livelihood Of Parking Attendants

The impact on the sub-project will be the most on the livelihood of the parking attendants. Since the present parking will be temporarily shifted to an alternate site. During the construction phase of the sub-project the same employees of the contractor will continue with their livelihood. Another possibility; that of all the parking attendants not being hired by the contractor in the new /temporary parking developed for the period of construction activities is that of some of them losing their livelihoods for the interim period. The third possibility is that of the parking contract being awarded to a new entity after construction of the facility for proper operation and maintenance. In this case, the untrained staff of the present contractor will not be hired by the new one thereby causing a loss of livelihood. The number of parking attendants in the present parking employed by the parking contractor Mr. Dileep Singh Chauhan is 20 all of whom shall be employed by him in the same capacity in the make-shift parking that will be allotted to him during the pre-construction phase.

6.19.7 Impact On Livelihood Of Drivers Of E-Rickshaws, Horse Carts And Golf Carts

The livelihood of the large number of e-rickshaws and animal drawn carts presently operating in the sub-project area will be substantially hit during the civil works.

Mitigation:

As a mitigative measure, these may be shifted to operate from the temporary alternate parking space that will be operational during this period. After the construction of the new parking facility and the rehabilitation of the market, only 40 e-rickshaws, 10 golf carts and 15 horse

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carts will be permitted to ply within the defined/prescribed area and the rest will be moved out to ply on other routes in the city. Separate license will be issued to both groups by the RTO towards this effect.

6.19.8 Impact On Women And Other Vulnerable Groups

Women do not form a sizeable number within the PAPs. While some shops are registered in women's names, only four were found being run and managed by women. Some women hawkers and vendors were found outside the sub-project area; selling their wares in the vicinity of the Neem-ka-Tiraha and the ticket counters. However, the women- folk, children, aged and differently abled among the tourists, form a considerable number and care has to be taken to minimize the short term adverse impacts on them.

Mitigation:

Dedicated pathways and ramps, well-lit separate toilet and other facilities and covered resting places shall be provided to them during the period of construction. These aspects have been taken care-off in the design of the parking and other civic facilities so that they do not face inconvenience in the sub-project area.

6.19.9 Public Notice/Information Boards

According to the suggestion given by locals during the interviews and discussions, the administration as well as the contractor should give prior notice with the details of project, start and end date of construction and contact person in case of any emergency. This information would help them better adjust to the situation and make necessary adjustments and provisions. Additionally, the interviewees said that they understood the inconveniences were of a temporary measure and are for a social cause hence they are willing to bear the temporary problems and difficulties.

6.19.10 SUMMARY OF ANTICIPATED SOCIAL IMPACTS & MITIGATION MEASURES

The project report of the proposed project for Visitor Center and Parking Rehabilitation at Taj Mahal West Gate, after social impact assessment concludes that the project falls in 'low impact' category and has overall positive impacts on the life and environment of the people. There is no land acquisition under this project.

Impacts of activities identified during the assessment are discussed below:

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Positive impacts

Rehabilitation of the existing parking facilities and restoration of commercial establishments and shops at Ber-ka-Tila Market will provide better livelihood opportunities to the vendors. Short term economic gain for the petty shops of the area selling daily provisions would also be provided by the influx of the labourers during the period of construction of these facilities. Other visitor friendly measures include better placement of the security staff, integrated planning and management of parking and other infrastructure and transport facilities will provide better livelihood opportunities to the PAPs and a better experience to the visitors to the Taj Mahal.

Adverse impacts

During the construction phase of the project, there will be disruption in the business of the hawkers/vendors, which can be mitigated by shifting them to other locations within the Taj complex during the period of construction/rehabilitation of existing facilities. Resettlement allowance is being paid to the affected vendors by this sub-project. The project has been designed on the existing parking and market hence there is no land acquisition.

Due to the excavation work for the parking facility, there will be a disturbance in the traffic movement. Visitors to the monument will suffer more inconvenience during the excavation period than that during construction. Re-routing of the traffic and parking at alternate site has been suggested as a mitigation measure.

Although no road closure is envisaged during construction phase, the excavation work will lead to road blockage, which would result in the commercial establishments and vendors experiencing problems in operating their business on daily basis. As per the feedback received from discussions and interactions with the local community during consultations, most shop-owners and mobile vendors are welcoming the proposed sub-project as they see a direct benefit of improved working conditions. They are aware of, and prepared to face temporary inconveniences caused by construction if the project is implemented in a timely manner.

The Resettlement Action Plan ensures to suggest appropriate mitigation measure against the issues/ concerns identified during the environmental and social impact assessment study. All the social issues were studied and have been substantiated using appropriate evidences to ascertain the magnitude of their impacts. Even the issues of public grievances and public notice have been taken care-off in the report to confirm transparency during the project implementation. It has been envisaged that post construction of the new, integration of the renovated and restored facilities with tourist movement, including the 71 shops will provide

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them better livelihood opportunities thereby meeting the project objectives of pro-poor tourism of the Government of Uttar Pradesh. The details are available in the Resettlement and Rehabilitation Action Plan.

6.20 PROJECT BENEFITS

Employment opportunities will be enhanced, due to the proposed project as it will involve the local labor/work force during the construction phase and operational phase. This would lead to increased wage rate and eventually increase the socio-economic conditions of the local vendor and shopkeepers survive just outside of the visitor centre & parking building in comparison of existing.

Similarly, during the operation phase, the proposed project will increase the various business opportunities in the form of food stalls, involvement of technician/engineer during maintenance electrical/mechanical equipments, fire fighting system, environment management system, horticulture practices etc.

The key benefits of the proposed project are listed below:

1. The project will reduce the air pollution in comparison of existing air pollution from unmanaged/inadequate parking facility.
2. The project will build the social infrastructure within the site in terms of water supply, electrical power supply, and drainage & sewerage network.
3. The project will provide high standards of security and safety to the tourist.
4. Labours and construction staff will engage during construction & operational phase provide employment.
5. Rain water harvesting system will improve the ground water levels in the site area.
6. Tourist will get the guidance liberally from visitor centre supported by U.P. Tourism Department.
7. At the entry gate and exit gate, vehicle congestion will be minimizing specially on peak season as well as on every Saturday & Sunday, due to which tourist can save the fuel.
8. Tourist (Owner of vehicle) feel relax at the time of entry & exit from parking and their driver can rest in driver hall.
9. Due to construction of this project water pollution, air pollution, noise pollution and soil pollution will be more controlled in comparison of existing.
10. Due to regularization of traffic just outside of the parking building, pedestrians & local single item venders can move easily without any hindrance.
11. Ultimately income of Archeological Survey of India will be increased because more vehicle will be easily parked in this parking building, that's why it will increase the numbers of tourist.

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CHAPTER - 7

ANALYSIS OF ALTERNATIVES

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The requirements based on the analysis and data assessment has been framed for the proposed project, keeping in mind the area and location of the site.

The requirements framed are mentioned hereby:

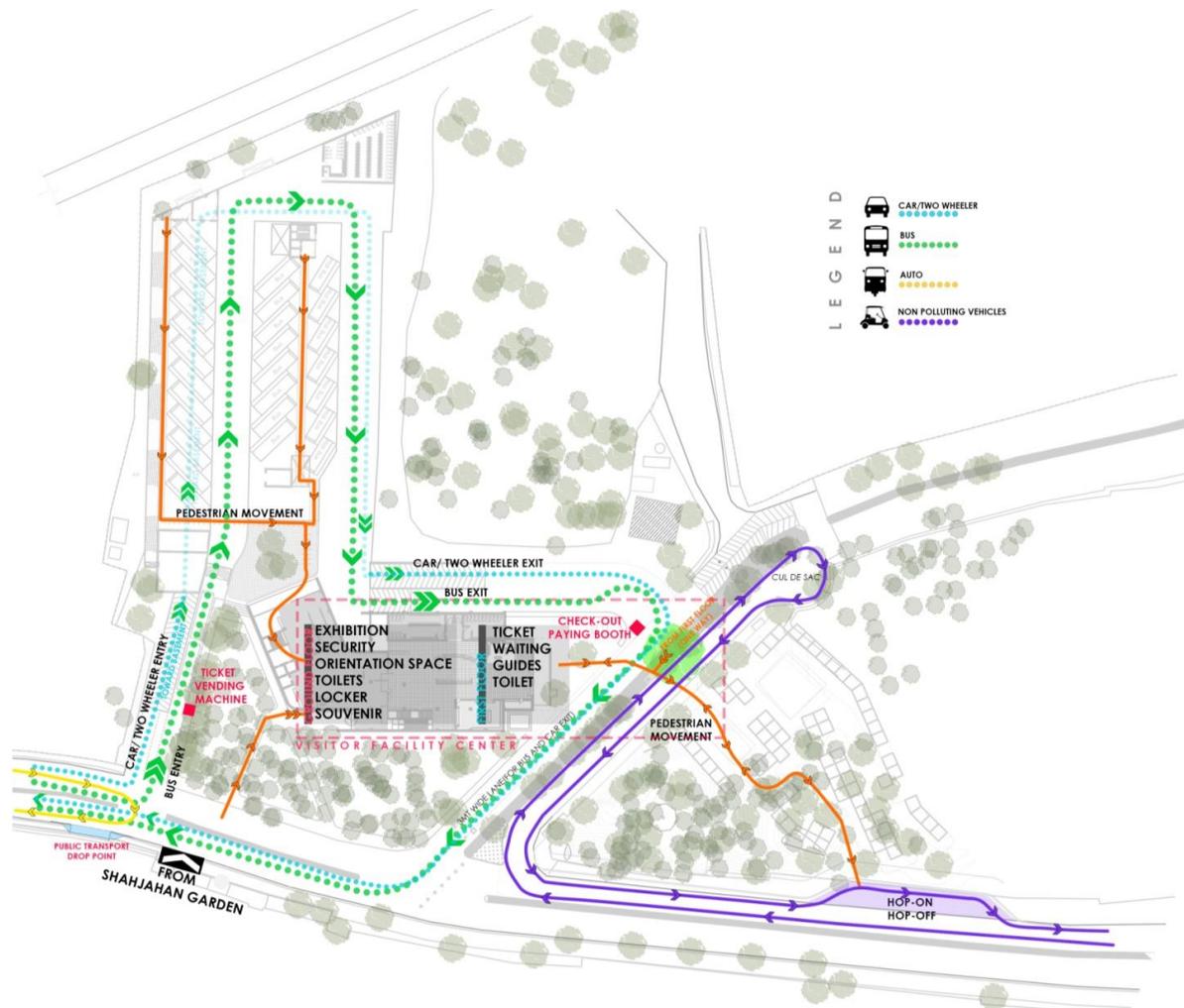
1. Information booth
2. Pre-lobby area
3. Waiting area
4. Ticket counter 10 in nos.
5. 02 numbers of Automatic ticket vending machine
6. Toilets as per norms
7. Security room
8. First aid room
9. Guide Room
10. Locker
11. Snacks counter
12. Souvenir shop
13. Tourist police space
14. Administration office

An ideal design had been conceptualized based on these requirements and those estimated in the parking demand assessment. Both of these are based on the tourist inflow data and projected figures derived from it.

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CONCEPT

Described further is the proposed concept as per the ideal design framed for the facility.



PROPOSED PARKING CONCEPT

Double Basement Parking Complex with open parking at ground level

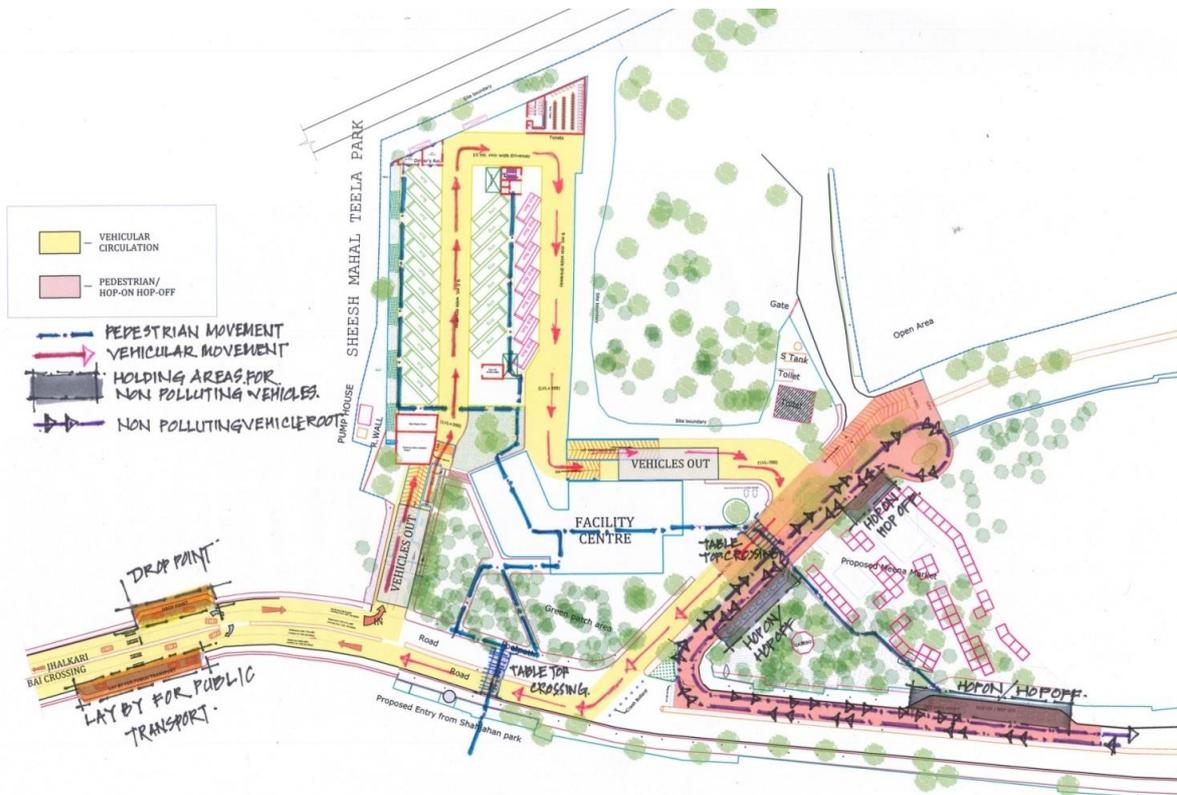
Ground Level – Open Bus Parking and Facility Centre

Basement 1 – Car Parking/ Two wheeler parking

Basement 2 – Car Parking/ Two wheeler parking

Based on different options of movement patterns and vehicular flow, five different options were worked out for the discussed requirements. A comparative analysis of the options was done each of it having a set of merit and demerits. The exercise has given the most adequate and optimized design. The options are mentioned further.

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SITE PLAN

Option 1 -

MERITS

1. Building directly faces the green patch. Ramp is away from the green area, which makes it away from the public spillover area. Thus, there is segregation between the public area and the vehicular circulation.
2. Green patch can be used for spillover of excess visitors. The green patch which lies directly on the south of the building may act as buffer between the west gate road and the facility.
3. Building gets green cover and open land on three sides which is majorly the facing sides of the building. This feature improves the interface of the building with the public activity around the facility.
4. There is a lot of space for returning visitors to board their vehicles, right from the facility exit to the space on the West Gate road.
5. Good enough queue space for the vehicles at the exit of the parking is available in this option.
6. Minimum congestion at the entry point.
7. Visitors coming from the Shahjahanpark and from public transport can have an easy connectivity through the green space in front of the building.

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DEMERITS

1. Pedestrian towards facility center have a conflict with the buses exiting the parking, though buses are only 28 in number.
2. Building is away from green patch resulting in restriction in spillover of activities.
3. Vehicles are moving all around the green space which is a potential spill over or buffer space
4. A bit less space for queue as compared to Option 1, but still sufficient
5. Building gets minimum green cover on its immediate surroundings.



SITE PLAN

Option 3 –

MERITS

1. Complete segregation of vehicular traffic and pedestrian circulation. Vehicles take the rear road for exit.
2. The area around facility center is free from any ramps or vehicular circulation, thus surrounded by green open land, potential space for spill over.
3. Proximity of the facility centre with the community market.
4. Unhindered connectivity between shops and visitor centre
5. Minimum congestion at the entry point.
6. Optimum use of road connecting Cremation ground.

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7. The Taj west gate road will have significant reduction in traffic and the section can be better organized with pedestrian friendly activities like drop out points , pathways etc.
8. No trees to be cut at entry point of the parking.

DEMERITS

1. The rear road is not very wide, however can hold on way exit traffic; but there would be occasional conflict with the vehicles going towards the cremation ghat.
2. People have to cross the entire site and go towards north of it, to board the vehicles, or go to their vehicle in basement itself to board their vehicles.
3. The social and psychological inconvenience attached to the dead body procession which occurs on this road going towards the cremation ghat, is a demerit for this design. However this is an occasional activity.



Option-4

MERITS

1. Segregation of Pedestrian and vehicular circulation achieved as the vehicles entry and exit at the same point
2. Facility block surrounded by green and open land

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DEMERITS

1. Major conflict and clutter space at the entry/exit point on the West Gate as it is also the space for people coming from Shahjahan Garden.
2. No. of trees cut are substantially more, by 21 in numbers. Total trees to be cut as per this option shall be 41 nos.
3. A vehicular circulation inside the parking lot has to be diverted at the entry/exit point causing a concentration on that point.
4. Boarding space for returning visitors is very less or concentrated on the conflict zone.
5. Parking movement in basement will be difficult as entry and exit are at same place.



