

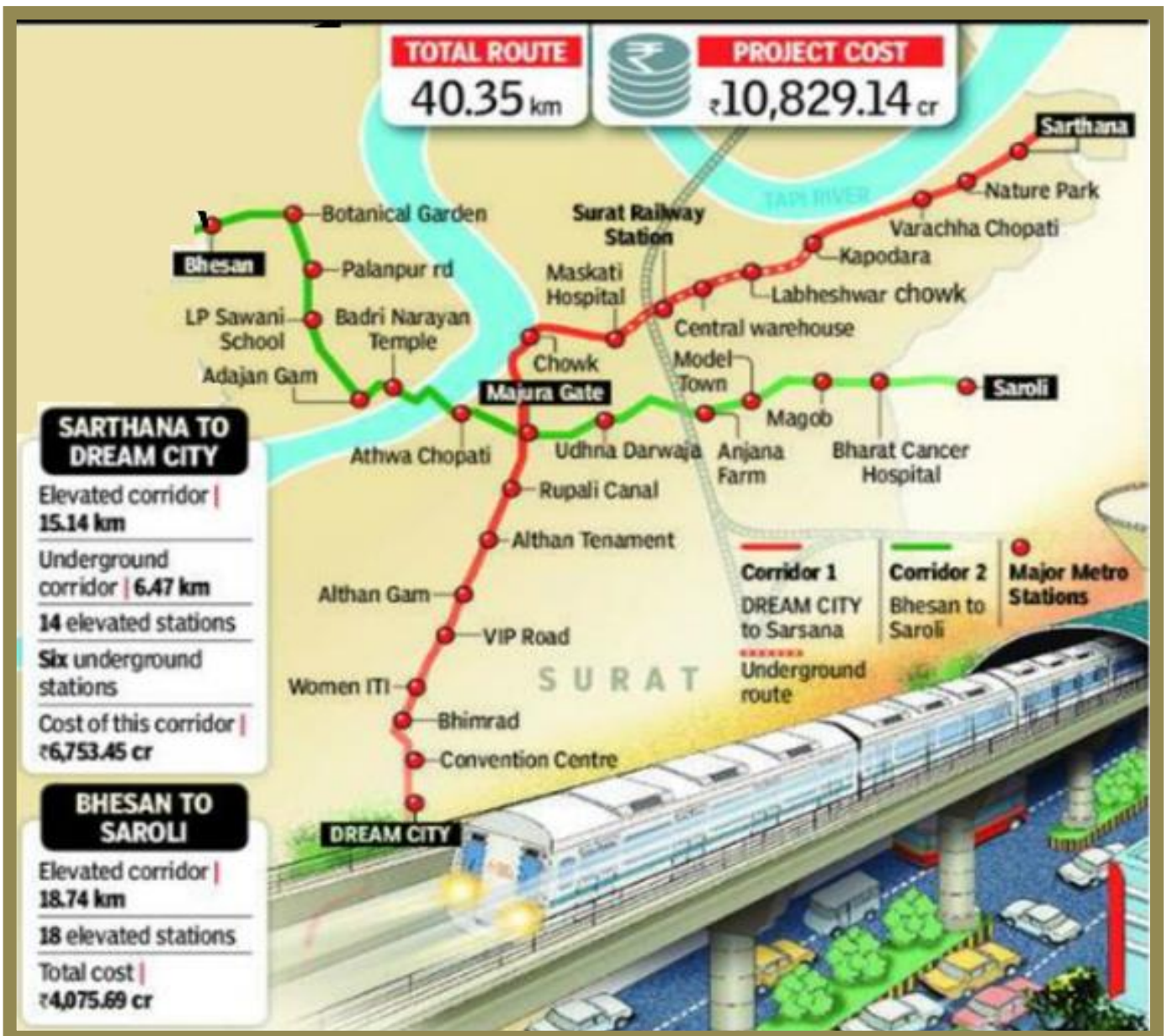


Gujarat Metro Rail Corporation (GMRC) Limited

(SPV of Government of India and Government of Gujarat)

[Formerly known as Metro-Link Express for Gandhinagar and Ahmedabad (MEGA) Company Limited]

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP) FOR SURAT METRO RAIL PROJECT (PHASE-I)



FINAL REPORT
JANUARY 2021

RITES LIMITED

(A Government of India Enterprise)
RITES Bhawan, Plot No.1, Sector-29
GURGAON-122001(INDIA)
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B	16/01/2021	Final Report	Dr. Sanjay K. Pradhan (Social Safeguard Specialist) Mr. S. Harinag (Environmental Safeguard Specialist)
A	15/12/2020	Draft Report	Dr.Sanjay K.Pradhan (Social Safeguard Specialist) Mr.S. Harinag (Environmental Safeguard Specialist)
Rev.	Date	Description	Originated

Client:



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Project:

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Prepared by:



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Chapter 1 : Introduction

1.1. BACKGROUND

Surat, a city in the Indian state of Gujarat is the eighth largest city and ninth largest urban agglomeration in India. The city with its center on the banks of river Tapti, is located 284 km south of the state capital – Gandhinagar, and 289 km north of Mumbai. The city is famous for its diamond cutting and polishing and is also known as the Diamond City of India. Traditionally, the major industries in the city were textile manufacturing and shipbuilding.

Recognizing the need to cater to ever increasing population of the city and provide commuters an environment friendly, fast and reliable travel option, present Government of Gujarat decided to take steps to implement metro rail transit systems (MRTS) in cities having population more than 2 Million. As a part of this decision, Metro Rail Project for Surat is being initiated as the city population is more than 5.5 million. The detailed project report (DPR) for Surat Metro Rail was prepared by Delhi Metro Rail Corporation (DMRC) in June 2018.

In August 2012, Surat Municipal Corporation (SMC) proposed four routes for the Metro project. The Government of Gujarat approved two corridors in January 2017. In March 2019, Union Government approved the Surat Metro Rail Project with two metro rail corridors and with a combined length of 40.35 km. The first corridor is proposed from Sarthana to Dream City Line covering 21.61 km. The second corridor is proposed from Bhesan to Saroli covering 18.74 km. These two corridors will intersect at Majura Gate.

Gujarat Metro Rail Corporation (GMRC) Limited, a Special Purpose Vehicle (SPV) of Government of Gujarat and Government of India, is the implementing agency for Surat Metro Rail Project Phase I. GMRC awarded the consultancy work to RITES Limited for preparation of Environmental Impact Assessment and Social Impact Assessment study reports. The assignment will cover the Surat Metro Rail project's two corridors, i.e. from Bhesan to Saroli and Sarthana to Dream city along with two depot sites.

1.2. PROJECT AREA

Surat city geographical area is about 327 sq. km and the city is bounded by the Arabian Sea on the west, Bharuch in the North, the Valsad district in the south, the Dangs district in the south-east, and the Tapi district in the east. The Tapi is the major river which passes through the central parts of the district also throughout Surat city and flows towards the west. Surat's climate is classified as tropical. The summers here have a good deal of rainfall, while the winters have very little. April and May are the hottest months. With the onset of monsoons, temperature decreases appreciably in June. Industrial development in Surat

district is attributed to the presence of many units of diamond processing, textiles, and chemical & petrochemical industries.

The Sitalink or Surat BRTS is a bus rapid transit system in the city, which is the available public transport system in Surat City. In the absence of adequate full-fledged public transport system, the use of individual modes such as cycles, 2- wheelers, cars etc, and un-organized intermediate public transport (IPT) has increased in Surat City. Cycling and walking constitute about 45% of the total trips and this feature needs to be integrated within the upcoming public transport initiatives.

1.3. PROPOSED METRO RAIL SYSTEM IN SURAT CITY

Following two corridors have been finalized for implementation of Metro Rail Project in Surat:

- Corridor 1: Sarthana to Dream City (via Nana Varachha, Rly station, Majuragate, Exhibition centre)
- Corridor 2: Bhesan to Saroli (via L P Savani, Majura Gate, Mithikhadi)

The proposed metro rail network is shown in Figure 1.1. All the components of project description for proposed Metro Corridors in respect of alignment details, rolling stock, power supply, traction system and signaling are detailed in project main features of the proposed metro network are being reproduced below from DPR of Surat MRTS DPR.

The Phase I of metro implementation has a total length of 40.35 km with 38 stations. These corridors provide connectivity to all congested, important, and densely populated areas of the city. Details of the length of corridors, elevated/underground length and number of stations are given in Table 1.1.

Table 1.1: Salient Features of the Corridors

S. NO	ROUTE		LENGTH IN KM		STATIONS
1.	Sarthana to Dream City	Elevated	15.14	21.61	14
		Underground	6.47		6
2.	Bhesan to Saroli	Elevated		18.74	18
			TOTAL	40.35	37*

*Interchange Station - Majura Gate Metro Station

Corridor 1: Sarthana to Dream City

The proposed alignment of Corridor-1 starts from Sarthana and heads towards Dream City and both are elevated stations. Total 20 stations have been proposed along the corridor of which 14 stations are elevated and 6 stations are UG. Summary list of stations along the corridor is given in Table 1.2.

