Mumbai Urban Transport Project - III
Executive Summary for
Panvel-Karjat Suburban Corridor (Double Line)

Introduction:
The Mumbai Suburban Rail System has been the heart line of Mumbai carrying more than 7.6 million people in and out of the main business district of Mumbai in more than 2,900 suburban train services. With the increasing population in the Metropolitan Region of Mumbai, there is ever growing demand of passenger traffic on the suburban rail system. Mumbai Railway Vikas Corporation (MRVC) is a Special Purpose Vehicle constituted by Ministry of Railways, Government of India and the Government of Maharashtra to implement railway projects under Mumbai Urban Transport Project (MUTP) to cater to the demands of the ever growing passenger traffic of the Mumbai Metropolitan Region. The Mumbai Urban Transport Project (MUTP) was designed with a vision to improve the mass transportation services in Mumbai and meet the steadily growing demand of the Mumbai Suburban Rail System. MUTP-I was completed in year 2012 and works under MUTP-II are in progress. MUTP-III was sanctioned by Union Cabinet on 30.11.2016. The projects under MUTP-III are comprised of the following components:

a) Quadrupling of Virar-Dahanu Road Section (63 RKm) on Western Railway
b) Suburban corridor between Panvel-Karjat Section (28 RKm) on Central Railway
c) Elevated corridor link between Airol-Kalwa (3 RKm) on Central railway
d) Trespass control measures in mid-sections on suburban Railway of Mumbai
e) Procurement of rolling stocks of 565 new Electrical Multiple Units (EMU); i.e. 47 Nos. of 12 car rakes.

Panvel-Karjat Suburban Corridor (Double Line):

Presently, a single line track (28.15 km) connects Panvel with Karjat. This alignment traverses the Talukas of Panvel, Khalapur and Karjat of Raigad District of Maharashtra State. It caters to goods and a few longdistance passenger trains. The Navi Mumbai area, especially around Panvel, has witnessed significant urbanization and population growth in recent years. The area between Panvel and Karjat is also developing very fast and there is increasing demand for extending the suburban rail services to Karjat. MRVC has therefore proposed a double line for extending the suburban rail services on the Panvel-Karjat section.
The proposed double line corridor from Panvel to Karjat is almost parallel to the existing track with diversion between Wavarle and Karjat with a total alignment length of 29.5 km. Between Wavarle and Karjat the new alignment will be at about 600m from existing line in East/ North side. The double line is proposed to be located on the left of the existing line from Panvel to Karjat.

There are two tunnels on the existing line; a smaller tunnel at Nadhal (220 m length) and a larger one at Wavarle (2692 m length). The proposed alignment will have three tunnels. One tunnel of about 220m length is proposed near Nadhal. The second tunnel of about 2600m length and third tunnel of about 300m length are proposed between Wavarle and Karjat. Separation of minimum 7.8m has been maintained between the existing and proposed lines. There are 34 minor bridges and 8 major bridges in proposed alignment. There are 13 RUBs in this section which will be extended. There will be no level crossing along the corridor up to Karjat.

There are 5 existing stations on this line at Panvel, Chikhale, Mohope, Chowk and Karjat. Additional platforms, stations buildings with required passenger amenities are planned at all station. At Karjat, new Suburban terminal is proposed on East side of existing Kalyan-Karjat Railway line. At Chikhale new station building is proposed to be constructed with required passenger amenities. 6 stabling sidings are proposed at Karjat station and 4 stabling sidings at Mohope station.

The other details include:

<table>
<thead>
<tr>
<th>1</th>
<th>Length</th>
<th>29.5 Km</th>
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<tbody>
<tr>
<td>2</td>
<td>Rail Flyover</td>
<td>2 Nos (1 near Panvel &amp; 1 near Karjat)</td>
</tr>
<tr>
<td>3</td>
<td>ROBs</td>
<td>2 Nos</td>
</tr>
<tr>
<td>4</td>
<td>RUBs</td>
<td>13 Nos</td>
</tr>
<tr>
<td>5</td>
<td>Tunnels</td>
<td>03 (01 near Nadhal and 02 between Wavarle and Karjat)</td>
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Morbe Dam is located on the North of the existing track near Chowk area. The proposed alignment is in between the existing track and the Morbe Dam. The shortest distance between the existing track and Morbe Dam is 235 m while the longest distance is 635 m.

**Scope of the Study**

The project will be implemented within applicable Indian legal framework and will also comply with the safeguard policies of the World Bank. Based on the study of Environmental Impact Assessment Notification (EIA Notification) issued by Ministry of Environment, Forest and Climate Change (MoEFCC), it is our understanding that the proposed MUTP III components do not require environmental clearance from MoEFCC.

The components of Environmental Assessment Study include:

1. Detailed baseline environmental monitoring of various environmental attributes such as ambient air quality, noise and vibrations, water quality (surface and groundwater) and ecological profile
2. Identification of all the environmental issues of MUTP-III project that may have negative/positive impacts on the project influence area during various stages of project design, construction and operation

3. Formulation of mitigation measures for the adverse environmental impacts and opportunities for enhancement of benefits, with associated detailed cost estimates for all the impacts identified

4. Public consultation and disclosure as per the operational policies (Operational Policies 4.01 and others) of the World Bank. This also includes consultation with stakeholders such as Matheran ESA Cell, Mumbai Metropolitan Region Development Authority (MMRDA), Department of Environment (Government of Maharashtra) etc.