SITE PLAN

Option 5

MERITS

1. Major part of the front of the building is directly connecting to the green patch, giving unobstructed entrance to the pedestrian from Shahjahanpark and elsewhere. The bus route remains at the rear and basement car ramp is at the end of the facility building.
2. Green patch can be used for spillover of excess visitors.
3. There is a lot of space for returning visitors to board their vehicles, right from the car ramp exit, to the space on the West Gate road.

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4. Visitors coming from the Shahjahanpark and from public transport can have an easy connectivity through the green space in front of the building.
5. The conflict area between pedestrian and vehicles is reduced to only buses which are 28 in number, as the ramp from basement is shifted towards the front.

DEMERITS

1. There is still a vehicular and pedestrian conflict on the exit area of the parking, between the buses and the visitors coming out of the facility block. Though the maximum capacity of the buses in parking is 28 indicating occasional conflict.
2. The vehicle exit area is being split up, cars coming out of a different area and buses from the rear making it an additional management job to collect tickets from different areas. However it can be managed by providing separate booths.

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SITE PLAN

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BASEMENT PLAN 1

Parking capacity

No. of cars – 224

Two Wheelers – 149

Area- 8803.42sqmt

BASEMENT 2 PLAN

Parking capacity

No. of cars – 230

Two Wheelers – 149

Area- 8803.42sqmt

As per the concept, the facility has been proposed near the green patch on the eastern wing of the proposed site. The facility area on this side shall establish segregated movement of the visitors going towards the Taj Mahal and returning from it.

No. of trees required to be cut as per this design is 35. Mentioned below is the list of the trees which is identified to be cut on the site for the execution of the project.

S.No.	Specie of Tree	No. of trees
1.	EUCALYPTUS	12
2.	DATE PALM	10
3.	NEEM	10
4.	KAT SAGON	03

As mentioned here, the ideal design has a condition that it requires to cut a greater number of trees. As it is crucial to give an environmental concern to the proposal, which suggests the number of trees to be cut on site to be minimized. This shall save some trees on the site from cutting and thereby give an optimized design for the proposed parking and facility.

The design is thus optimized by maneuvering the proposed basement line at some places in such a way that the trees at those places can be saved from cutting. However, in the process the parking capacity has also been compromised to some extent, reducing it by 33 cars in two basements combined.

The optimized design also reduces some facilities provided in the facility block due to the space constraints and limited resources in management of the facilities provided.

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The optimized design also takes care of the execution stage of the project, with planned phase wise construction of the complex, appropriate spaces for the stacking and preparation of the construction material, adequate spaces for the labour-camps and utilities related to their safety and hygiene. Concern is also given to secure the construction premises, such as adequate barricading and arrangement to avoid spillage of dust and noise from the site. This is also to ensure that the construction process causes minimum inconvenience to the visitors approaching the monument from the West gate.

As per the Optimized design the trees to be cut have been reduced substantially. The list of the trees as per the optimized design is mentioned below:

S.No.	Specie of Tree	No. of trees
1.	EUCALYPTUS	12
2.	DATE PALM	10
3.	NEEM	8

Explained further are the features of the proposed design which also explain the advanced construction and the adequacy or the preparedness of the design concept with respect to some important factors related to the design.

As per the Optimized design, the facilities provided in the facility block are mentioned hereby:

1. Pre-lobby area
2. Information booth
3. Waiting area
4. Tourist police space
5. Money Exchange counter
6. Ticket counter 2 in no
7. 2 numbers of Automatic ticket vending machine
8. Prepaid Ticket vending machine for non-polluting ferrying vehicles
9. Toilets as per norms
10. Security room
11. First aid room
12. Lost and found room
13. Locker/Cloak room
14. Administration office
15. Souvenir shop

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There are some other facilities provided at other locations of the site, which are mentioned further,

1. Toilet facility (also considering the waiting drivers and the maintenance staff)
2. Drinking water
3. Driver Waiting hall
4. Parking administration room
5. Electrical panel room
6. Token collecting kiosk near the exit of the parking
7. Car lift

It is to be noted that, the car lift provided for the facility has to be installed with a machine room which has a certain height. The machine room atop the car-lift, shall give height to the structure of around 6-7 mts whereas the maximum height allowed for the site is only 3.75 mts. As the car lift is integral to the requirements of the parking complex, and only the machine room part of the installation exceeds the height limit, approval shall be sought in the same manner mummy for staircases are considered.

CHAPTER - 8

ENVIRONMENT

MANAGEMENT PLAN

Environmental Management Plan

The environmental management plan has following components:

1. Environmental Management Plan
2. Environmental monitoring plan
3. Reporting Requirement
4. Institutional Arrangement
5. Grievance Redress Mechanism

A. Clearances and Authorizations (Before & During Construction)

Activity/Permission	Applicable Rules & Regulations	Responsibility	Technical Support	Granting Authority/Executing Authority
1. Consent to Establish the Project.	The Water Act, 1974 and The Air Act, 1981.	State Project Coordination Unit (SPCU), UP Pro-Poor Tourism Development Project/ Agra Development Authority (ADA).	Supervision Consultant	U.P. Pollution Control Board (UPPCB)
2. Permission from Taj Trapezium Authority.	Taj Trapezium Notification, Gol.	SPCU and ADA	Supervision Consultant	Taj Trapezium Authority
3. Permission for cutting of 30 trees at the project site.	Taj Trapezium Notification, Gol	SPCU and ADA	Supervision Consultant	Empowered Committee,

				Supreme Court of India
4. Concurrence and Authorizations for shifting of parking lot during construction.	Local Body Regulations	SPCU	Supervision Consultant	ADA, ULB and other stakeholders
5. Permissions for sewer connection to the proposed sanitation facilities.	Local Body Regulations	SPCU	Supervision Consultant	UP Jal Nigam and ULB
6. Authorization for installation of CNG supply and CNG based DG Sets.	Taj Trapezium Notification, Gol	SPCU and Contractor	Supervision Consultant	Gas Supply Agency and UPPCB
7. Permissions for extraction of ground water for the project.	Ground Water Regulations	SPCU and Contractor	Supervision Consultant	Central Ground Water Authority
8. Clearance / Permission for earthwork excavation for basement construction	EIA Notification - minor minerals	Contractor	Supervision Consultant	District EIA Authority/Mines Dep.
9. Sourcing/procurement of construction material from authorized/approved agencies.	Regulations of Gol / GoUP	Contractor	Supervision Consultant	Respective Regulatory Agencies

B. Environmental Management Plan (During Construction Phase)

Environmental Component/ Issue	Mitigation Measures	BOQ Reference	Implementing Agency	Supervision agency
I. Site Development and Preparation				
1. Cutting of 30 trees located in the project site.	Prepare plan for compensatory Plantation of 300 trees at Sabji kaTila complying to the clearance	Item No. 780	Contractor	Supervision Consultant ADA/SPCU

Environmental Component/ Issue	Mitigation Measures	BOQ Reference	Implementing Agency	Supervision agency
	requirements of Empowered Committee of Supreme Court of India, obtain approval from UP Forest Department, plant 300 trees as per the approved plan and maintain the plantations for a period of one year and ensure a minimum of 90 percent survival rate.			
2. Demolition of existing structures (public toilet), concrete floor and others	<ul style="list-style-type: none"> ▪ Metal barricades of at least 4 m height shall be erected around the entire area of construction, to avoid hazards, construction nuisance and dust pollution to neighboring population, tourists and the monuments. The barricades should remain until the construction activity is completed. ▪ No demolition activity shall be done during peak tourist hours of 11 AM to 4 PM. ▪ Dust Suppression measures such as sprinkling of water (to wet the dust prone area/construction site) shall be done at regular intervals to control fugitive dust emissions during demolition activities. ▪ All Construction and demolition waste should be disposed as per the Construction and Demolition Waste Management Rules, 2016 of Government of India (Refer to Appendix). 	Item No.781	Contractor	Supervision Consultant ADA/SPCU
3. Impact on drainage pattern	<ul style="list-style-type: none"> ▪ To control the flow of the drain in the 			

Environmental Component/ Issue	Mitigation Measures	BOQ Reference	Implementing Agency	Supervision agency
	<p>monsoon season a Concrete Hume Pipe having Dia 450 mm shall be installed, so that the over flow of storm water coming from Taj Ganj Area. There is a location near Meena Bazaar where the drain is tapped and a mechanical screen will be installed to remove the floating material.</p>			
<p>4. Earthwork excavation for the construction of basement</p>	<ul style="list-style-type: none"> ▪ Only mechanical means shall be adopted and no herbicides and chemicals shall be used for clearance. ▪ Metal barricades of at least 4 m height shall be erected around the entire area of construction, to avoid hazards, construction nuisance and dust pollution to neighboring population, tourists and the monuments. The barricades should remain until the construction activity is completed. ▪ Reuse excavated earth for the site development of temporary parking facility (15000 cu.m), for compensatory plantation (7500 each) and landscaping of the project site, and dispose all the remaining excavated earth (about 43535 cu.m or more) at the ring road being developed by ADA. ▪ No earth work excavation activity shall be carried out during peak 	<p>Item No.781</p>	<p>Contractor</p>	<p>Supervision Consultant ADA/SPCU</p>