Figure 1.1: Proposed Metro Corridors in Surat City

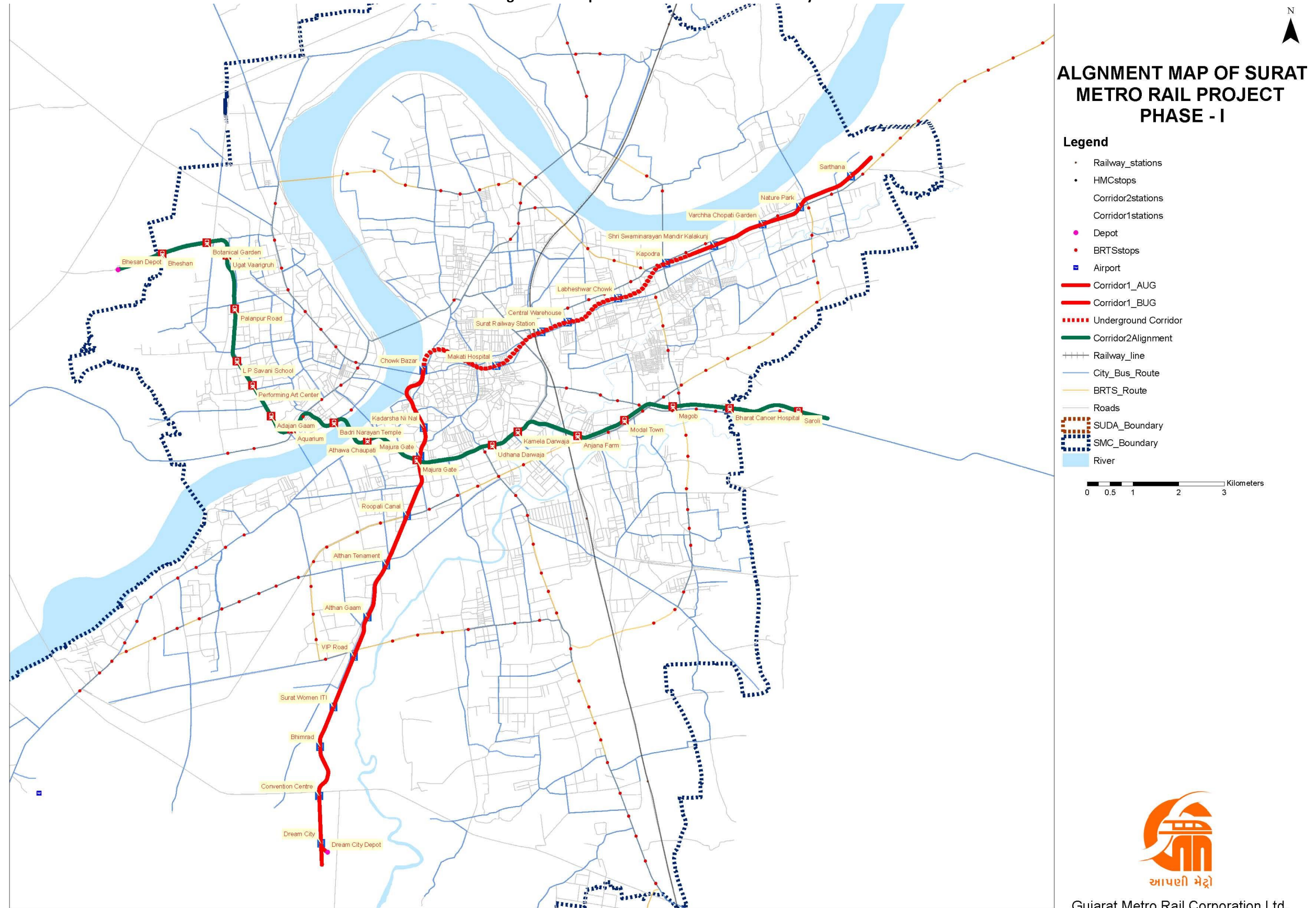


Table 1.2: Proposed Stations along Corridor-1

S. No	Station Name	Chainage (m)	Inter Station Distance (m)	Elevated/Underground
0	DEAD END	(-) 450	450.00	ELEVATED
1	Sarthana	0.0	1238.10	ELEVATED
2	Nature Park	1238.1	870.40	ELEVATED
3	Varcha Chopati Garden	2108.5	1088.10	ELEVATED
4	Shri Swaminarayan Mandir	3196.6	1040.40	ELEVATED
5	Kapodara	4237.0	1269.60	U/G
6	Labheshwar Chowk	5506.60	1162.30	U/G
7	Central Warehouse	6668.9	586.70	U/G
8	Surat Railway Station	7255.6	1231.40	U/G
9	Maskati Hospital	8487.00	1802.80	U/G
10	Chowk Bazar	10289.8	1431.90	U/G
11	Kadarshna Ni Nal	11721.7	592.10	ELEVATED
12	Majura Gate	12330.8	1297.70	ELEVATED
13	Rupali Canal	13611.5	1084.70	ELEVATED
14	Althan Tenament	14696.2	1147.30	ELEVATED
15	Althan Gam	15843.5	855.60	ELEVATED
16	VIP Road	16699.1	1109.30	ELEVATED
17	Surat Women ITI	17808.4	851.10	ELEVATED
18	Bhimarad	18659.5	1169.90	ELEVATED
19	Convention Centre	19829.4	880.90	ELEVATED
20	Dream City	20710.3	450.00	ELEVATED
	DEAD END	21160.3	450.00	ELEVATED

Source: DPR

Corridor-2: Bhesan to Saroli

The proposed alignment of Corridor-2 starts from Bhesan and heads towards Saroli, this section is fully elevated. Total 18 stations have been proposed along this corridor. Summary list of stations along the corridor is given in Table 1.3.

Table 1.3: Proposed Stations along Corridor-2

S. No	Station Name	Chainage (m)	Inter Station Distance (m)	Elevated/ Underground
0	DEAD END	-949.6		
1	Bheshan	0	949.60	ELEVATED
2	Botanical Garden	950.6	950.60	ELEVATED
3	Ugat Vaarigruh	1617.5	666.90	ELEVATED
4	Palanpur Road	2738.9	1121.40	ELEVATED
5	L.P.Savani school	3831.6	1092.70	ELEVATED
6	Performing Art Centre	4421.8	590.20	ELEVATED
7	Adajan Gam	5155	733.20	ELEVATED
8	Aquarium	5770.1	615.10	ELEVATED
9	Badri Narayan Temple	6891.5	1121.40	ELEVATED
10	Athwa Chaupati	7863.5	972.00	ELEVATED
11	Majura Gate	9019.2	1155.70	ELEVATED
12	Udhana Darwaja	10646.2	16270.00	ELEVATED
13	Kamela Darwaja	11247.2	601.00	ELEVATED
14	Anjana Farm	12593.9	1346.70	ELEVATED
15	Model Town	13636.3	1042.40	ELEVATED
16	Magob	14744.00	1107.70	ELEVATED
17	Bharat Cancer Hospital	15899.4	1155.40	ELEVATED
18	Saroli	17341.8	1442.40	ELEVATED
	DEAD END	17791.8	450.00	ELEVATED

Source: DPR

1.3.1. Stations

Station Design is dependent on the peak hour traffic load for each station. Accordingly, maximum capacity required at any station for emergency evacuation has been adopted. Typical station drawings of Elevated, underground and Interchange Stations are shown in Figure 1.2 to Figure 1.4.

Figure 1.2: Typical Drawing of Elevated Station

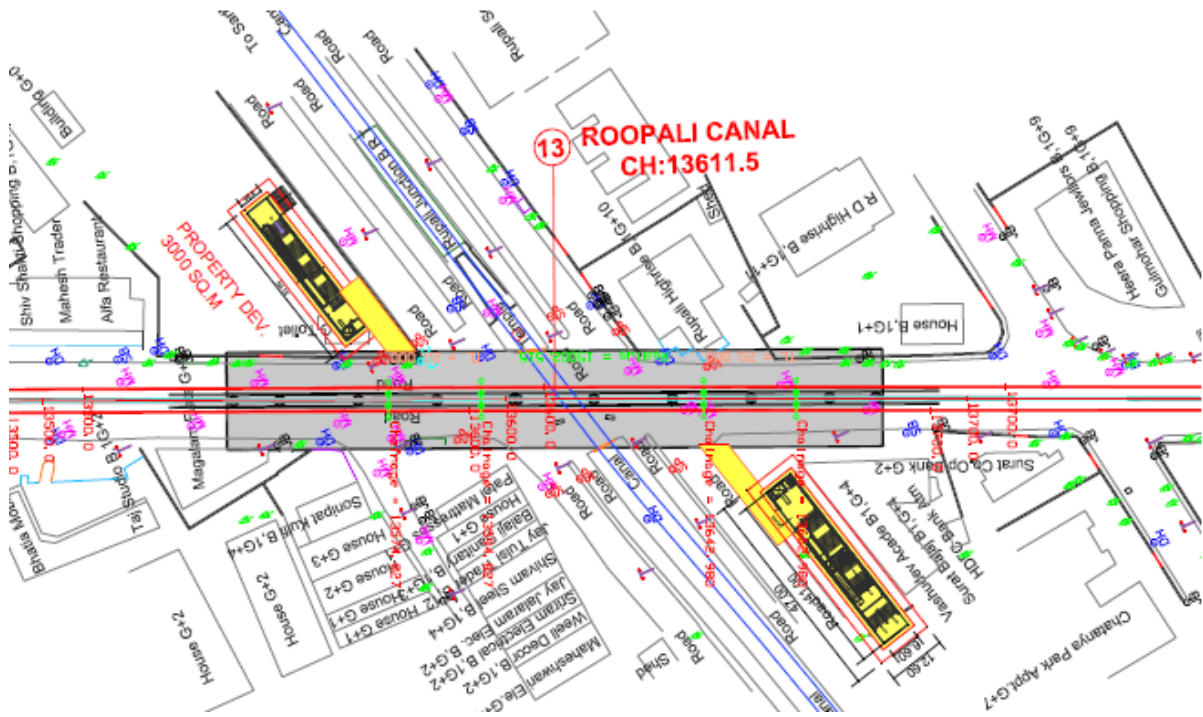
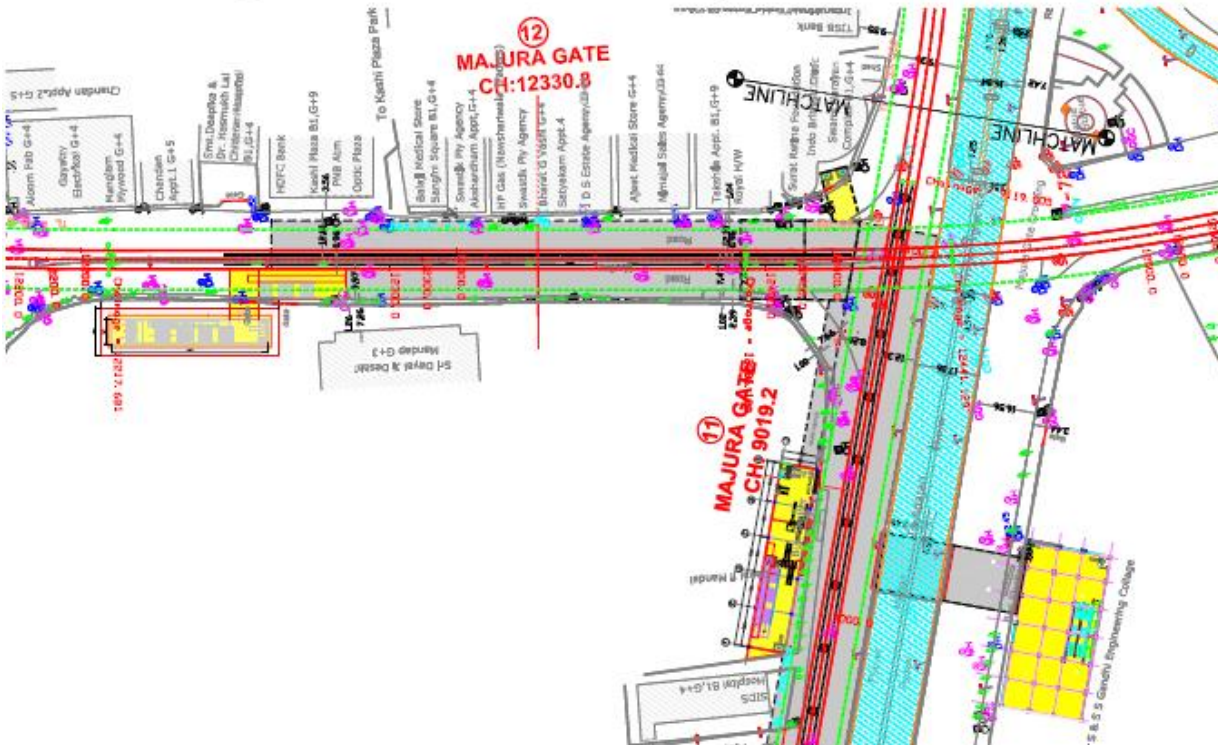


Figure 1.3: Typical Drawing of Underground Station



Figure 1.4: Typical Drawing of Interchange Station


The stations are generally located on the road median. Length of each elevated station is 140m. All the stations are two-level stations. The concourse is planned along the whole length of the platform with staircases leading from either side of the road. The maximum width of the station at concourse is 21m. Passenger facilities like ticketing, information, etc are provided at the concourse level.

Structure of the underground station (type-1) is essentially a concrete box about 20~21m wide, 14.6-m high and 190 or as per design long with an intermediate slab. Sides of the box are made of 1.2 m thick RCC. The roof of station box is about 1.2 m thick. Structure of this type-2 of underground station is essentially a concrete box about 10~11m wide, 20.5 ~ 22.0 m high and 190 or as per design long with an intermediate slab separating two Platforms.

1.3.2. Permanent Way

Gauge: Standard Gauge has been adopted for this metro railway. It permits sharper curves, which is advantageous for metro alignment in urban scenario and results in minimum property demolition and property acquisition. The Land requirement for the maintenance depots is also lower in Standard Gauge. Standard Gauge rolling stock results in recurring saving in energy consumption during operation as for the same passenger carrying capacity, gross weight of a metro coach is lower.

Formation: Ballast less track is proposed for elevated and underground stretches and depots to optimize maintenance and risk to road vehicles. This will help reduce fugitive dust emissions during operation.

Welding: To minimize noise and vibrations, track joints are proposed to be welded.

1.3.3. Rolling Stock, Traction and Signalling

The required transport demand forecast is the governing factor for the choice of the Rolling Stock. The forecasted Peak Hour Peak Direction Traffic calls for a Medium Rail Transit System (MRTS).

- A short train consisting of 3 cars which can be increased for increasing the Passenger Carrying Capacity of Trains with the consideration of matching the growing traffic demand.
- The rolling stock shall be Standard 1435 mm track gauge section having maximum width of 2.9 m, Axle load of 16 tones and capacity of 3 coach units as 764 passengers. Seating arrangement will be longitudinal and AC class accommodation will be provided.
- Total traction and auxiliary power requirement are 30.25 MVA and 11.99 MVA to fulfill the power demand of Sarthana to Dream city and Bhesan to Saroli corridors in 2021, respectively.
- The system under normal operating conditions will be an automatically operated system utilizing Automatic Train Control and Automatic Train Protection (ATP) under the overall control of a train driver and OCC operators.
- Computer Based Interlocking (CBI) signalling and continuous automatic train control with Automatic Train Protection (ATP) is proposed while telecommunication system is integrated with Optical Fibre Cable, LED/LCD based boards, Mobile Radio, Mobile system etc.
- Fare collection system is provided with automation in association with Contactless Smart Card and Retractable Flap Type Control Gates, Ticket Office Machine, TR, PTD etc.

1.3.4. Ventilation and Air-Conditioning System

The underground stations of the corridor are built in a confined space. Many passengers occupy concourse halls and the platforms, especially at the peak hours. The platform and concourse areas do not have adequate natural ventilation. It is, therefore, essential to provide forced ventilation in the stations and inside the tunnel for the purpose of:

- Supplying fresh air for the physiological needs of passengers and the staff
- Removing body heat, obnoxious odors and harmful gases
- Removing large quantity of heat dissipated by the train equipment/fixtures
- Removing fumes and heat emitted by station equipment/fixtures

1.3.5. Maintenance Depots

It is proposed to establish one depot- cum- workshop for each Corridor with following functions:

- (i) Major overhauls of all the trains.
- (ii) All minor schedules and repairs.
- (iii) Lifting for replacement of heavy equipment and testing thereafter.
- (iv) Repair of heavy equipment's.

The depots are to be developed with full/light/heavy repair facilities, stabling and light inspection facilities.

1.3.6. Power Requirements

Power supply is required for the operation of Metro system for running of trains, station services, workshop, depot, and other maintenance works within the premises of metro system. The power requirement is for peak hour demand for traction and auxiliary application. Some of assumptions to estimate the power supply are:

- Specific energy consumption of rolling stock 60 kWh/1000 GTKM in case of 750V dc Traction at Pantograph level is considered as per MOUD guideline
- Elevated/at –grade station load – initially 250 kW, which will increase to 300 kW in the year 2046.
- Underground station load – initially 2000 kW, which will increase to 2200 kW in the year 2046.
- Depot & Metro Bhawan auxiliary load - initially 2000 kW (each), which will increase to 2200 KW in the year 2046.

1.3.7. Sub Station

Keeping in view the reliability requirements, Four Receiving Sub-stations (RSS) are proposed to be set up for corridor – 1 (2 RSS) and corridor – 2 (2 RSS). This is an economical solution without compromising reliability. Based on DMRC discussions with M/s Torrent Power, M/s GETCO & Surat Municipal Corporation, it is proposed to avail power supply for traction as well as auxiliary services from the grid sub-stations at 66 kV voltages through cable feeders.

1.3.8. Construction Activities

Illustrative list of construction activities is placed below. These activities typically involve movement of earth and construction material, movement, and placement of pre-cast elements:

- In-situ open foundations and piles of columns
- In-situ casting of columns
- Pre-cast segments or pre-cast non-segmental girders
- Boring of tunnels by Tunnel Boring Machine or open cut and cover / NATM.
- Cut and cover or NATM and blasting for construction of underground stations
- In-situ earth retaining structures like diaphragm walls, sheet piles, secant piles etc

1.3.9. Project Cost Estimate

The overall Capital Cost for the Surat Metro rail network under Phase-I at March 2017 price level has been estimated at **Rs.12,492 Crores** including applicable Taxes & Duties of **1950.81 Crores**. The details are tabulated in Table 1.4.

Table 1.4: Corridor-wise Details of Capital Cost

S. No.	Name of the Corridor	Capital Cost (Rs. Crore)	Taxes & Duties (Rs. Crore)	Total (Rs. Crore)
1.	Sarhana – Dream City	6554	1211.91	7765.91
2.	Bhesan–Saroli	3987	738.90	4725.90
	Total	10,541	1950.81	12,491.81 =12,492

Source: DPR for Surat Metro Rail Project, June 2018

1.3.10. Environmental and Social Impact Assessment

Initial Environmental and Social Impact Assessment was carried out by DMRC during DPR stage. Detailed Environmental and Social Impact Assessment for phase I of Surat Metro Rail Project has been carried out by RITES Limited in Year 2019 & 2020. ESMP on the basis detailed EIA & SIA has been presented in the subsequent Chapters.

Chapter 2 : Environment and Social Management Plan

The environmental management plans are primarily devised from environmental impact assessment report. The EIA document specifically discusses the environmental impacts during the design, construction, and operational phases of the project. It identifies the positive and negative impacts on environmental receptors identified along alignment during different phases of project and proposes the measures to minimize the impacts. After identification of impacts and proposing mitigation measures it also proposes the monitoring plan to monitor the suitability of implemented mitigation measures during construction and operational phases of project. The Environmental Management Plan (EMP) contains a description of proposed remedial measures and monitoring plan for the construction and operational period of the project. The EMP often contains construction/management guidelines that specifically address how the project proponent/contractors are to incorporate environmental considerations into their work. This chapter spells out the set of measures to be undertaken during project construction and operation to mitigate or reduce the adverse environmental impacts.

EMP contains set of mitigation measures for lessening of negative environmental impacts through: a) changes in the design, construction practices, maintenance, and operation; and b) additional actions taken to protect the biophysical and social environment, as well as individuals who have been impacted adversely by a project. The extent and timing of imitative actions are based on the significance of the predicted impacts.

The contractors should consider ESMP document as guidebook for environment management during construction and operational phases of the project. In case further reference/discussion is required over any issue given in this document, provisions of EIA reports, EHS manual and tender/contract document shall prevail.

During the construction phase, the civil contractor will be responsible of the implementation of the most of the E&S mitigation measures in relation with the works. GMRC will be responsible of some of the measures such as disclosure & supervision of E&S monitoring, compensatory afforestation, management Plan for Flamingos. During the operational phase, GMRC will hold the responsibility of implementation of ESMP.

E&S Monitoring: During construction, the monitoring will be carried out by contractor under the supervision of GMRCL.

Compensatory Afforestation: Compensatory afforestation should be done by GMRCL in association with Forest Department at the identified sites. However, the contractor will be responsible for transplantation of trees under the supervision of GMRCL.

Management Plan for Flamingos: PIU will take charge of Flamingo issue including the operation phase in consultation with Deputy Conservator of Forest, Surat.

Environment Management System is intended to facilitate implementation, tracking and reporting on Environment Management Plan and Environment Monitoring Plan proposed for the project. Roles and responsibilities for preparation and Implementation of Environmental Management Plan (EMP) and Environmental Monitoring Plan (EMoP) at different stages of the project are summarized in Table 2.1 and Social Management plan is given in Table 2.2. The Environmental and Social Management and Monitoring costs are briefly given in the following tables however details are mentioned in the EIA& SIA Reports for Surat Metro Rail Project.

Table 2.1: Environmental Management Plan – Design, Construction, and Operation

S. No	Environmental Impact	Mitigation Measure		Frequency of Monitoring		Cost in Rs. Lakh		Implementing Entity	Responsible Entity
		Corridor 1: Sarthana - Dream City	Corridor 2: Bhesan - Saroli	Corridor 1	Corridor 2	Corridor 1	Corridor 2		
EMP During Location and Design Phase									
1.	Displacement and private property acquisition, impact of environmentally sensitive areas.	An analysis of alternatives has been undertaken as part of the elaboration of the Detailed Project Report (DPR) of the Project. However, this analysis does not fully take into consideration the potential environmental and social impacts of the solution recommended by the DPR and the alternatives that may exist. Therefore, in order to determine the alignment which minimizes the environmental and social impacts, GMRC will ensure that, for any civil work packages of the Project (notably including the viaducts, the stations, the depots), within the framework of the detailed design studies, an analysis of possible alternatives and alignment adjustments.		NA		-		DPR and design consultant	PIU
2.	Loss of trees and water bodies	Alignment designs to avoid or minimize impact are in line with ESS1 and ESS 6 of World Bank and Forest Conservation Act 1980.		NA		-		DPR and design consultant	PIU
3.	Visual intrusion	To design aesthetic structures of viaduct and stations on elevated sections.		NA		-		DPR and design consultant	PIU
4.	Archaeological Monuments	No Impact on legally protected Archaeological Monuments due to proposed alignments; accordingly, ESS 8 of World Bank and The Ancient Monuments and Archaeological sites and Remains Act, 1958 amended in 2010 are not triggered. Though the EIA mentions that no cultural heritage is to be found in the Project area, should the case arise, GMRC and the contractors shall apply measures that meet both applicable		NA		-		DPR and design consultant	PIU

S. No	Environmental Impact	Mitigation Measure		Frequency of Monitoring		Cost in Rs. Lakh		Implementing Entity	Responsible Entity
		Corridor 1: Sarthana - Dream City	Corridor 2: Bhesan - Saroli	Corridor 1	Corridor 2	Corridor 1	Corridor 2		
		national legislation and World Bank ESS 8 related to Cultural Heritage							
EMP during Pre-construction Phase									
1.	Disclosure	Disclosure of EMP/EMoP measures for feedback to various stakeholders; revise the EMP/EMoP measures if necessary. These measures are to be implemented are compliance with ESS 10.		Once after preparation of EIA report	-			PIU	PIU
2.	Loss of trees	The compensatory Forestation plan are in line with Saurashtra Felling of trees (infliction of Punishment) Act, 1951 & amendment Rule 2008, Forest Conservation Act 1980 and ESS 6 of World Bank.						PIU for Compensatory Afforestation; and Contractor for Transplantation	PIU
		Implement compensatory afforestation for 836 trees along the corridor and 176 trees at Depot.	Implement compensatory afforestation for 762 trees along the corridor and 319 trees at Depot	Four Times in a Year for entire construction period	Four Times in a Year for entire construction period	77.60	85.96		
3.	Site measures	Prepare Environment, Health and Safety (EHS) Manual in line with World Bank ESS guidelines and National regulations.		NA		-		Contractor	PIU
4.	Environmental Management and Monitoring	Implement institutional requirements for implementation of EMP and EMoP.		Set up of Env. Division	Set up of Env. Division	166.31	166.31	PIU	PIU
EMP during Construction Phase									
1.	Soil erosion, fugitive dust generation,	Implement suitable construction methods and as per EHS Manual <ul style="list-style-type: none"> Careful planning, timing of cut and fill operations 		Part of EHS manual	Part of EHS manual	-	-	Contractor	PIU

S. No	Environmental Impact	Mitigation Measure		Frequency of Monitoring		Cost in Rs. Lakh		Implementing Entity	Responsible Entity
		Corridor 1: Sarthana - Dream City	Corridor 2: Bhesan - Saroli	Corridor 1	Corridor 2	Corridor 1	Corridor 2		
	muck disposal and C&D waste management	and re-vegetation shall reduce the Soil Erosion and dust generation <ul style="list-style-type: none"> • Contractor shall dispose the muck/dry soil generated at construction sites at a mutually agreed location by GMRC. • Contractor shall carry out the reconciliation for the disposed soil and quantities shall submit to GMRC on quarterly basis. • Dry wheel wash facilities shall be provided at exit gate, from where soil disposal shall be carried. • Sufficient staff shall be made available at site to control the disposal of muck/soil from site such as a supervisor, labors for wheel cleaning; brooms for wheel cleaning and concrete pad where wheels will be cleaned. • The dumpers carrying the muck/dry soil must be covered while plying on the roads on the way to disposal location. • Contractor shall take due care that muck generated during piling/tunneling works does not get contaminated with any contaminant. • The onsite muck shall be monitored quarterly at random location during piling works in progress. In case any polluted muck is produced; the muck shall be handled and disposed as per provisions of Hazardous and Other Wastes (Management and Trans boundary Movement) Rules, 2016 and its amendments • Construction and Demolition Waste shall be 							

S. No	Environmental Impact	Mitigation Measure		Frequency of Monitoring		Cost in Rs. Lakh		Implementing Entity	Responsible Entity
		Corridor 1: Sarthana - Dream City	Corridor 2: Bhesan - Saroli	Corridor 1	Corridor 2	Corridor 1	Corridor 2		
		disposed in accordance with the provisions of C & D waste Handling Rules 2016 and its amendments. <ul style="list-style-type: none"> Contractor should submit the details to PIU as per Annexure 8 of this document. 							
2.	Air and Noise Pollution	<ul style="list-style-type: none"> Vehicles and machinery are to be maintained to emission standards; periodic check of machinery and vehicles; dust collectors and physical barriers at bulk loading and un-loading areas; machinery noise muffles etc and personal protective gear to workers. Contractor should submit the details to PIU as per Annexure 1, 2, 3, 6 & 9 of this document. By implementing the proposed air and Noise mitigation measures, the project is expected to comply with the Indian Standards and WB ESF guidelines. 		Twice a month for entire construction period	Twice a month for entire construction period	34.06	34.06	Contractor	PIU
3.	Vibration	<ul style="list-style-type: none"> Implement vibration monitoring and building condition surveys at sensitive structures. Contractor should submit the details to PIU as per Annexure 7 of this document. 		Once in a month at 17 locations, for entire construction period at that location	Once in a month at 8 locations, for entire construction period at that location	61.20	28.80	Contractor	PIU
4.	Water pollution	<ul style="list-style-type: none"> Implement measures such as sedimentation tanks on site for batching plants Contractor shall try and reduce the water consumption through use of energy efficient water fixtures at sites and project offices Leakage of water should not be allowed through 		Four Times in a Year at 6 locations for entire construction period	Four Times in a Year at 7 locations for entire construction period	8.40	9.80	Contractor	PIU