Environmental Component/ Issue	Mitigation Measures	BOQ Reference	Implementing Agency	Supervision agency
	tourist hours of 11 AM to 4 PM and also during monsoon. <ul style="list-style-type: none"> ▪ Dust Suppression measures such as sprinkling of water (to wet the dust prone area/construction site) shall be done at regular intervals to control fugitive dust emissions during earthwork excavation. 			
II. Air Environment				
1. Emissions from Construction Equipment and movement of vehicles.	<ul style="list-style-type: none"> ▪ All vehicles used at project road should have of valid 'Pollution under Control' (PUC) Certificates. ▪ All equipment should be operated only through electricity or CNG. ▪ Generators shall be operated only through CNG. ▪ All vehicles and equipment shall be operated by certified and trained operators. ▪ Vehicles carrying soil / construction material shall be covered and transported to avoid dust pollution. 	Item No.781	Contractor	Supervision Consultant ADA/SPCU
2. Fugitive dust generation due to wind from stock piling of earth/sand or other loose construction material.	<ul style="list-style-type: none"> ▪ Stock piling of construction material shall be done at designated and approved places away from locations of tourist movement and water bodies/ drains. ▪ Regular sprinkling of water and covering stock piles should be done to prevent wind-blown dust. ▪ Temporary barriers (berms, silt fence or sandbag) shall be erected to prevent spreading of construction 	Item No.781	Contractor	Supervision Consultant ADA/SPCU

Environmental Component/ Issue	Mitigation Measures	BOQ Reference	Implementing Agency	Supervision agency
	material. <ul style="list-style-type: none"> ▪ Stone cutting for construction shall be done in an enclosed and isolated area provided with bag filters. Stone dust shall be used as filler material within the construction site. 			
III. Water Environment				
1. Depletion of water resources due to use of water for construction.	<ul style="list-style-type: none"> ▪ Authorization for use of ground water or other sources of water supply, should be obtained. ▪ In case tanker water is used, the source of shall have necessary authorizations. ▪ All efforts shall be made to reuse/ recycle water during construction. 	Item No.781	Contractor	Supervision Consultant ADA/SPCU
2. Contamination of surrounding areas and stagnation of water due to construction waste, vehicle washing, cleaning, other activities.	<ul style="list-style-type: none"> ▪ Concrete for the construction purposes shall be obtained only from authorized 'ready mix concrete' suppliers. ▪ No cleaning, washing or maintenance activity shall be undertaken in the influence area of the project and near any water body. All equipment and vehicle shall be serviced /washed only in vehicle workshops. ▪ Adequate water supply and sanitation (toilets with adequate collection and treatment) facilities shall be provided to the construction labor at construction sites and other project facilities. ▪ Spilled over concrete and all other 	Item No.781	Contractor	Supervision Consultant ADA/SPCU

Environmental Component/ Issue	Mitigation Measures	BOQ Reference	Implementing Agency	Supervision agency
	<p>waste generated by the project shall be managed complying with Construction and Demolition Waste Management Rules, 2016 & Solid Waste Management Rules 2016 and guidelines annexed to this EMP.</p> <ul style="list-style-type: none"> ▪ Adequate treatment and reuse facilities shall be provided for the liquid and solid waste generated due to the project activities. ▪ All waste shall be reused for the project activities to the extent feasible. ▪ Waste and construction activities shall be managed, to avoid spillage in the nearby drains water bodies. 			
IV. Noise Pollution				
<p>1. Vehicles and Construction machinery movement & operation.</p>	<ul style="list-style-type: none"> ▪ All plant and equipment used in construction shall strictly conform to the prescribed noise standards of Central Pollution Control Board. ▪ All construction personal should be provided with ear plugs and other personal protective equipment. 	<p>Item No.781</p>	<p>Contractor</p>	<p>Supervision Consultant ADA/SPCU</p>
V. Land Pollution				
<p>1. Soil contamination from spillage of fuel, oils / lubricants from construction equipments and storage areas.</p>	<ul style="list-style-type: none"> ▪ No fuel / lubricants should be stored in project site. All oils/lubricants storage shall be procured from authorized agencies / suppliers. ▪ Construction vehicles should be well maintained with periodic inspection to avoid leakages / spillage. 	<p>Item No.781</p>	<p>Contractor</p>	<p>Supervision Consultant ADA/SPCU</p>

Environmental Component/ Issue	Mitigation Measures	BOQ Reference	Implementing Agency	Supervision agency
	<ul style="list-style-type: none"> ▪ Bitumen waste / scrap (if any) should be disposed in authorized disposal sites with approval from the engineer in-charge. 			
<p>2. Land pollution due to Disposal of Construction and Demolition Waste.</p>	<ul style="list-style-type: none"> ▪ All Construction and demolition waste should be disposed as per the Construction and Demolition Waste Management Rules, 2016 of Government of India. ▪ Efforts should be made to reuse the waste generated during excavation of the road. Some measures include ▪ All arrangements for transportation during construction including provision, maintenance, dismantling and clearing debris shall be considered incidental to the works and shall be planned and implemented by Contactor. ▪ Debris / waste generated from other construction activities shall be disposed such that it does not spill into surface water bodies or drains in the area. ▪ Debris/ waste shall not be stored in the project area or roads for more than 24 hours. ▪ 	<p>Item No.781</p>	<p>Contractor</p>	<p>Supervision Consultant ADA/SPCU</p>
<p>Occupational health and safety hazards to construction personnel.</p>	<ul style="list-style-type: none"> ▪ Shall comply with the safety protocols, Building and Other Construction Workers Regulations of Gol and Environment, Health and Safety (EHS) Guidelines of World 	<p>Item No.781</p>	<p>Contractor</p>	<p>Supervision Consultant ADA/SPCU</p>

Environmental Component/ Issue	Mitigation Measures	BOQ Reference	Implementing Agency	Supervision agency
	<p>Bank Group.</p> <ul style="list-style-type: none"> ▪ Shall provide suitable safety barricading at all construction sites. ▪ Shall provide and ensure use of PPEs(Personal Protective Equipment) such as Helmets, Mask, gum boots, gloves Ear plug etc. ▪ All vehicles and equipment shall have safety gear such as safety belt, reverse horn, etc. ▪ All electrical connections shall be provided earth link circuit breaker (ELCB) and earthing. ▪ Shall provide appropriate and adequate safety signage in local language (Hindi) and English at all project areas. ▪ Shall deploy Health & Safety Officers at the construction sites ▪ No labor camp (except rest area) should be set up at construction site. ▪ Labor camp should be established at a suitable place, with all basic facilities such as water supply, sanitation etc. in compliance to BOWCR of GOI. ▪ Shall provide facilities for first aid and medical support on call at project sites. ▪ Shall monitor and analyze all safety incidents/accidents and take appropriate preventive/ mitigative actions. 			

Environmental Component/ Issue	Mitigation Measures	BOQ Reference	Implementing Agency	Supervision agency
“Chance of Find” of items / materials of cultural and / or archeological importance during construction the execution of the project.	<ul style="list-style-type: none"> ▪ Report to relevant authorities, comply with World Bank’s safeguard policy on Physical and Cultural Resources and Monuments and Archeological sites and Remains Act, 1958 & as amended Act 2010 of Gol. ▪ Prepare cultural properties management plan (if needed) 	Item No.781	Contractor	Supervision Consultant ADA/SPCU

Summary of Guidelines for Construction and Demolition Waste Management & Solid Waste Management(as per Demolition Waste Management Rules, 2016 & Solid Waste Management Rules 2016)

- (i) Every waste generator shall segregate construction and demolition waste and deposit at collection centre or handover it to the authorized processing facilities
- (ii) Waste generator shall ensure that there is no littering or deposition of waste so as to prevent obstruction to the traffic or the public or drains.
- (iii) Large generators (who generate more than 20 tons or more in one day or 300 tons per project in a month) shall submit waste management plan and get appropriate approvals from the local authority before starting construction or demolition or remodeling work,
- (iv) Large generators shall have environment management plan to address the likely environmental issues from construction, demolition, storage, transportation process and disposal / reuse of C & D Waste.
- (v) Large generators shall segregate the waste into four streams such as concrete, soil, steel, wood and plastics, bricks and mortar,
- (vi) Large generators shall pay relevant charges for collection, transportation, processing and disposal as notified by the concerned authorities;
- (vii) Segregate and store the waste generated in three separate streams namely bio-degradable, non biodegradable and domestic hazardous wastes in suitable bins and handover segregated wastes to authorized waste pickers or waste collectors as per the direction or notification by the local authorities from time to time;
- (viii) Wrap securely the used sanitary waste like diapers, sanitary pads etc., in the pouches provided by the manufacturers or brand owners of these products or in a suitable wrapping material as instructed by the local authorities and shall place the same in the bin meant for dry waste or non- bio-degradable waste;
- (ix) Store separately construction and demolition waste, as and when generated, in his own premises and shall dispose off as per the Construction and Demolition Waste Management Rules, 2016; and

- (x) Store horticulture waste and garden waste generated from his premises separately at site and dispose of as per the directions of the local body from time to time.
- (xi) No waste generator shall throw, burn or burry the solid waste generated by him, on streets, open public spaces outside his premises or in the drain or water bodies.
- (xii) All waste generators shall pay such user fee for solid waste management, as specified in the bye-laws of the local bodies.