S. No	Environmental Impact	Mitigation Measure		Frequency of Monitoring		Cost in Rs. Lakh		Implementing Entity	Responsible Entity
		Corridor 1: Sarthana - Dream City	Corridor 2: Bhesan - Saroli	Corridor 1	Corridor 2	Corridor 1	Corridor 2		
		pipes and valves <ul style="list-style-type: none"> Reuse of water used for curing and for other uses to be planned Contractor should submit the details to PIU as per Annexure 1, 2, 6 & 9 of this document. By implementing the proposed measures, the project is expected to comply with Water (Prevention and Control of Pollution) Act, 1974 & its amendments and ESS 3 of World Bank. 							
5.	Soil pollution	<ul style="list-style-type: none"> Implement measures to prevent ingress of toxic / heavy metals. Suitable storage area for such materials shall be prepared and equipment shall be made available for handling of these materials. Contractor shall take all necessary precautions such that construction material, diesel, grease, waste oil, chemicals etc. does not spill on ground. Regular monitoring of groundwater and soil leachate shall be conducted at muck disposal areas where possibility of ground water contamination is anticipated Contractor should submit the details to PIU as per Annexure 2 & 6 of this document. By implementing the proposed measures, the project is expected to comply with Water (Prevention and Control of Pollution) Act, 1974 & its amendments and ESS 3 of World Bank. 		Four Times in a Year at 5 locations of elevated section & 3 muck samples per km of UG section for entire construction period	Four Times in a Year at 5 locations for entire construction period	5.97	5.00	Contractor	PIU
6.	Water supply; wastewater and solid waste	<ul style="list-style-type: none"> Arrange for water supply; Implement measures as per EHS Manual. The contractor shall prepare the waste 		Part of EHS manual	Part of EHS manual	-	-	Contractor	PIU

S. No	Environmental Impact	Mitigation Measure		Frequency of Monitoring		Cost in Rs. Lakh		Implementing Entity	Responsible Entity
		Corridor 1: Sarthana - Dream City	Corridor 2: Bhesan - Saroli	Corridor 1	Corridor 2	Corridor 1	Corridor 2		
	disposal from construction activities	management plan and submit to the Project Authority for concurrence. <ul style="list-style-type: none"> Contractor shall dispose-of hazardous wastes as per the provisions of Hazardous and other wastes (management and trans boundary movement) rules 2016 and its amendments Contractor shall dispose-off nonhazardous solid wastes, nonhazardous liquid wastes, and biomedical wastes as per the provisions of EHS manual. 							
7.	Incident Management	Prepare Incident Management Plan with reporting formats.						Contractor	PIU
8.	Environmental Monitoring	Prepare Environmental Monitoring Plan for Air, Noise, Soil, Water, Vibration and Ecological		Air: Twice a month for entire construction Noise: Twice a month for entire construction Soil: Four times in a Year for entire construction Water: Four times in a Year for entire construction Vibration: Once in a month for one year Ecology: Four times in a Year for entire construction		114.64	82.67	Contractor	PIU
9.	Availability of institutional capacity	Implement training and establish environment unit as per EHS manual		Training to PIU officials and Establishment of Environment Unit	Training to PIU officials and Establishment of Environment Unit	173.41	173.41	Contractor	PIU

S. No	Environmental Impact	Mitigation Measure		Frequency of Monitoring		Cost in Rs. Lakh		Implementing Entity	Responsible Entity
		Corridor 1: Sarthana - Dream City	Corridor 2: Bhesan - Saroli	Corridor 1	Corridor 2	Corridor 1	Corridor 2		
10.	Tree protection/ Cutting and Disposal	<ul style="list-style-type: none"> The compensatory Afforestation is planned in line with Saurashtra Felling of trees (infliction of Punishment) Act, 1951 & amendment Rule 2008, Forest Conservation Act 1980 and ESS 6 of World Bank. Contractor shall prepare an action plan for 2093 trees to be affected (Cut: 932 trees and Transplant: 1161) and trees proposed to be planted (about 3957 saplings) as per compensatory afforestation norms The trees proposed for plantation in the project area are Gulmohar, Pipal, Neem, Karanj, Siris etc. Other than Contractor, no one can cut the identified trees which are falling in the ROW. Biomass shall not be stored at site for more than 15 days. By implementing the proposed Afforestation measures, the project is expected to comply with World Bank ESF guidelines. 		Four Times in a year during entire construction	Four Times in a year during entire construction	5.00	7.25	Contractor	PIU
11.	Energy Management /Conservation	The contractor shall use and maintain lighting, tools, and equipment of appropriate specifications to conserve energy as per EHS guidelines.		Part of EHS manual	Part of EHS manual	-	-	Contractor	PIU
12.	Traffic Diversion/Management	<ul style="list-style-type: none"> Traffic Management and Engineering measures like road widening, traffic segregation, one-way movements, traffic diversions, acquisition of service lanes, etc shall be implemented. By implementing these control measures, the project is expected to comply with the Indian Standards and WB ESF guidelines. 						Contractor	PIU

S. No	Environmental Impact	Mitigation Measure		Frequency of Monitoring		Cost in Rs. Lakh		Implementing Entity	Responsible Entity
		Corridor 1: Sarthana - Dream City	Corridor 2: Bhesan - Saroli	Corridor 1	Corridor 2	Corridor 1	Corridor 2		
13.	Management Plan for Flamingos	<ul style="list-style-type: none"> No spillage or disposal of construction waste close to Tapi River. Restriction of Construction activities near Tapi River during winters. Regular monitoring of River Water Quality. An amount of Rs. 10.00 Lakh provided for Flamingo Conservation. The project is expected to comply with the WB ESF guidelines by Implementing the management plan for flamingos 		-	3 times in a year at Tapi River		10.00	PIU in consultation with Deputy Conservator of Forest, Surat	PIU
14.	Construction Material Management and House Keeping	<ul style="list-style-type: none"> Full height fence, barriers, barricades etc. shall be erected around the site All stairways, passageways and gangways shall be maintained without any blockages or obstructions All surplus earth and debris shall be removed/disposed-off to officially designated dumpsites By implementing the proposed mitigation measures, the project is expected to comply with Indian Standards and WB ESF guidelines Contractor should submit the details to PIU as per Annexure 4, 5, 10 & 11 of this document. 		Part of EHS manual	Part of EHS manual	-	-	Contractor	PIU
EMP during Operation Phase									
1.	Air Pollution	<ul style="list-style-type: none"> Air Quality monitoring need to be carried out at all stations and depots locations. 		2 days in a week; 1 week	2 days in a week; 1 week	22.68	20.52	PIU	PIU

S. No	Environmental Impact	Mitigation Measure		Frequency of Monitoring		Cost in Rs. Lakh		Implementing Entity	Responsible Entity
		Corridor 1: Sarthana - Dream City	Corridor 2: Bhesan - Saroli	Corridor 1	Corridor 2	Corridor 1	Corridor 2		
				in a season; 3 seasons in a year for 3 years at all 20 stations and 1 depot	in a season; 3 seasons in a year for 3 years at all 18 stations and 1 depot				
2.	Noise Pollution	<ul style="list-style-type: none"> Use ballast-less track with elastic and absorbent fittings for Noise Control Green belt within the depot boundary Noise barriers at sharp curved portions, structures falling within 20 m distance from the alignment and at sensitive receptors These mitigations measures proposed for Noise Management is in accordance with Noise Pollution (Regulation and Control) Rules, 2000 and its amendment and ESS 3 of World Bank. 		-	-	-	-	PIU	PIU
		Monitoring will be at all metro stations and at Depot	Monitoring will be at all metro stations and at Depot.	2 days in a week; 1 week in a season; 3 seasons in a year for 3 years at all 20 stations and 1 depot	2 days in a week; 1 week in a season; 3 seasons in a year for 3 years at all 18 stations and 1 depot	3.78	3.42		
		Noise Barrier proposed for a length of 9339 m	Noise Barrier proposed for a length of 6690 m	-	-	1120.68	802.80		
3.	Vibration	Vibration can be reduced by: <ul style="list-style-type: none"> proper design and maintenance of track and rolling 		1-day monitoring; 4 times in a year	1-day monitoring; 4 times in a year	25.20	7.20	PIU	PIU

S. No	Environmental Impact	Mitigation Measure		Frequency of Monitoring		Cost in Rs. Lakh		Implementing Entity	Responsible Entity
		Corridor 1: Sarthana - Dream City	Corridor 2: Bhesan - Saroli	Corridor 1	Corridor 2	Corridor 1	Corridor 2		
		stock <ul style="list-style-type: none"> resilient soft base plates between rail and track slab resilient rubber between the base plate and track slab 		for 3 years at 7 identified sensitive receptors	for 3 years at 2 identified sensitive receptors				
4.	Soil Monitoring	Soil quality monitoring to be checked at baseline monitoring locations		4 times in a year for 3 years at 5 locations	4 times in a year for 3 years at 5 locations	3.00	3.00	PIU	PIU
5.	Water supply, sewage and solid waste disposal at stations and depots	<ul style="list-style-type: none"> Implement measures including treatment and reuse of waste water, rain water harvesting to augment ground water. Organic waste shall be segregated and treated by in-site bio composter technique. By implementing the proposed mitigation measures, the project is expected to comply with Indian Standards and ESS 3 of World Bank 				23.88	23.04	PIU	PIU
6.	Incident Management	Implement Incident Management Plan in accordance with EHS Manual		Part of EHS manual	Part of EHS manual	-	-	PIU	PIU
7.	Management Plan for Flamingos		<ul style="list-style-type: none"> Maintaining, and restoring favorable hydrological conditions and water quality at Tapi River. Minimizing human disturbance from boating, fishing, and tourists etc near the alignment crossing at 	-	-	-	10	PIU in consultation with Deputy Conservator of Forest, Surat	PIU

S. No	Environmental Impact	Mitigation Measure		Frequency of Monitoring		Cost in Rs. Lakh		Implementing Entity	Responsible Entity
		Corridor 1: Sarthana - Dream City	Corridor 2: Bhesan - Saroli	Corridor 1	Corridor 2	Corridor 1	Corridor 2		
			Tapi River • The project is expected to comply with the WB ESF guidelines by implementing the management plan						
8.	Monitoring and Grievances	<ul style="list-style-type: none"> Implement mechanism to monitor progress of implementation of the EMP/EMoP measures and results achieved. Implement mechanism for project-level grievance Redressal. 						PIU	PIU

Table 2.2: Environmental Management Plan – Design, Construction, and Operation

Sr. No	Project related Social issues	Mitigation Measures	Frequency	Implementation Agency/ Authority	Supervision Agency	Cost (Lakh)	Remarks
Social Management- Design Phase							
1.	Acquisition of land affecting private structures and households	<p>Acquisition of private land will be as per The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013.</p> <p>The affected people will be compensated and assisted as per the provisions given in Entitlement Matrix in respect of PAPs due to implementation of Surat Metro Rail Project (SMRP).</p> <p>Resettlement & Rehabilitation activities of SMRP will be governed by the general principles based on The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 and RFCTLARR (Gujarat Government) Act.2016.</p>	Once	Revenue Department, Government of Gujarat	GMRC	--	The cost is tentative & depend upon actual land acquisition (Revenue Department)
2.	Gender Action Plan	<p>Ensure that women's needs are equally met through Resettlement Action Plan;</p> <p>Ensure that compensation disbursement is transparent and compensation shall be in the name of both spouses.</p> <p>Reserved seats for women in each coach shall be included in each metro route</p>	Once	GMRC	GMRC	--	-

Sr. No	Project related Social issues	Mitigation Measures	Frequency	Implementation Agency/ Authority	Supervision Agency	Cost (Lakh)	Remarks
		<p>operation.</p> <p>CCTV cameras shall be installed to monitor the security of women passengers inside coach.</p> <p>Information on mobile phone based application for security of women commuters shall be disseminated through at least one signage inside the coach.</p> <p>The separate sanitary facilities in adequate numbers at stations.</p> <p>Adequate number of signboards shall be provided to show the location of sanitary facilities available at station.</p> <p>Separate seating arrangement for women and children, priority seating for pregnant woman and elderly women shall be provided in coaches.</p>					
3	Elders and people with disability	It shall be ensured that train contains fully accessible coaches. Staff shall be trained in methods of assistance and be at hand on request.	Once	Contractor	GC/GMRC	--	-

Sr. No	Project related Social issues	Mitigation Measures	Frequency	Implementation Agency/ Authority	Supervision Agency	Cost (Lakh)	Remarks
		<p>Stations for all levels should be fully accessible with wide entrance and shall be accessible by wheelchair.</p> <p>For persons with hearing impairments an electronic sign board shall be displayed on each platform at noticeable locations.</p> <p>For persons with Visual impairments, an electronic sign board shall be displayed on each platform at noticeable locations.</p> <p>Identification signage shall be provided on the doors of wheelchair accessible coach.</p> <p>Space for a wheelchair should be available at the side of door.</p> <p>The space shall be indicated inside and outside the car by using the international symbol of access;</p> <p>Wheel stoppers and ring-strap or other appropriate safety grip shall be provided for wheelchair users.</p> <p>An appropriate number of designated seats for passengers with disabilities and elderly people shall be provided near the doors.</p>					

Sr. No	Project related Social issues	Mitigation Measures	Frequency	Implementation Agency/ Authority	Supervision Agency	Cost (Lakh)	Remarks
		<p>Approach route shall not have level difference. If the station is not on the same level as the walkway or pathway, it shall have ramp. Walkway surfaces shall not be non-slippery.</p> <p>Approach walkway should have tactile pavements for persons with visual impairments.</p> <p>The counters shall have pictographic maps indicating all the services offered at the counter and at least one of the counter staff should be sign language literate.</p> <p>At least one of the ticket gates shall be minimum 900 mm wide to allow a wheelchair user through and have a continuous line of guiding pavers for people with visual impairments.</p> <p>The platform shall:</p> <p>Have a row of warning pavers installed before the track edge and shall have non-slip and level flooring.</p> <p>All platforms shall inter-connect by means of an accessible routes or lifts and way finding references shall be available at</p>					

Sr. No	Project related Social issues	Mitigation Measures	Frequency	Implementation Agency/ Authority	Supervision Agency	Cost (Lakh)	Remarks
		decision points. Colour shall be used to identify routes and provide assistance in locating doors, walls and hazards. Structural elements such as columns shall be colour contrasted or brightly marked to assist visually impaired.					
Social Management- Construction Phase							
1	Gender Action Plan	Safe lighting at work place and workers colony along with separate access to female/male toilets and waiting areas shall be ensured if women workforce deployed at site; First aid medical facilities at the working sites for pregnant women, elderly and children shall be ensured if women workforce deployed at site; Ensure that women shall be consulted and provided opportunities to help them get benefits under the wage employment during project construction. It will be ensured that women workers are paid at par with male workers. Adherence to provision of labor law shall	Continuous throughout construction	Contractor, PIU(GMRC), SHE Personnel	GC and GMRC	--	-

Sr. No	Project related Social issues	Mitigation Measures	Frequency	Implementation Agency/ Authority	Supervision Agency	Cost (Lakh)	Remarks
		<p>be ensured for civil contracts.</p> <p>If women workers are deployed at sites then day crèche facilities shall be provided to facilitate the women with infants working on site.</p> <p>Visible reporting desks is requires at construction camps, work place.</p> <p>To address Gender Based Violence (GVB) the project has prepared GAP. It shall comprise:</p> <ul style="list-style-type: none"> • Integrate GVB into Information Education Communication (IEC) strategy/materials, GRM, safety talks and regular meetings. • Community consultation and identification of GVB focal points within the community. • Training of labors on occupational health and safety issues. • Mapping the service providers for GVB prevention and response. <p>Contractor shall carry out awareness programs for laborers on the risks of STDs/AIDS and human trafficking in coordination with Gujarat State AIDS Control Society.</p>					

Sr. No	Project related Social issues	Mitigation Measures	Frequency	Implementation Agency/ Authority	Supervision Agency	Cost (Lakh)	Remarks
2	Non- monetary support Arrangements for PAPs	GMRC shall extend following support to PAPs: Support for getting compensation from Revenue Department Support for getting compensation and grievance Redressal.				--	
	Disruption to access from house and shops to roads	7 days' advance notice through poster and leaflet before start of work. Provide alternate access before disruption. Restore permanent access as is where is basis	Continuous throughout construction	Contractor, PIU(GMRC)	GC and GMRC		
	Differential impacts on vulnerable and disadvantaged population	7 days' advance notice through poster and leaflet before start of work. Impacted disadvantaged population will be treated case by case basis by provision of temporary access and other assistance as identified.	Continuous throughout construction	RAP implementation agency, Contractor	GC and GMRC		
Social Management- Operation Phase							
1.	Gender Action Plan	It will be ensured that women, children and elderly people accessible facilities shall be provided at stations. Provisions of separate queues for women for buying tickets for travel in Metro shall be ensured, if required. Separate seating for women and, priority	Continuous During operation	Station Manager	GMRC	--	Cost shall be included in O&M contract

Sr. No	Project related Social issues	Mitigation Measures	Frequency	Implementation Agency/ Authority	Supervision Agency	Cost (Lakh)	Remarks
		<p>seating for pregnant women and elderly citizens will be provided in the coaches.</p> <p>Emergency intercom and video surveillance shall be part of metro operation system.</p> <p>Separate toilets for men and women at stations shall be provided;</p> <p>Patrolling of platforms during night hours by security personnel shall be ensured</p> <p>Ladies security personnel to be deployed for frisking women passengers;</p> <p>Promote women's employment in the metro services sector.</p>					
2.	Elders and people with disability	<p>Staff shall be trained in methods of assistance and shall be available at hand on request.</p> <p>Good illumination shall be ensured at stations to ensure the comfort of visually impaired.</p> <p>Automated kiosks shall be accessible for wheelchair users and shall be clearly marked with international symbol</p>					

Sr. No	Project related Social issues	Mitigation Measures	Frequency	Implementation Agency/ Authority	Supervision Agency	Cost (Lakh)	Remarks
		<p>accessibility.</p> <p>Braille buttons and audio announcement system shall be ensured for persons with vision impairments.</p> <p>It will be ensured that stations operations shall be easy to understand and operate for persons with learning disabilities, intellectual disabilities and elderly persons.</p> <p>Information's or help desks shall be close to the station entrance and highly visible upon entering the station.</p> <p>In addition, they should be clearly identifiable and accessible to wheelchairs bound and normal users</p> <p>Help desks shall have a map of the facility and attendants can view with passengers when providing information's.</p>					

Chapter 3 : Environment and Social Monitoring

3.1. ENVIRONMENT MONITORING PLAN

3.1.1. Pre-Construction Phase

The environmental monitoring programme helps in signalling the potential problems resulting from the proposed project activities and will allow for prompt implementation of corrective measures. Pre-construction phase monitoring has been done for the proposed project for air, noise, vibration, water, and soil quality. This will have to be followed by monitoring of afforestation/transplantation.

3.1.2. Construction Phase

Monitoring schedule for the entire period of construction (5 Years) is summarized in Table 3.1. The number of locations could be modified based on need when the construction commences. Monitoring should be carried out by NABL Accredited/MoEFCC recognized private or Government agency. The contractor will be responsible for carrying out monitoring during construction under the supervision of PIU. The results of air quality, water quality, wastewater, vibration monitoring will be submitted to management quarterly during construction phase.

Table 3.1: Construction Stage Monitoring Schedule

Parameter	Locations and Frequency	Reference/Standard	Implementation by / Approval by
Air	One day monitoring for Twice in Month at four locations for each corridor for entire construction period.	<ul style="list-style-type: none"> Guidelines for Ambient Air Quality Monitoring, CPCB, 2003 National Ambient Air Quality Standards 2009 	Contractor/PIU
Noise	One day monitoring for Twice in Month at four locations for each corridor for entire construction period.	<ul style="list-style-type: none"> Protocol for Ambient Level Noise Monitoring, CPCB, May 2015 ISO/ TC 108 (vibration) 	Contractor/ PIU
Vibration	Once in a month for a Year at 17 locations for Corridor 1 and 8 locations for Corridor 2		
Water (surface and ground water) and wastewater	Once in a season, four seasons in a year at baseline monitoring locations	<ul style="list-style-type: none"> Guide Manual – Water and wastewater analysis, CPCB Drinking water – Specifications IS 10500: 2012 and CPHEEO Manual 2012 	Contractor/ PIU
Soil	Once in a season, four seasons in a year at baseline monitoring	US EPA test protocols	Contractor/ PIU

Parameter	Locations and Frequency	Reference/Standard	Implementation by / Approval by
	locations		
Ecology	Terrestrial: Four times per year along each corridor, at depots and afforestation sites. Aquatic: 3 samples & 3 times in a year at Tapi River for Phytoplankton, Zooplankton and Benthos	As per Forest authorities & SMC	Contractor/ PIU, SMC & Forest Department

The environmental monitoring cost during construction phase is estimated as **Rs 114.64 Lakh** and **Rs 84.92 Lakh** for Sarthana to Dream city and Bhesan to Saroli corridor respectively. The estimated cost towards environmental monitoring during construction will be part of civil contract and details are given in Table 3.2.

Table 3.2: Environmental Monitoring Cost during Construction

S No	ITEM	QUANTITY	TOTAL COST (Rs in Lakh)
Corridor I: Sarthana to Dream City			
i.	Air Quality Monitoring	4 Samples X 24 times in a year X 5 Years	29.20
ii.	Noise Quality Monitoring	4 Samples X 24 times in a year X 5 Years	4.86
iii.	Soil Quality Monitoring	5 Samples X 4 times in a year X 5 Years	5.00
iv.	Soil Quality Monitoring for Muck	3 muck samples per km for the UG section	0.97
v.	Water Quality Monitoring	6 Samples X 4 times in a year X 5 Years	8.40
vi.	Vibration Monitoring	17 Sample X 12 times in a year X 1 Year	61.20
vii.	Ecological Monitoring	4 times in a year X 5 Years	5.00
Env. Monitoring Cost for Corridor I: Sarthana to Dream City			114.64
Corridor II: Bhesan - Saroli			
i.	Air Quality Monitoring	4 Samples X 24 times in a year X 5 Years	29.20
ii.	Noise Quality Monitoring	4 Samples X 24 times in a year X 5 Years	4.86
iii.	Soil Quality Monitoring	5 Samples X 4 times in a year X 5 Years	5.00
iv.	Water Quality Monitoring	7 Samples X 4 times in a year X 5 Years	9.80
v.	Vibration Monitoring	8 Sample X 12 times in a year X 1 Year	28.80
vi.	Ecological Monitoring	4 times in a year X 5 Years	5.00
vii.	Ecological Monitoring: Aquatic	3 times in a year X 5 Years	2.25
Env. Monitoring Cost for CorridorII: Bhesan - Saroli			84.92

3.1.3. Operation Phase

The environmental monitoring schedule during operation phase for 3 years is presented in Table 3.3. The results of air quality, water quality, waste water, vibration will be submitted to management bi-annually during operation phase.