C. Clearances and Authorizations (During Operational Phase)

Activity/Permission	Applicable Rules & Regulations	Responsibility	Technical Support	Granting Authority/Executing Authority
1. Consent to Operate (Water Consent & Air Consent) for the Project.	The Water Act, 1974 and The Air Act, 1981.	Contractor /Agra Development Authority (ADA).	Supervision Consultant	U.P. Pollution Control Board (UPPCB)
2. Hazard Authorization	Hazardous Waste (Management & Handling), Rule-2016	Contractor/ Agra Development Authority (ADA).	Supervision Consultant	U.P. Pollution Control Board (UPPCB)
3. Renewal for extraction of ground water for the project for operation of the project.	Ground Water Regulations	Contractor/ Agra Development Authority (ADA).	Supervision Consultant	Central Ground Water Authority
4. NOC (No-Objection Certificate)	Fire Protection Act, 2005	Contractor/ Agra Development Authority (ADA).	Supervision Consultant	U.P. Fire Department

D. Environmental Management Plan (During Operational Phase)

Environmental Component/ Issue	Mitigation Measures	BOQ Reference	Implementing Agency	Supervision agency
I. Air Environment				
1. Emissions from parking vehicles .	1. Exhaust emission should trap and treat in wet scrubber along with water recirculation system for air pollution control and the sludge will	Item No.-- ---	Contractor	Supervision Consultant ADA/SPCU

Environmental Component/ Issue	Mitigation Measures	BOQ Reference	Implementing Agency	Supervision agency
	<p>be disposed through U.P. Waste Management Project.</p> <p>2. Two generators sets are proposed on the site and one of them should be installed before the start of the construction work at site, so that all the equipments to be used on the site can be installed appropriately. All the equipments should be power-backed by the CNG based generators except the Poclain/JCB excavator.</p> <p>3. Continuous gas supply should be ensured at the site</p>			
II. Noise Environment				
<p>1. Operation of CNG based generator sets and other machineries and vehicular movement</p>	<p>1. As regards CNG Based Gen sets, these shall be provided with acoustic enclosures ensuring maximum outside noise level of 70-75 dB (A) at 1.0 m distance</p> <p>2. Trees with heavy foliage will be planted around the project site help slightly muffle the noise.</p> <p>3. Proper vehicular management will be adopted to avoid congestion.</p> <p>4. Provision of Adequate Structural Foundation to Minimize Vibration for Machineries.</p>	<p>Item No.-- ---</p>	<p>Contractor</p>	<p>Supervision Consultant ADA/SPCU</p>
III. Water Environment				
<p>1. Depletion of water resources due to use of water.</p>	<p>1. A detailed Rain Water Management Plan shall be developed which will consider the above sources. The plan will</p>	<p>Item No.-- ---</p>	<p>Contractor</p>	<p>Supervision Consultant ADA/SPCU</p>

Environmental Component/ Issue	Mitigation Measures	BOQ Reference	Implementing Agency	Supervision agency
	<p>incorporate best management practices which will include following:</p> <ul style="list-style-type: none"> a. Storm water shall be treated in two ways, first of which is collected from the podium surface, contaminated with oil and grease content and it will be passed through grease trap before connecting to the kuccha tank for rain water storage, and the overflow will be connected to the storm water drain. The other source shall be the storm water collected from raw surface of the site(green area etc.), which will be directly diverted into the kucch tank for rain water storage. b. Regular inspection and cleaning of storm drains. c. Cover waste storage areas if existing in open space. d. Avoid application of pesticides and herbicides before wet season. e. Secondary containment and dykes in oil storage facilities. f. Conducting routine inspections to ensure cleanliness. g. Preparation of spill response plans, particularly for oil storage areas. h. Provision of slit traps in storm water drains. 			

Environmental Component/ Issue	Mitigation Measures	BOQ Reference	Implementing Agency	Supervision agency
	<ol style="list-style-type: none"> i. Good housekeeping in the above areas. 2. Rain water harvesting management system should be implemented and obtain permission for ground water abstraction from Central Ground Water Authority. 3. To provide water impermeable layer for the temporary storage and disposal of the sludge. 4. All efforts shall be made to reuse/ recycle water during operation. 			
<p>2. Contamination of surrounding areas and stagnation of water due operational activities of the project.</p>	<ol style="list-style-type: none"> 1. Adequate water supply and sanitation (toilets with adequate collection and treatment) facilities shall be provided. 2. Adequate treatment and reuse facilities shall be provided for the liquid and solid waste generated due to the project activities. 3. Waste shall be managed, to avoid spillage in the nearby drains, water bodies. 4. Proper operation & maintenance of Sewage Treatment Plant (200 KLD Capacity) and rain water harvesting system. 	<p>Item No.-- -----</p>	<p>Contractor</p>	<p>Supervision Consultant ADA/SPCU</p>
IV. Land Pollution				
<p>1. Soil contamination from spillage of oils & grease / lubricants from operational equipments and storage areas.</p>	<p>1. The generated waste lubricating oil will be collected in MS containers and stored in impervious floor</p>	<p>Item No.-- -----</p>	<p>Contractor</p>	<p>Supervision Consultant ADA/SPCU</p>

Environmental Component/ Issue	Mitigation Measures	BOQ Reference	Implementing Agency	Supervision agency
	<p>along with dyke to prevent the spillage.</p> <p>2. The waste lubricating oil will be disposed through authorized recyclers from Pollution Control Board.</p>			
2. Land pollution due to Disposal of Municipal Solid Waste.	<p>1. Municipal Solid Waste will not be temporary stored on unpaved area.</p> <p>2. All solid and other wastes from the proposed project should be properly collected, stored and disposed. An integrated solid waste management plan will be developed.</p>	Item No.-- ----	Contractor	Supervision Consultant ADA/SPCU
V. Waste Generation and Management				
1. Generation of Municipal Solid Waste	<p>1. Adequate numbers of separate bins as per the category of waste will be provide at appropriate places in the proposed project site for the proper collection of Municipal Solid Waste.</p> <p>2. All the generated municipal solid waste will be collected in separate bins and disposed as per "The Municipal Solid Waste Management & Handling Rule, 2016" of Government of India.</p>	Item No.-- ----	Contractor	Supervision Consultant ADA/SPCU
2. Generation of Hazardous Waste	<p>1. The generated waste lubricating oil will be collected in MS containers and stored in impervious floor along with dyke to prevent the spillage.</p>	Item No.-- ----	Contractor	Supervision Consultant ADA/SPCU

Environmental Component/ Issue	Mitigation Measures	BOQ Reference	Implementing Agency	Supervision agency
	2. The waste lubricating oil will be disposed through authorized recyclers from Pollution Control Board. 3. Discarded/used batteries will be collected in impervious acid proof floor along with dyke to prevent the spillage. 4. The Discarded/used batteries will be disposed through authorized recyclers from Pollution Control Board.			
3. Generation of E-Waste	1. A separate space will be provided for temporary collection of E-waste and disposed through authorized recyclers from Pollution Control Board.	Item No.-- ----	Contractor	Supervision Consultant ADA/SPCU

4. INSTITUTIONAL ARRANGEMENT

The State Project Coordination Unit (SPCU) created in Department of Tourism and is supported by existing agencies (the Development Authorities in each core target area) and competitively selected decentralized teams (Technical Support Units – TSUs) based in each of the project core target areas, in principle in Agra, Mathura, Sarnath and Kushinagar. The TSUs will support the respective Development Authorities, the project implementing entities, in the day-to-day execution of respective subprojects.

Social, heritage management and environment specialists are hired by the SPCU to coordinate, review, support and monitor all respective safeguards aspects of the project. The specialists will also train and strengthen the capacities of specialists in the TSUs and in the implementing entities. The project may hire qualified civil society organizations for the implementation of the ESMP. The SPCU and the decentralized TSUs may also be supported by competitively recruited experts in highly specialized areas, as needed.

Agra Development Authority (ADA) will be primarily responsible for implementation of the project ESMP. ADA will be assisted by SPCU through its Environment Specialist and Social specialist and TSU in implementation. ADA will designate one of its official as Environment and Social Officer. The implementing team will comprise of the following:

- Environment & Social Officer of ADA,
- Social Specialist of SPCU,
- Environment Specialist of SPCU
- Representative of local NGO
- Local people representatives

The roles and responsibility of these officials is given in Table :

Roles and responsibilities of implementing team

Players	ROLES and RESPONSIBILITIES
SPCU	<ul style="list-style-type: none">• Provide guidance to Social Officer of ADA;
Social Specialist	<ul style="list-style-type: none">• Monitoring implementation activities and make budgetary provisions• Participate in meetings;• Monitor physical and financial progress on implementation.
SPCU	<ul style="list-style-type: none">• Provide guidance to environment Officer of ADA;
Environment Specialist	<ul style="list-style-type: none">• Monitoring implementation of EMP activities through regular visits to the sub-project sites

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- Participate in meetings;
- Monitor progress on EMP implementation.

IA/TSU

Officer

- Co-ordinate with district administration for implementation
- Translation of ESMP into local language and ensure dissemination at community level – prepare pamphlets on policy for information dissemination;
- Provide training for skill enhancement
- Liaison with district administration for dovetailing of government schemes for provision of basic services.
- Report on physical, financial and EMP progress of implementation
- Participate in the project level meetings;
- Report progress, highlighting issues not addressed, to provide for mid-course correction;

NGO

Representative

- Represent interest of stakeholders during the implementation of ESMP and gender actions.
- Provide information to stakeholders and local community and conduct awareness programs
- Be part of grievance mechanism

FRAMEWORK FOR MONITORING AND EVALUATION

The project authority will be responsible for carrying out monitoring and evaluation. Internal monitoring will be carried out by the Environmental and Social Officers of ADA with assistance from Social Specialist and Environment Specialist of SPCU and local representatives. This will help monitor project activities closely. Regular monitoring by undertaking site visits will help identify potential difficulties and problems faced in the project implementation and subsequently help take timely corrective measures including deviations, if needed.

Monitoring will start as soon as the project implementation begins and Social Officer and local representatives are appointed / nominated at site for implementation of ESMP. Components of monitoring will include performance monitoring i.e., physical progress of the work and impact monitoring and external evaluation. Indicators that would be monitored related to performance are provided in the following sections. However, if during the project implementation some other indicators are found relevant then those shall be included. NGO with appropriate expertise will be hired for external evaluation of ESMP implementation or the DPR components.

A quarterly report of internal monitoring will be prepared by concerned officer of ADA. The monitoring will also provide feedback on community concerns, grievances and requests. Monitoring will focus on and ensure the following:

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- Verification that there are no outstanding or unresolved issues with respect to the project
- Information campaign, discrimination and consultation with affected people,
- Effective operation of the Grievance Redress Committees detailing out number of complaints received and those resolved; reasons for not being able to resolve the grievance and status of unresolved grievances.

Framework of monitoring is summarized in Table 7.2.

Table 7.2 : Framework for Monitoring

Type	Indicators	Issues	Procedure	Timing	Responsibility
Process level monitoring\	Project/ ESMP Implementation	Employment of local labor including women	Site observation, attendance record, interaction with laborers and contractors	Monthly	ADA / NGO
		Campsite management including lodging arrangement and campsite facilities	Site observation, interaction with laborers, contractors	Monthly	ADA /SPCU/ Local Representatives/NGO
		EMP Implementation	as prescribed in the EA Report& Bid document	Monthly	Contractor/SPCU/ADA
		Use of health and safety measures	Site observation, interaction with laborers, contractors	Quarterly	ADA / SPCU/ Local Representatives/ NGO
		Temporary leasing of land and house, if any	Site observation, contractors, check contract agreement	Monthly	ADA / Local Representatives/ NGO
		Discrimination of wage rate between male and female workers	Interaction with laborers, labor survey, record of wage payment	Monthly	ADA / SPCU.

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		Incidence of communicable diseases	Discuss with local people, health workers/ post/ records	Annually	ADA / SPCU/NGO
Impact Level	Change in Forest Cover/ Vegetation Types if any	Changes in vegetation	Consultation with forest department/ local representatives	Annually	ADA / SPCU
	Social safety	State of social harmony and social security	Police records, consultation with stakeholders.	Annually	ADA / SPCU
Note: No type of change in forest cover /vegetation is proposed under this DPR					

5. GRIEVANCE REDRESSAL CELL (GRC):

An Integrated Grievance Redressal Mechanism (IGRM) based on use of ICT shall be established, with necessary officials and systems, at the state as well as subproject levels. Grievances if any, may be submitted through various mediums, including in person, in written form to a noted address, through a toll-free phone line or through direct calls to concerned officials, and online. All local contact information and options for complaint submission will be available on site on local information boards. Moreover, they will be in addition to the Public Information Officers to be appointed under the Right to Information (RTI) Act. A half yearly report on Grievance Redressal by the project will be prepared. The project will abide by the RTI Act of 2005; it will commit itself for proactive disclosure and sharing of information with the key stakeholders, including the communities/beneficiaries. The project will have a communication strategy focusing on efficient and effective usage of print and electronic media, bill boards, posters, wall writing, and adoption of any other method suiting local context, logistics, human and financial resources.

The project however will have a project level Grievance Redressal Cell (GRC) to address the grievances of the stakeholders related to project implementation and project impacts if any.

Members of GRC:

The GRC will be constituted by the DM of Mathura. The GRC will have local representatives and other opinion leaders who will look into the grievance of the people. It will be chaired by a

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retrieved officer, who served as principal/judge/ DM/Additional DM, etc. The suitability of the Chairperson will be decided by the DM in consultation with ADA. Apart from the nominated person, the cell will have a representative from ADA as convener.

GRC will have representatives of the village residents including, farmers, youth groups and women self-help groups together with representative of city administration. Total of 12 – 15 members will be part of the GRC.

Functions of the Cell:

The GRC will conduct a meeting in the first week of every month to hear the grievances from the stakeholders. All the complaints will be forwarded to the concerned department/officials within 15 days from the date of receiving the complaints. The issues will be resolved/addressed by concerned officials within 45 days from the receipt of the complaints. All the grievances received shall be discussed by the Chairperson of the cell with DM for the necessary action.

The compliance to all the petitions shall be reviewed in each of the meeting by the chairman and the DM. In case the grievances are not addressed by the GRC, it will be escalated to the office of District Magistrate by the Chairperson / ADA. The stakeholders can also approach judiciary if their grievances are not addressed at any of these levels. The grievance cell shall submit a monthly report to the ADA for reference regarding the issues received and the cases disposed and forwarded to higher level.

INFORMATION DISCLOSURE:

The ESMP will be translated into local language and will be shared with the affected community. The English and translated version of ESMP will be disclosed on the website of Department of Tourism. Hard copies in English and Hindi will be placed at following offices:

- ADA
- Office of District Magistrate, Mathura

Through public meetings, attempts would be made to ensure that vulnerable groups such as SC households understand the process of project preparation and their needs are addressed in the best manner possible.

CAPACITY BUILDING AND TECHNICAL SUPPORT

Given that Department of Tourism is implementing a World Bank-financed project for the first time, the capacity to address social, cultural and environmental issues as per the World Bank safeguards policies is limited. The Department of Tourism project staff will require training in the management of safeguards issues. The training program is to be coordinated and

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anchored by the Department of Tourism with support from agencies/individuals experienced in safeguard aspects for developing courses on conducting training programs.

The course contents will focus on the ESMF, concept, regulatory requirements, environment and social priority issues, project cycle of investments, outline of the ESIA, management plans and report formats. It will also focus on the resettlement and rehabilitation and heritage policies and procedures, land acquisition process, identification of project affected people, social entitlement frameworks, social assessment, risk assessment and management skills.

As part of the capacity building program, the Department of Tourism would also aim to develop decentralized local capacity on managing environmental, social and cultural properties issues associated with various investments. In order to achieve this objective, the specialists will develop a network of technical man power resources such as staff from universities/research institutions, civil society organizations, etc. These persons will be trained during the course of the project, so that they can provide support to the project agencies in conducting the required impact assessments and later in implementing all applicable management plans (including Resettlement Action Plan, Gender Action Plan, as relevant) and also offer support on an on-going basis.

The capacity building at the local level for ESMP implementation agency as well as for the monitoring and redressal committee would be done through the tourism department.

In addition to the above, DoT program will continue to mainstream the environmental, cultural and social issues within the training programs of State Project Coordination unit and the implementing entities. The program will be structured in such a way that it clearly brings out the value addition and enhancement benefits of proper management of environmental and social issues. Proposed capacity building plan is given in Table No. 7.3.

Capacity Strengthening Plan

MODULES	CONTENT	DURATION
ESMF	<ul style="list-style-type: none"> • Project Concept • ESMF Concept • Regulatory Requirements • E&S Priority Issues • Subproject types • ESIA • Process Outline • Reporting 	Half a day To be repeated every alternative year
Environmental Assessment Process	<ul style="list-style-type: none"> • Environmental Laws & Regulations • EIA process 	Full day class room training.