Table 3.3: Operation Stage Monitoring Schedule

Parameter	Frequency	Reference/Standard	Implementation by / Approval by	Period (years)
Air	2x24 hours in a week for each season, Three seasons in a year at all metro stations and Depot	<ul style="list-style-type: none"> Guidelines for Ambient Air Quality Monitoring, CPCB, 2003 National Ambient Air Quality Standards 2009 	PIU	3
Noise	2x24 hours in a week for each season, Three seasons in a year at all metro stations and Depot	Metro Rail Transit System, Guidelines for Noise and Vibrations, RDSO, Ministry of Railways, September 2015	PIU	3
Vibration	24 hours, once in two months at Sensitive locations at 7 locations for Corridor 1 and 2 locations for Corridor 2			
Water (surface and ground water)	Once in a season, four seasons in a year at baseline monitoring locations	<ul style="list-style-type: none"> Guide Manual – Water and wastewater analysis, CPCB Drinking water – Specifications IS 10500: 2012 and CPHEEO Manual 2012 	PIU	3
Wastewater	Once in a season, Four seasons in a year at all stations and Depot			
Solid Waste	Once in a season, Four seasons in a year at Depot	<ul style="list-style-type: none"> Solid Waste Management Rules 2016 	PIU	3
Soil	Once in a season, four seasons in a year at baseline monitoring locations	US EPA test protocols	PIU	3
Ecology	Once in a season, four seasons in a year at Afforestation Sites	As per Forest authorities & SMC	PIU, SMC & Forest Dept.	3

The environmental monitoring cost during operation phase is **Rs 81.54 Lakh & Rs 61.53 Lakh** for Sarthana to Dream city and Bhesan to Saroli corridors respectively. The estimated cost towards environmental monitoring during operation will be the responsibility of PIU and details are given in Table 3.4.

Table 3.4: Environmental Monitoring Cost during Operation

S No	ITEM	QUANTITY	TOTAL COST (Rs in Lakh)
Corridor I: Sarthana to Dream City			
i.	Air Quality Monitoring	21 Samples X 2 days X 3 times in a year for 3 Years	22.68
ii.	Noise Quality Monitoring	21 Samples X 2 days X 3 times in a year for 3 Years	3.78
iii.	Soil Quality Monitoring	5 Samples X 4 times in a year X 3 Years	3.00
iv.	Water Quality Monitoring	6 Samples X 4 times in a year X 3 Years	5.04
v.	Vibration Monitoring	7 Samples X 4 times in a year X 3 Year	25.20
vi.	Quality of Wastewater	21 Samples X 4 times in a year for 3 Years	17.64
vii.	Ecological Monitoring	4 times in a year X 3 Years	3.00
viii.	Solid Waste Characteristics at Depot	1 Sample X 4 times in a year X 3 Year	1.20
Env. Monitoring Cost for Corridor I: Sarthana to Dream City			81.54
Corridor I: Bhesan - Saroli			
i.	Air Quality Monitoring	19 Samples X 2 days X 3 times in a year for 3 Years	20.52
ii.	Noise Quality Monitoring	19 Samples X 2 days X 3 times in a year for 3 Years	3.42
iii.	Soil Quality Monitoring	5 Samples X 4 times in a year X 3 Years	3.00
iv.	Water Quality Monitoring	7 Samples X 4 times in a year X 3 Years	5.88
v.	Vibration Monitoring	2 Samples X 4 times in a year X 3 Year	7.20
vi.	Quality of Wastewater	19 Samples X 4 times in a year X 3 Years	15.96
vii.	Ecological Monitoring	4 times in a year X 3 Years	3.00
viii.	Ecological Monitoring: Aquatic	3 times in a year X 3 Years	1.35
ix.	Solid Waste Characteristics at Depot	1 Sample X 4 times in a year X 3 Year	1.20
Env. Monitoring Cost for Corridor II: Bhesan - Saroli			61.53

3.2. SOCIAL MONITORING PLAN

The internal monitoring for RAP, GAP and SEP implementation will be carried out by GMRC. Independent Evaluation Agency will be hired by GMRC for mid and end term evaluation. Social monitoring cost during implementation is given in Table 3.5.

Table 3.5: Social Monitoring Cost during Implementation

S.No	ITEM	Monitoring Agency	Evaluation Agency	Total Cost (Rs. in Lakh)
1	RAP	PIU(GMRC)	Independent Evaluation Agency	80.00
2	GAP	PIU(GMRC)	Independent Evaluation Agency	
3	SEP	PIU(GMRC)	Independent Evaluation Agency	

Chapter 4 : Capacity Development and Training

4.1. ESMP REPORTING ARRANGEMENT AND INSTITUTIONAL STRENGTHENING

Supervision involves periodic checking to ascertain whether activities are going according to the plans. It provides necessary feedback for project management team to keep the program on schedule. The supervision and reporting process with respect to implementation status of mitigation measures during construction will initiate from the contractor at the lowest rung who will report to the Project Implementation Unit (PIU) through the Project Management Consultant (PMC).

During construction phase of the project, the ESMP implementation comprises of the following key activities:

- Implementing various mitigation and enhancement measures within the time frame recommended
- Overseeing the implementing various mitigation and enhancement measures and fine tuning/advocating more measures, if needed, depending on site conditions;
- Project level monitoring of key performance indicators to evaluate the implementation of ESMP measures at the recommended intervals.
- Periodical reporting of status of ESMP implementation and monitoring results and key performance indicators and
- Evaluation of ESMP measures implemented based on the data available from project level monitoring and status reports and providing directions accordingly.

These activities to be carried out by various agencies that will be involved in the implementation of metro project. It is also to be noted that all these activities will be carried out concurrently or at regular intervals and at different duration and location. This makes it pertinent that all agencies involved work within a predefine setup. The coordination model proposed during construction and operation phases is presented in Figure 4.1 and Figure 4.2, respectively.

Figure 4.1: Institutional Mechanism for ESMP Implementation (Construction Phase)

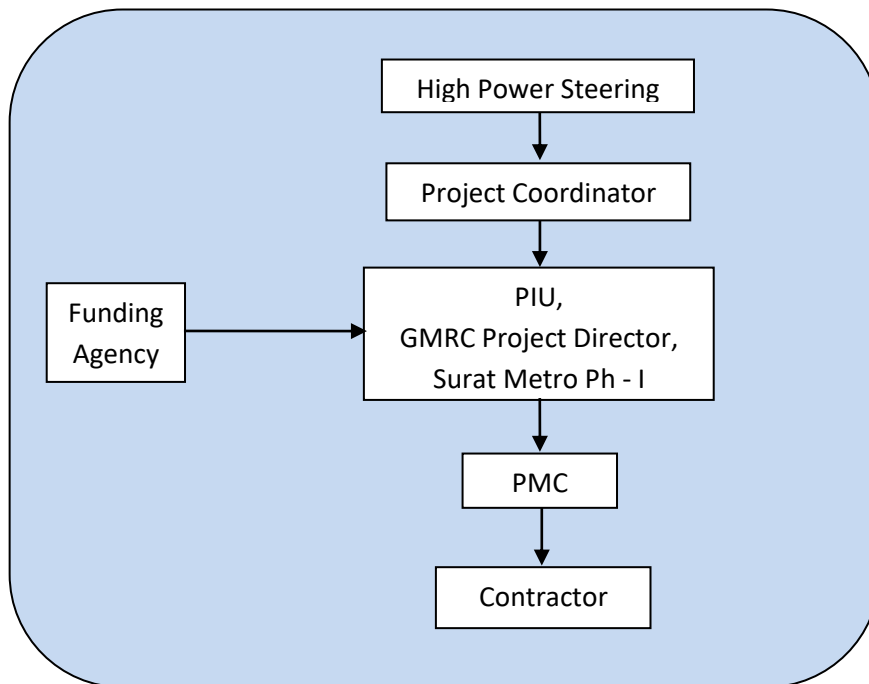
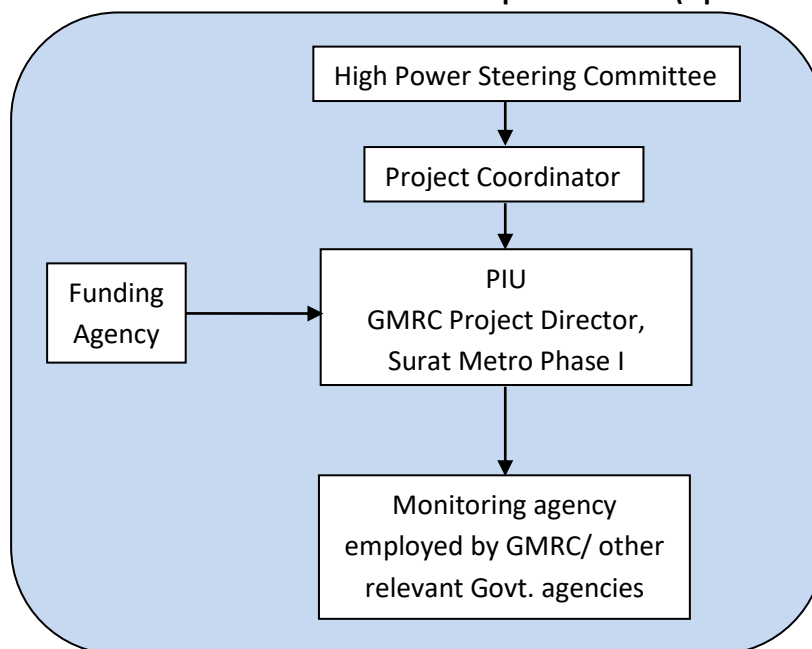


Figure 4.2: Institutional Mechanism for ESMP Implementation (Operation Phase)



Project Implementation Unit (PIU): The responsibility of implementing environmental mitigation measures lies with the PIU. PIU in this project will be Gujarat Metro Rail Corporation Ltd. (GMRC). The responsibility also includes various tasks such as notifying various affected parties such as the resident and commercial establishment, facilitate the relocation of people, notify other utility departments such as telephone, water supply, sewerage etc. which used the road for providing public utility services.

Project Management Consultant (PMC): The PIA will get the EMP implemented through the Project Management Consultant (PMC) appointed for managing engineering and construction related activity. The PIU will deliver the responsibility of the implementation as per the contract agreement. In order to effectively discharge the duties PMC will have an environmental officer/expert in the project management unit. The environmental officer will work for a full time basis at the site office. The officer must possess experience in the environmental management of metro projects.

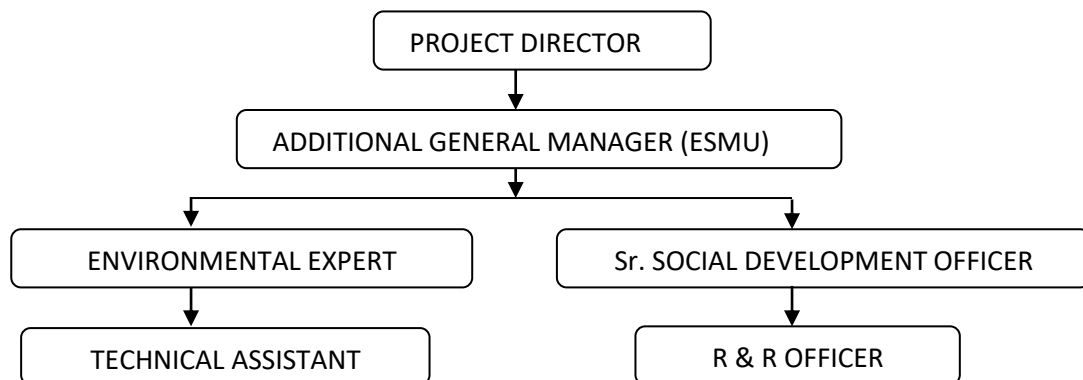
Project Contractor: Project contractor will implement the EMP measures, enhancement measures and measures as directed by PIU and PMC. The responsibility to implement the EMP measures will be built in to the contractual agreement. The contractor shall submit a report on compliance of environmental mitigation measures periodically to the PMC. The PMC will review and approve the Environmental Compliance Report (ECR) submitted by the contractor and forward the ECR to PIU after approval. The PIU will then submit the ECR to Joint Project Director (JPD), environment which after review and monitoring will submit to Independent Monitoring Panels through the Project Director, GMRC. The Project Director accordingly submits report to the Funding Agency.

GMRC: GMRC as an apex organization shall initiate to coordinate process among the concern organization for ESMP implementation. GMRC shall take lead in

- Reviewing the progress of the project for the subsequent year- institution wise
- Reviewing and discussing the salient features of the report in the year on environmental aspects and their violations
- Organizing and coordinating training programs for all member organization

Environmental and Social Management Unit (ESMU) needs to be set up by the GMRC for implementation of ESMP and Environmental Monitoring Plan (EMoP). The ESMP comprises staff and structure is shown in Figure 4.3.

Figure 4.3: Organizational Structure of ESMP



4.2. REPORTING SYSTEM

The monitoring report of environmental parameters (Air, Noise, Water and soil) will be prepared by the environmental engineer and submitted to the Project Management Consultant.

- The contractor will report to Construction Supervision Consultant (CSC) and CSC will report to GMRC on compliance. GMRC may disseminate the information to all interested parties.
- Non compliance of the monitoring will be seen by the GMRC.
- Photographic monitoring record will be maintained by the contractor. All material source points, disposal locations, plant locations, camp locations, etc should be photographed.
- A full record of construction activities will be kept as a part of normal contract monitoring system under the various stages of construction.
- The following reporting format for various activities during construction are attached:
 - Annexure 1: Details of Batching Plant
 - Annexure 2: Details of Muck Dumping Operations
 - Annexure 3: Details of Machinery during Construction
 - Annexure 4: Safety Check List
 - Annexure 5: Accident Report
 - annexure 6: Pollution Monitoring
 - Annexure 7: Vibration Monitoring
 - Annexure 8: Restoration of Construction Sites
 - Annexure 9: Keeping Records of Consent obtained by Contractor
 - Annexure 10: Checklist for Environment Inspection
 - Annexure 11: Summary Sheet

GMRC will be responsible for supervision and implementation of the RAP, GAP and SEP. GMRC will prepare quarterly progress reports and submit copies to AFD & KfW. The Independent Evaluation Agency will submit draft and final reports of their assignments to GMRC, and AFD & KfW and determine whether resettlement goals have been achieved. Submission of the draft report would be carried out after completion of assignment and the final report should be submitted after receiving feedback from GMRC and AFD & KfW.

4.3. ESTABLISHMENT OF ENVIRONMENTAL DIVISION

It is recommended that Project Authority establishes an Environment Division at the initial stage of the project itself. This division should have an Environmental Officer and an Environment Engineer. The task of the division would be to monitor implementation of environmental mitigation measures and environmental monitoring and it should report directly to Chief Engineer of the Project Authority. Progress of the division should be reviewed by an Environmental Advisor once in a year. The Environmental Advisor should be an experienced expert familiar with environmental management in similar projects. Cost for the first ten years (including 10% annual increase) is given in Table 4.1. The estimated cost

for 10 years is **Rs 166.31 Lakh** for each corridor. The division will be set up at one location for both the corridor and capital & recurring costs are distributed equally among two corridors.

Table 4.1: Environmental Division Cost

S No	ITEM	COST (Rs)	
		Corridor I	Corridor II
A	Capital Cost		
	Office Furnishings (Computer, furniture etc) LS	250,000	
B	Recurring Cost		
	Man Power Cost (For 12 months)		
	Environmental Engineer/Officer @ Rs. 40,000/month	480,000	
	Environmental Assistant @30000/month	360,000	360,000
	Office Maintenance and consumables @ Rs. 10,000/month	120,000	
C	Sub Total (A+B)	785,000	785,000
	Miscellaneous and unforeseen expenses, LS (10 % of C)	78,500	78,500
	Total cost for establishment of cell for 1 Year	863,500	863,500
	Total cost for 10 years with 10% annual increase	16,631,450	16,631,450

4.4. TRAINING

The training for engineers, managers and workers will be impacted by GMRC on regular basis to a) monitor implementation of approved EMS by Contractor b) monitor environmental status during operation and c) monitor disaster management during operation. The cost is estimated to be Rs 7.10 Lakh for each corridor as given in Table 4.2. The curriculum for all the corridors will be same. One extension officer for each corridor (is considered and cost is distributed equally among the each corridor.

Table 4.2: Cost for Training Program

S. No.	ITEM	Cost (Rs)
1	Curriculum Development and course preparation 1 month Rs.50000 LS	50,000
2	Extension Officer (1 year) Rs.30,000/month	360,000
3	Instructor 6 sessions of 3 days each (@ 30000/session)	180,000
4	Demonstration/Presentation Aids LS	70,000
5	Miscellaneous (Material etc) LS	50,000
	Total	7,10,000

Chapter 5 : Cost Estimates

5.1. ENVIRONMENTAL COST

The total estimated cost of environmental management and monitoring plan for the proposed project is **Rs 3656.44 Lakh** (Table 5.1). The details of each component given in respective chapters. The cost towards environmental monitoring and rainwater harvesting during construction phase will be the part of Civil Contract and remaining cost will be the part of Project Implementation Unit (PIU).

Table 5.1: Cost of Environmental Management Plan

S. No	Item	Amount in Rs. Lakh	
		Sarthana to Dream City	Bhesan to Saroli
1.	Compensatory Afforestation & Transplantation		
	Compensatory Afforestation @ Rs. 1200 per Tree	17.57	15.98
	Transplantation @ 9999 per Tree	52.39	63.69
	Add. tree for transplantation @ Rs. 1200 per Tree	7.64	6.29
2.	Noise Barriers @ 0.12 Lakh/meter	1120.68	802.80
3.	Rainwater Harvesting @ 22 Lakh/km	341.10	418.27
4.	Flamingo Conservation	-	10.00
5.	Environmental Monitoring		
	A. During Construction		
	Air Quality Monitoring	29.20	29.20
	Noise Quality Monitoring	4.86	4.86
	Soil Quality Monitoring	5.97	5.00
	Water Quality Monitoring	8.40	9.80
	Vibration Monitoring	61.20	28.80
	Ecological Monitoring	5.00	5.00
	Ecological Monitoring - Aquatic	-	2.25
	B. During Operation		
	Air Quality Monitoring	22.68	20.52
	Noise Quality Monitoring	3.78	3.42
	Soil Quality Monitoring	3.00	3.00
	Water Quality Monitoring	5.04	5.88
	Vibration Monitoring	25.20	7.20

S. No	Item	Amount in Rs. Lakh	
		Sarthana to Dream City	Bhesan to Saroli
	Quality of Waste Water	17.64	15.96
	Ecological Monitoring	3.00	3.00
	Ecological Monitoring - Aquatic	1.35	-
	Solid Waste Characteristics at Depot	1.20	1.20
6.	Training and Extension	7.10	7.10
7.	Environment Division (Cell)	166.31	166.31
8.	Waste Water Treatment through Bio Digesters	21.72	21.42
9.	Effluent Treatment Plant (ETP)	39.24	28.22
Total in Rs. Lakh		1971.27	1685.17
Total Cost in Rs. Lakh for both the Corridors		3656.44	

5.2. SOCIAL COST

The estimated social cost of this project is based on data and information collected during census and socio-economic surveys conducted in July, August, September 2019 and February 2020 and the unit rates are provisional sums. R&R benefits are proposed to be provided in addition to compensation. The cost for implementation of Resettlement and Rehabilitation Plan is given in Table 5.2. The total cost for R&R implementation plan is **INR 4718.20 Lakh**.

Table 5.2: R&R Benefits Cost

S. No	Description	Unit	Quantity	Rate in Rs. Lakh	Amount in Rs. Lakh
1	Compensation for loss of private land and structure has been presented in capital cost of DPR				
Compensation for Titleholders					
Residential PAFs					
2	Annuity or employment	no.	96	5.00	480.00
3	Subsistence allowance	no	96	0.36	34.56
4	Transportation allowance	no	96	0.50	48.00
5	Resettlement Allowance	no	96	0.50	48.00
Commercial PAFs					
6	Annuity or employment	no.	255	5.00	1275.00
7	Subsistence allowance	no	255	0.36	91.80
8	Resettlement Allowance	no	255	0.50	127.50
9	Transportation allowance	no	255	0.50	127.50
10	Loss of Small traders/self-employment	no	255	0.25	63.75
Compensation for Non-Titleholders					
Tenants					
11	Rental Allowance	no	115	0.04	4.60

S. No	Description	Unit	Quantity	Rate in Rs. Lakh	Amount in Rs. Lakh
12	Shifting Allowance	no	115	0.50	57.50
13	Financial assistance for loss of trade	no	81	0.25	20.25
	Squatters				
14	Accommodation for residential PAFs	no	57	7.50	427.50
15	Subsistence allowance	no	57	0.36	20.52
16	Shifting Allowance	no	57	0.50	28.50
17	Financial assistance for loss of trade	no	0	0.25	0.00
18	Rental Allowance (Rs.4000/- for 12 months)	no	57	0.04	2.28
	Kiosks (Vendors)				
19	Subsistence allowance	no	153	0.36	55.08
	Vulnerable Group				
20	One time financial assistance	no	118	0.50	59.00
	Cost for Implementation of LRP*				
21	LRP Implementation cost (LS)			40.30	40.30
	Cost for Implementation of SEP				
22	SEP cost (Considered lump sum Rs.3000000 per year for 5 years)	no	5	30.00	150.0
	Cost for Gender Development Plan				
23	Cost for GAP and HIV Awareness (LS)			50.00	50.00
	Loss of Employment				
24	Compensation for economic loss of employees	no	167	0.36	60.12
	Compensation for Community Structures				
25	Religious structures (LS)	no	29	15.00	43.50
26	Community (Trust) structures (LS)	no	5	10.00	50.00
27	Toilet (LS)	no	6	10.00	60.00
28	Educational & health centre (LS)	6	5	25.00	150.00
	General				
29	Cost for NGO Recruitment	LS	1	250.00	250.00
30	Cost for Independent Evaluation Agency		1	50.00	50.00
31	Training for Staffs	no	15	0.50	7.50
32	Dissemination of Entitlement Matrix, RP etc	LS		5.00	5.00
33	Administrative Expenses	LS		10.00	10.00
				Sub Total	4289.26
				Contingencies@10% of Sub Total	428.92
				TOTAL	4718.18

*LRP cost includes skill development, training programs, employment placements (in case PAP meets requirements of available opportunities) etc. This has been calculated based on Ahmadabad Phase-I metro project.

**NGO cost includes cost of man month, travel expenses, accommodation, telecom, and office equipment and coordination charges.

***** End of Main Report *****

ANNEXURE



- Annexure 1: Details of Batching Plant
- Annexure 2: Details of Muck Dumping Operations
- Annexure 3: Details of Machinery during Construction
- Annexure 4: Safety Check List
- Annexure 5: Accident Report
- annexure 6: Pollution Monitoring
- Annexure 7: Vibration Monitoring
- Annexure 8: Restoration of Construction Sites
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- Annexure 11: Summary Sheet

ANNEXURE 4.1

**DETAILS OF BATCHING PLANT
(To be filled by the Contractor)**

Name of Location _____

Report for Batching Plant

Reporting Month.....

Date of Submission.....

1. Environment Features of the surrounding area

1.1	Name and location of Batching Plant	
1.2	Wind direction	
1.3	Name (s), distance population and type of settlements in a 1.5 km radius of site.	

2. Details of Batching Plant and Mitigation Measures taken

2.1	Installed Capacity	
2.2	Average Utilization	
2.3	Last maintenance date	
2.4	Details of Sedimentation tank	

3. Explain Air Pollution Control Measures taken at the Batching Plant site

--

4. Explain Noise Pollution Control Measures taken at the Batching Plant site

--

Remark

Submitted	Checked	Approved
Signature	Signature	Signature
Name	Name	Name
Designation		
Contractor	Environmental Engineer of Construction Supervision Consultant	In-charge Officer (PIU)

ANNEXURE 4.2

DETAILS OF MUCK DUMPING OPERATIONS

(To be filled by the Contractor)

Dumping site location _____

Reporting Month.....

Date of Submission

1. Environment Features of the surrounding area

1.1	Location of Dumping site	
1.2	Capacity of Dumping site	
1.3	Safety measure taken at Dumping site (s)	
	1. 2. 3. 4. 5.	

Remark

Submitted

Signature

Name

Designation

Contractor

Checked

Signature

Name

Environmental Engineer of
Construction Supervision
Consultant

Approved

Signature

Name

In-charge Officer (PIU)

ANNEXURE 4.3

DETAILS OF MACHINERY DURING CONSTRUCTION

(To be filled Monthly by the Contractor)

Location Name _____

Reporting Month.....