**Environmental Assessment Report for Visitor Center and Parking Rehabilitation at
Taj Mahal West Gate, Agra**

	<ul style="list-style-type: none"> • Identification of Environmental Impacts • Impact Identification Methods • Identification Mitigation Measures • Formulation of Environmental Management Plan • Implementation and Monitoring • Institutional Mechanism 	Half a day field training.
Social Assessment Process	<ul style="list-style-type: none"> • Social Assessment process • Description of project; RPF, gender frameworks; and National regulatory frameworks • LA process • Necessity for RAP/ ARAP, Gender plan and its preparation process • Implementation and Monitoring • Institutional Mechanism • Grievance Mechanism 	<p>Half a day class room training.</p> <p>Half a day field training.</p>
Cultural Properties Assessment Process	<ul style="list-style-type: none"> • Cultural Properties Assessment process • Description of project and national regulatory frameworks • Necessity for PCRMP and its preparation process • Implementation and Monitoring • Institutional Mechanism 	<p>Half a day class room training.</p> <p>Half a day field training.</p>

CHAPTER - 9

ENVIRONMENT

MONITORING PLAN

ENVIRONMENT MONITORING PLAN

During Construction Phase:

Attributes	Parameters	Locations	Frequency	Responsibly	Supervision
1. Ambient Air Quality	PM ₁₀ , PM _{2.5} , SO ₂ , NO _x , as per NAQM	03 locations (project site, upwind and downwind direction of the site) – 144 samples @ 2 years construction	Once before construction and then fortnightly	Contractor (BoQ. 782)	Supervision Consultant/SPCU
2.Exhaust emissions of vehicles&machinery	SPM and NO _x	All Vehicles and Machinery – 144 measurements	Once a month	Contractor (BoQ. 782)	Supervision Consultant/SPCU
3. Water Quality	CPCB Drinking water and discharge parameters respectively	Ground Water and wastewater generated at site – 16 samples	Quarterly	Contractor (BoQ. 782)	Supervision Consultant/ SPCU
4. Ambient Noise monitoring	Daily averages of Day and night equivalent noise levels	3 locations–Project Site and two sensitive locations as approved by Engineer-in-Charge – 144 samples	Once before construction and then fortnightly	Contractor (BoQ. 782)	Supervision Consultant/SPCU
5. Vibration monitoring	Ground vibration monitoring during construction	3 locations – at site, 100 m site and near the monument complex – 72 measurements	Once before construction and then monthly	Contractor (BoQ. 782)	Supervision Consultant / SPCU
6.Construction equipment fitness	Fitness certificate from authorized service center	Physical observation, documents check	Quarterly	Contractor (BoQ. 781)	Supervision Consultant/SPCU
7.Trained Health, Safety and Environment (HSE) personnel	Trained HSE personnel with at least 3 years' experience in the same type of works	Physical observation, document checks	All the time	Contractor (BoQ. 781)	Supervision Consultant/SPCU
8.Dust suppression Measures	No fugitive dust observed at site	Physical observation	Regular as needed	Contractor (BoQ. 781)	Supervision Consultant/SPCU

Attributes	Parameters	Locations	Frequency	Responsibly	Supervision
9.Barricades and sign boards for safety of workers and the public (size 2.0 m x1.0 m)	Minimum 50 nos. of boards at site, site is protected from intrusion of invaders	Physical observation	All the time	Contractor (BoQ. 781)	Supervision Consultant/SPCU
10.Use of Personal Protective Equipment (PPEs)	Supply and ensure use of PPEs (Jacket, helmet, gum boots, eye protection, hearing aid, etc). suitable to the nature of work.	Physical observation	All the time	Contractor(BoQ. 781)	Supervision Consultant/SPCU
11.Drinking water for personnel	Safe and potable drinking water to all the personnel at site	Physical observation& verification with labor	All the time	Contractor(BoQ. 781)	Supervision Consultant/SPCU
12. Sanitation facilities for workers	Mobile toilets with anaerobic digestion available at site	Physical observation	All the time	Contractor(BoQ. 781)	Supervision Consultant/SPCU
13.Access/roads	Clear access to site without blocking access to any property	Physical observation	All the time	Contractor(BoQ. 781)	Supervision Consultant/SPCU
14.Labour wages	Minimum wages act, labour laws	Wage register and verification with labor	Regularly/ Monthly	Contractor(BoQ. 781)	Supervision Consultant/SPCU
15.Labour welfare	Wages, working and rest hours, overtime, health and sanitations, maternity facilities	Labour Acts /laws, document check, physical observation	Regularly/ Monthly	Contractor(BoQ. 781)	Supervision Consultant/SPCU
16.Health & Safety	Training records	Site observation/ verification with labor	Monthly	Contractor(BoQ. 781)	Supervision Consultant/SPCU
17.Child labour	No child labour is deployed	Physical observation& verification	All the time	Contractor(BoQ. 781)	Supervision Consultant/SPCU
18.Grievances	Grievance from nearby residents/visitors	Grievance register, public consultations	Monthly	Contractor(BoQ. 781)	Supervision Consultant/SPCU

Reporting Requirements.

A monthly compliance report to the above environmental management plan and monitoring plan shall be submitted by the contractor to DSC / TSU. On the basis of monthly compliance report from contractor and supervision on site, DSC will prepare quarterly progress report and submit to SPCU/TSU.

During Operation Phase

Attributes	Locations	Parameters	Frequency	Responsibility	Supervision
CNG based Gen Set emissions	at Gen Set stacks	PM ₁₀ , PM _{2.5} , SO ₂ , NO _x , HC.	Once in three months	Contractor/ADA (BoQ. -----)	Supervision Consultant/SPCU
Gen set noise	At 0.5 m outside Gen set	Noise level	Once in three months	Contractor/ADA (BoQ. -----)	Supervision Consultant/SPCU
STP Performance	Inlet and Outlet	pH, TSS, BOD, COD, Oil & Grease	Once in a month for performance of STP	Contractor/ADA (BoQ. -----)	Supervision Consultant/SPCU
Ambient Air Quality	-	PM ₁₀ , PM _{2.5} , SO ₂ , NO _x ,	Daily monitoring is proposed with LED display units as the project site lies near to world heritage site	Contractor/ADA (BoQ. -----)	Supervision Consultant/SPCU
Ambient Noise	03 locations in & around the parking building	Day and night equivalent noise level	Once in three Months	Contractor/ADA (BoQ. -----)	Supervision Consultant/SPCU

Reporting Requirements.

A monthly compliance report to the above environmental management plan and monitoring plan shall be submitted by the contractor. ADA to DSC / TSU. On the basis of monthly compliance report from contractor and supervision on site, DSC will prepare quarterly progress report and submit to SPCU/TSU.

CHAPTER – 10

BUDGET OF ENVIRONMENT MANAGEMENT PLAN & ENVIRONMENT MONITORING

Budget for Environment Management Plan (Including EMP cost components mentioned in project BOQ) & Environment Monitoring

Water Pollution Management

S.NO.	PARTICULARS	COST (RS.)	REMARK
1.	Sewage Collection Sump along with pump and piping at project site	6,65,000/-	-
2.	Curing water recirculation tank	8,10,000/-	-
3.	Tertiary treatment of water for curing which will be taken from Dhandupura STP	10,16,000/-	Already Included in BOQ
4.	STP (200 KLD) at proposed site in operation phase	66,50,574/-	Already Included in BOQ

Air Pollution Management

S.NO.	PARTICULARS	COST (RS.)	REMARK
1.	Natural Gas line up to the project site along with supporting equipment	75,00,000/-	Already Included in BOQ
2.	Ventilation ducting along with wet scrubber for vehicular smoke	2,96,79,961/-	Already Included in BOQ
3.	Ambient Air Quality Equipment for monitoring during operation period	86,81,150/-	Already Included in BOQ
4.	System for washing of Truck Tires	5,00,000/-	-
5.	Sprinkler System for earth removal/digging	1,80,000/-	-

ENVIRONMENT ASSESSMENT STUDY

By ANB CONSULTANTS

VISITOR CENTER AND PARKING REHABILITATION AT TAJMAHAL WEST GATE

NOISE ENVIRONMENT

S.NO.	PARTICULARS	COST (RS.)	REMARK
1.	Acoustic enclosure for gen sets	8,00,000/-	Already Included in BOQ

GREEN BELT

S.NO.	PARTICULARS	COST (RS.)	REMARK
1.	Cost of horticulture & plantation	88,59,907/-	Already Included in BOQ

COMPENSATORY AFFORESTATION

S.NO.	PARTICULARS	COST (RS.)	REMARK
1.	Cost of 150 trees plantation at Sabjikatila	82,500/-	Already Included in BOQ