Date of Submission

1. Details of Machinery Operation

1.1	Total machinery in operation (Nos.)	
1.2	Number of pavers	
1.3	Number of rollers	
1.4	Number of excavators	
1.5	Number of graders	
1.6	Number of dumpers	
1.7	Number of Cranes	
1.8	No. of workshops with repairs facility (furnish location and type of facility provided)	Workshop on Facility Location Provided
1.9	Number of vehicles in repair at each location	
1.10	Details of waste disposal	
1.11	Others	

Remark

Submitted

Signature

Name

Designation

Contractor

Checked

Signature

Name

Environmental Engineer of
Construction Supervision
Consultant

Approved

Signature

Name

In-charge Officer (PIU)

ANNEXURE 4.4

**SAFETY CHECK LIST
(To be filled by the Contractor)**

1	Contract No.	
2	Name of Contractor	
3	Representation	
4	Name of Safety Officer	
5	Date of Inspection	

Adequate at time of Inspection Needs Improvement Needs Immediate Attention	Location 1			Location 2			Location 3			Remark
	Location 1			Location 2			Location 3			
	A	B	C	A	B	C	A	B	C	
General										
House keeping										
Stacking of Material										
Passageway										
Lighting										
Ventilation										
Others										
Electrical										
Switches										
Wirings										
Fixed Installation										
Portable Lighting										
Portable Tool										
Welding Machine										
Others										
Fire Prevention										
Fire Fighting Appliance										
Dangerous Goods Store										
Gas Welding Cylinders										
Others										
Others										
Dust Control										
Noise Control										
First Aid Equipment										
Washing Facility										
Latrine										
Canteen										
Provision of Personal Protective										
Helmet										
Eye Protector										
Ear Protector										
Respirator										
Safety Shoes										
Safety Belts										
Others										
Remark										

Submitted

Signature

Name

Designation

Contractor

Checked

Signature

Name

Environmental Engineer of
Construction Supervision
Consultant

Approved

Signature

Name

In-charge Officer (PIU)

ANNEXURE4.5

ACCIDENT REPORT
(To be completed on Occurrence of Injury by the Safety Officer)

Type of Accident

	Fall of person from a height		Explosion
	Slip, trip or fall on same level		Fire
	Struck against fixed objects		Contact with hot or corrosive substances
	Struck by flying or falling objects		Contact with poisonous gas or toxic substances
	Struck by moving objects		Contact with electric current
	Struck / caught by cable		Hand tool accident
	Stepping on nail etc.		Vehicle / Mobile plant accident
	Handling without machinery		Machinery operation accident
	Crushing / burying		Other (please specify)
	Drowning or asphyxiation		

Agent Involved in Accident

	Machinery		Excavation / underground working
	Portable power appliance		Floor, ground, stairs or any working, surface
	Vehicle or associated equipment / machinery		Ladder
	Material being handled, used or stored		Scaffolding/gondola
	Gas, vapor, dust, fume or oxygen		Construction formwork, shuttering and false work
	Hand tools		Electricity supply cable, wiring switchboard and associated equipment
	Floor edge		Nail, splinter or chipping
	Floor opening		Other (Please specify)
	Left shaft		
	Stair edge		

Unsafe Action Relevant to the Accident

	Operating without authority		Failure to use proper footwear
	Failure to secure objects		Failure to use eye protector
	Making safety devices inoperative		Failure to use respirator
	Working on moving or dangerous equipment		Failure to use proper clothing
	Using un-safety equipment		Failure to use warn others or given proper signals
	Adopting unsafe position or posture		Horseplay
	Operating or working at unsafe speed		No unsafe action
	Unsafe loading, Placing, mixing etc.		Others (please specify)

	Failure to use helmet		
--	-----------------------	--	--

	No Protective gear		Unsafe layout of job, traffic etc.
	Defective protective gear		Unsafe process of job methods
	Improper dress / footwear		Poor housekeeping
	Improper guarding		Lack of warning system
	Improper ventilation		Defective tool, machinery or materials
	Improper illumination		No unsafe condition
	Improper procedure		Others (please specify)

Personal Factor Relevant to the Accident

	Incorrect attitude / motive		Unsafe act by another person
	Lack of knowledge or skill		No unsafe personal factor
	Physical defects		Other (please specify)

Remark

Submitted

Signature

Name

Designation

Contractor

Checked

Signature

Name

Designation

Environmental engineer.
Construction Supervision
Consultant

Approved

Signature

Name

Designation

In-charge Officer (PIU)

ANNEXURE 4.6

POLLUTION MONITORING

Construction site location _____
 Construction Stage: Report – Date: _____ Month _____ Year _____
 Mitigation measures suggested in last report complied or Not.....
 If not reasons thereof.....
 (Location at which monitoring to be conducted as per EMP)

Sl. No.	Chainage (km)	Details of locations	Duration of monitoring	Instruments used	Completion	Monitoring Parameters	Standards	Results	Reasons for exceeding standards	Mitigation Measures suggested	Type of area (Residential / Industrial / Commercial)	Remark
1. Air Monitoring (As per National Ambient Air Quality Standards, CPCB (2009))												
		As per decision of Engineer in Charge	As per Section 8.1			PM _{2.5}	60 µg/m ³					
						PM ₁₀	100 µg/m ³					
						SO ₂	80 µg/m ³					
						CO	02 mg/m ³					
						NO _x	80 µg/m ³					
2. Water Monitoring (As per Drinking Water Quality Standards, IS 10500, 2012)												
		As per decision of Engineer in Charge	As per Section 8.1			pH	6.5-8.5					
						BOD	Nil					
						COD	Nil					
						TDS	500 mg/l					
						Chlorides	250 mg/l					
						Nitrates	45 mg/l					
						Sulphates	200 mg/l					
						Iron	0.3 mg/l					
						Calcium	75 mg/l					
						Lead	0.01 mg/l					
3. Soil Monitoring												
		As per decision of Engineer in Charge	As per Section 8.1			pH	<7.0 Acid 6.5–7.5 Neutral >7.5 Alkaline					
						Organic Matter	0.5 -0.75 %					
						Sodium	0-1 %					
						Potassium	2-6 %					

Sl. No.	Chainage (km)	Details of locations	Duration of monitoring	Instrument s used	Completion		Monitoring Parameters	Standards	Results	Reasons for exceeding standards	Mitigation Measures suggested	Type of area (Residential / Industrial / Commercial)	Remark
							Chloride	0-1 %					
							Available Nitrogen	280-560 kg/hac					
							Phosphorou s	11.5 – 24.5 kg/hac					
							Arsenic	< 20 mg/kg					
							Cadmium	< 1 mg/kg					
							Mercury	< 1 mg/kg					
							Lead	< 35 mg/kg					
							Electric Conductivity	0.0-2.0 Non Saline 4.1-8.0 Saline 16.0 Strongly Saline					
4. Noise Monitoring (As per National Ambient Noise Standards, CPCB)													
		As per decision of Engineer in Charge	As per Section 8.1				L _{day}	Residential-55 dB(A) Commercial-65 dB(A)					
							L _{night}	Residential-45 dB(A) Commercial-55 dB(A)					
Remark													

Submitted
Signature

Name

Designation

Contractor

Checked
Signature

Name

Environmental Engineer of
Construction Supervision Consultant

Approved
Signature

Name

In-charge Officer (PIU)

ANNEXURE4.7

Format for Vibration monitoring

Construction site location _____
 Construction Stage: Report – Date: _____ Month _____ Year _____
 Mitigation measures suggested in last report complied or Not.....
 If not reasons thereof.....
 (Location at which monitoring to be conducted as per EMP)

Format for Vibration monitoring									
Sampling code	Location	Date	Start Time	Stop Time	Vibration level (PPV in mm/s)	Latitude	Standard	Longitude	Remarks
1							DGMS (Directorate General of Mines and Safety)		
2									
3									

Submitted
 Signature
 Name
 Designation
 Contractor

Checked
 Signature
 Name
 Environmental Engineer of
 Construction Supervision Consultant

Approved
 Signature
 Name
 In-charge Officer (PIU)

ANNEXURE 4.8

**RESTORATION OF CONSTRUCTION SITES
(To be filled by the Contractor)**

Construction site location _____

(Reporting by Contractor to PIU)

Construction stage: Monthly Report – DateMonthYear.

Sl. No.	Contract Package	Labor Camp		Construction Camp		Plant Site		Disposal Locations		Top Soil	
		O	R	O	R	O	R	O	R	Preserved	Restored

Remark

Submitted
Signature
Name
Designation
Contractor

Checked
Signature
Name
Designation
Environmental engineer of
Construction Supervision
Consultant

Approved
Signature
Name
Designation
In-charge Officer (PIU)

ANNEXURE 4.9

FORMAT FOR KEEPING RECORDS OF CONSENT OBTAINED BY CONTRACTOR

Construction site location _____

Construction Stage: Report – Date: _____ Month _____ Year _____

Sl. No.	Contractor's Name	Clearance	Applicable Acts	Agencies	Obtained on	Valid up to	Remarks
	Construction site location						

Remark

Submitted
Signature
Name
Designation
Contractor

Checked
Signature
Name
Designation
Environmental engineer of
Construction Supervision
Consultant

Approved
Signature
Name
Designation
In-charge Officer (PIU)

ANNEXURE 4.10
**CHECKLIST FOR ENVIRONMENT INSPECTION
(Points / Issues to be covered)**

Construction site location _____

Date of Inspection _____

S. No.	ESMP Measures
1	Provision of a personnel accountable for implementation of ESMP / Safety Measures with Contractor
2	Consent of PCB to Establish Batching Plant
3	Consent of PCB to operate Batching Plant
4	Compliance of PCB Conditions for Batching Plant installation and operation
5	Whether compliance reported through monthly Progress report to In-Charge (PIU)
6	PUC taken for all Construction vehicles
7	Concrete platform with trap under bitumen boiler, Fuel Tank for Batching Plant and generator set provided or not
8	Precautions to prevent contamination of soil by emulsion, oil and lubricant taken while storing
9	Providing cover to fine construction material & bituminous mix during transportation
10	Muck /debris disposal:
	a) Present status of land
	b) Closure and completion plan
11	Site specific traffic Safety management Plan:
	a) Contractor installed the warning / regulatory Traffic signs at the construction site
	b) The arrangement adequate
12	Safety equipment i.e. helmet, gloves, gumboot, mask, earplugs etc. provided to workers
13	Health Facility at camp and work site i.e. First Aid kit & suitable vehicle for conveyance in case of emergency / accident
14	Permit for Procuring River sand
15	License from Department of mines for quarrying
16	Consent to establish / operation of crusher
17	Provision of labor camp with sanitation & potable water
18	Fire precautions at Plant and site Office
19	Air and noise monitoring done in camp site
20	Whether any cultural property is being impacted
21	Status of drainage provision in camp area
22	General House Keeping

Remarks:

Submitted

 Signature
 Name
 Designation
 Contractor

Checked

 Signature
 Name
 Designation
 Environmental engineer of
 Construction Supervision
 Consultant

Approved

 Signature
 Name
 Designation
 In-charge Officer (PIU)

ANNEXURE 4.11

SUMMARY SHEET
(To be filled monthly by supervisory staff and Submitted to GMRC)

Construction site location _____

Month _____ Date _____

S No.	Description	Remarks
1	<i>No Objection Certificate</i>	
A	Cement Batching Plant	
	Location 1	
	Location 2	
	Location 3	
2	<i>Pollution under Certificate</i>	
	Vehicles	
	Machineries	
3	No Objection Certificate for Diesel Gen set	
	Location 1	
	Location 2	
4	Labor Camps	
	No. of sites Identified	
	Approved	
	Opened	
	Conforms to conditions imposed at the time of opening of sites	
	Closed	
5	<i>Workers</i>	
	No of workers employed	
	No of male workers	
	No of female workers	
	No of day workers	
6	Borrow Area	
	No. of sites identified	
	Approved	
	Opened	
	Quantity of available material	
	Quantity of material Utilized	
	Quantity of Topsoil preserved	
	Quantity of top soil used	
	No of sites closed	
	No. of sites Rehabilitated	
7	Quarry	
	No. of sites identified	
	Approved	
	Opened	
	Material available	
	Material obtained	
	No. of sites Rehabilitated	

S No.	Description	Remarks
8	Disposal Locations	
	No. of sites identified	
	Approved	
	Opened	
	Amount of Waste disposed	
	Type of waste disposed	
	No. of sites Rehabilitated	
9	Road Safety	
	Road Safety norms and approved Traffic plan	
10	Cleaning of Culvert/ drains	
	No. of culverts/ drains	
	Nos Cleaned	
11	Trees	
	No of trees marked for cutting in field	
	No of trees cut	
	No of trees to be Planted	
	Trees Planted	
12	Haul Roads	
	Adequacy of maintenance of Haul Road Network	

Remarks:

Submitted

Signature

Name

Designation

Contractor

Checked

Signature

Name

Designation

Environmental engineer of
Construction Supervision
Consultant

Approved

Signature

Name

Designation

In-charge Officer (PIU)