SOLID WASTE MANAGEMENT

S.NO.	PARTICULARS	COST (RS.)	REMARK
1.	Solid waste collection bins	3,00,000/-	-

TEMPORARY SHED & TOILETS FOR LABOURS

S.NO.	PARTICULARS	COST (RS.)	REMARK
1.	Temporary Shed & Toilets for Labours	8,00,000/-	-

VISITOR CENTER AND PARKING REHABILITATION AT TAJMAHAL WEST GATE

SAFETY EQUIPMENT & FIRST AID FACILITY

S.NO.	PARTICULARS	COST (RS.)	REMARK
1.	Safety Equipment & First aid facility for manpower and Liaoning with nearest hospital	24,30,000/-	-

WATER CONSERVATION

S.NO.	PARTICULARS	COST (RS.)	REMARK
1.	Roof top rain water harvesting	5,72,627/-	Already Included in BOQ
2.	Water collected from the podium surface	47,01,582/-	Already Included in BOQ
3.	Water from the raw surface on the site	31,34,388/-	Already Included in BOQ

CHANCE FIND

S.NO.	PARTICULARS	COST (RS.)	REMARK
1.	Manual Excavation near chase find object	1,18,650/-	Already Included in BOQ
2.	Removal of debris around chance find	54,097/-	Already Included in BOQ

Breakup of Cost for Environment Monitoring during Construction phase is given in below table:

Item	Parameters	Location	Frequency	Cost (Rs.)
Ambient Air Quality	PM ₁₀ , PM _{2.5} , SO ₂ , NO _x .	At 03 locations at places in and around the project site.	Once in fifteen days @ 13,200/- per location (Sampling & analysis charges of Ambient Air for 24 Hours)	19,00,800/-
Emission Analysis of Construction Machinery (03 nos.)	Particulate Matter, NO _x	Machinery Locations	Once in fifteen days @ 13,050/- per Source (Sampling & analysis charges)	18,79,200/-
Ambient Noise	Day and night Equivalent noise level	03 locations are	Once in a week @ 6,000/- per Location	17,28,000/-

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VISITOR CENTER AND PARKING REHABILITATION AT TAJMAHAL WEST GATE

		Identified, places in and around the project site.		
Ground water	As per CPCB standards	Ground water at 01 Location at the project site.	Quarterly @ 17,655/- per Sample	1,41,240/-
Vibration	Ground vibration monitoring before start of construction and during construction (excavation and heavy equipment operation)	100 meters from the site and near TajMahal Complex	As per site conditions and construction plan	5,00,000/-
Total				61,49,240/-

Note:

- The above rates are as per the U.P. Pollution Control Board.
- Transportation charges for above monitoring will be charged extra as per U.P. Pollution Control Board.
- The above charges are applicable by considering 02 years period of the project.

Breakup of Cost for Environment Monitoring during Operation phase is given in below table:

(Monitoring cost is considered for 03 years period)

Item	Parameters	Location	Frequency	Cost (Rs.)
Gen set emissions	PM ₁₀ , PM _{2.5} , SO ₂ , NO _x , HC.	at Gen Set stacks	Once in three months @16,950/- per Source	4,06,800.00
Gen set noise	Noise level	At 0.5 m outside Gen Set	Once in three months @ 6000/- per Location	72,000.00
STP Performance	pH, TSS, BOD, COD, Oil & Grease	Inlet and Outlet	Once in a month for performance monitoring @7500/- per Sample	2,70,000.00

ENVIRONMENT ASSESSMENT STUDY

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VISITOR CENTER AND PARKING REHABILITATION AT TAJMAHAL WEST GATE

Ambient Air Quality	PM ₁₀ , PM _{2.5} , SO ₂ ,NO _x ,	-	Daily monitoring is proposed with LED display units as the project site lies near to world heritage site @15000.00 per month	5,40,000.00
Ambient Noise	Day and night equivalent noise level	03 locations in & around the parking building	Once in three Months @3000/- per Location	1,08,000.00
Total				13,96,800.00

Final Cost Of EMP& Environment Monitoring:

S. No.	Particulars	Cost (Rs.)
1.	Total Cost of EMP	7,75,36,436.00
2.	EMP Cost, which is already included in Project BOQ	7,18,51,436.00
3.	Total cost Environment Monitoring in Construction Phase	61,49,240.00
4.	Total cost Environment Monitoring in Operation Phase	13,96,800.00
5.	Final cost of EMP (excluding EMP cost in project BOQ) & Environment Monitoring : [Item (1-2)+3+4]	1,32,31,040.00

ENVIRONMENT ASSESSMENT STUDY

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VISITOR CENTER AND PARKING REHABILITATION AT TAJMAHAL WEST GATE

Final BOQ of EMP (excluding EMP cost components mentioned in project BOQ) & Environment Monitoring

S.N.	Item			Unit	Quantity	Rate	Amount (Rs.)	
A	Water Pollution Management							
1	Sewage Collection Sump along with pump and piping at project site			-	LS	₹ 6,65,000.00	₹ 6,65,000.00	
2	Curing water recirculation n tank			-	LS	₹ 8,10,000.00	₹ 8,10,000.00	
B	Air Pollution Management							
3	System for washing of Truck Tires			-	LS	₹ 5,00,000.00	₹ 5,00,000.00	
4	Sprinkler System for earth removal/digging			-	LS	₹ 1,80,000.00	₹ 1,80,000.00	
C	Solid Waste Management							
6	Solid waste collection bins			-	LS	₹ 3,00,000.00	₹ 3,00,000.00	
D	TEMPORARY SHED & TOILETS FOR LABOURS							
7	Temporary Shed & Toilets for Labours			-	LS	₹ 8,00,000.00	₹ 8,00,000.00	
E	Safety EQUIPMENT & First Aid Facility							
8	Safety Equipment & First aid facility for manpower and Liaoning with nearest hospital			-	LS	₹ 24,30,000.00	₹ 24,30,000.00	
F	Environment Monitoring during Construction Phase							
SN	Item	Parameters	Location	Frequency	Unit	Quantity	Rate	Amount (Rs.)
9	Ambient Air Quality	PM ₁₀ , PM _{2.5} , SO ₂ , NO _x .	At 03 locations at places in and around the project site.	Once in fifteen days @ 13,200/- per location (Sampling & analysis charges of Ambient Air for 24 Hours)	No.	144.00	₹ 13,200.00	₹ 19,00,800.00

ENVIRONMENT ASSESSMENT STUDY

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VISITOR CENTER AND PARKING REHABILITATION AT TAJMAHAL WEST GATE

10	Emission Analysis of Construction Machinery (03 nos.)	Particulate Matter, NOx	Machinery Locations	Once in fifteen days @ 13,050/- per Source (Sampling & analysis charges)	No.	144.00	₹ 13,050.00	₹ 18,79,200.00
11	Ambient Noise	Day and night Equivalent noise level	03 locations are Identified, places in and around the project site.	Once in a week @ 6,000/- per Location	No.	288.0	₹ 6,000.00	₹ 17,28,000.00
12	Ground water	As per CPCB standards	Ground water at 01 Location at the project site.	Quarterly @ 17,655/- per Sample	No.	8.0	₹ 17,655.00	₹ 1,41,240.00
13	Vibration	Ground vibration monitoring before start of construction and during construction (excavation and heavy equipment operation)	100 meters from the site and near TajMahal Complex	As per site conditions and construction plan	-	LS	₹ 5,00,000.00	₹ 5,00,000.00
Sub Total								₹ 61,49,240.00
G	Environment Monitoring during Operation Phase (For Three Years period)							
	Item	Parameters	Location	Frequency	Unit	Quantity	Rate	Cost (Rs.)
14	Gen set emissions	PM ₁₀ , PM _{2.5} , SO ₂ , NOx, HC.	at Gen Set stacks	Once in three months @16,950/- per Source	No.	24.00	₹ 16,950.00	₹ 4,06,800.00

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VISITOR CENTER AND PARKING REHABILITATION AT TAJMAHAL WEST GATE

15	Gen set noise	Noise level	At 0.5 m outside Gen set	Once in three months @ 6000/- per Location	No	12.00	₹ 6,000.00	₹ 72,000.00
16	STP Performance	pH, TSS, BOD, COD, Oil & Grease	Inlet and Outlet	Once in a month for performance monitoring @7500/- per Sample	No	36.00	₹ 7,500.00	₹ 2,70,000.00
17	Ambient Air Quality	PM ₁₀ , PM _{2.5} , SO ₂ , NO _x ,	-	Daily monitoring is proposed with LED display units as the project site lies near to world heritage site	No.	36.00	₹ 15,000.00	₹ 5,40,000.00
18	Ambient Noise	Day and night equivalent noise level	03 locations in & around the parking building	Once in three Months @3000/- per Location	No	36.00	₹ 3,000.00	₹ 1,08,000.00
Sub Total								₹ 13,96,800.00
GRAND TOTAL (COST OF EMP EXCLUDING EMP COST COMPONENT ALREADY TAKEN IN BOQ)								₹ 1,32,31,040.00

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