5. Preparation of Environmental Management and Monitoring Plan, comprising of a set of remedial (prevention, mitigation and compensation) measures for each project component of MUTP III separately and specifically as well as formulate Environmental Management Plan (EMP) and strategies at a generic MUTP III level

6. Formulation of institutional mechanism for the implementation and monitoring of EMP

Environment Parameters considered for impact identification are Air quality, Water quality, Land, Noise & vibration, Flora, fauna and biodiversity, Occupational Health & Safety and Environment Health & Safety. Various indicators are considered for these environment components to identify impacts particular to the activities. The detailed list of monitoring indicators with respect to various environment components is given in Figure 1.

Project Activities Identified for Impact Assessment:

Construction Phase:

1. Clearing the ground for construction activity e.g. bushes, scrub, trees cutting, dump wastes etc.: Environmental features such as trees, shrubs will be removed only if it is necessary. Replanting/Relocation of trees or plantation of additional trees will be undertaken as per Maharashtra Felling of Trees Regulation Act, 1964 in concurrence with local Tree authority or Forest department. Approximately 1,800 trees will be required to be cut in Panvel-Karjat stretch. To minimize the impact of tree cutting, new plantation will be carried out in the ratio of 1:5. Thus, around 9,000 trees will be planted throughout the stretch.

2. Dismantling/ Demolition activities before construction: MRVC has prepared a detailed list of various structures as building, temples, ticket counters, huts, toilets, maintenance room; staff quarters etc. are to be dismantled at various locations along the route. It is envisaged that waste generation from demolition activities in Panvel-Karjat stretch will be minimal as identified PAPs are less than 200. Maximum quantity of waste generated from demolition activities will be used during filling of the embankment and the Construction and Demolition waste will be disposed of as per Construction and Demolition Waste Management Rules, 2016.

3. Establishment and operation of the labour camps: The construction work for MUTP-III components will be carried out by three or four contractors as per various packages for earthwork, tunneling, flyover and bridges. Thus, four different labour camps will be set up though number of labours are expected only around 100. The contractor shall provide labour camps with adequate drainage, clean and sanitary premises, crèches, cooking facilities, adequate and convenient water supply, adequate toilet facilities, and sewage disposal facilities. The cooking facilities shall be provided with Liquefied
Petroleum Gas (LPG) so that no fire wood will be burned for cooking. Designated solid waste storage sites will be identified in consultation with municipal councils, Panchayat

4. **Access control and barricading:** Barricading the construction site will also protect people from accidents. Barricading will be required between existing and proposed railway line and also between constructions site and households, roads near the site. RUBs will be functional throughout the construction phase. Barricading will be done to protect existing tracks using G.I. sheets to ensure smooth operations on existing tracks.

5. **Relocation and arrangements of utility lines for construction works:** The utilities encountered commonly on site for construction work include electricity, water, telecommunication, drainage, overhead and underground cables, railway tunnel etc. Utilities such as gas pipeline, water pipeline are observed which will be either protected or relocated suitably in consensus with the concerned department.

6. **Tunneling:** The proposed alignment will have three tunnels. One tunnel of about 220m length is proposed near Nadhal. The second tunnel of about 2600m length and third tunnel of about 300m length are proposed between Wavvarle and Karjat. Tunneling in Panvel-Karjat area is planned to be carried out by New Austrian Tunneling Method (NATM) by MRVC. MRVC will appoint an external agency to design the blasting and monitor the tunneling and blasting works. The agency will develop appropriate blasting design considering geology, safety, blast geometry etc. About 3 km length of tunneling work is involved which would lead to generation of approximately 2.5 lakh m3 of waste generation. Contractor will use the excavated material to the extent possible and will store/ disposed of the balance waste in such a way that significant detrimental effect on land, surface and ground water within the area will be minimized.

7. **Collection of construction material (as in sand mining, blasting for rocks, quarrying), Transfer of construction materials:** All the construction material will be collected from authorized quarries only. The contractor is required to submit location of the quarries, the material movement plan and borrow area management plan along with the proposal including the clearances taken by the sand miners and quarry operators as per existing Rules for this activity. The construction material will be stored on site and only required quantity will be procured. The construction material will be transported in dumpers to the project site on daily basis during the construction phase. The project component of Panvel-Karjat will require earthwork of approximately 12 lakh m3.

8. **Storage, handling and disposal of Solid, Hazardous and Construction &Demolition (C&D) waste material:** Packaging, labeling, and transport of hazardous and other wastes is required to be done as per the Hazardous and Other Wastes (Management and Trans-boundary Movement) Rules, 2016. In case of C&D waste, the Contractor will handle the waste as per Construction and Demolition Waste Management Rules, 2016.

9. **Setting up the Ready Mix Concrete (RMC) Plant:** The site selection of setting up Ready Mix Concrete plant will be as per the Guidelines for Ready Mix Concrete Plant (RMC) issued by Maharashtra Pollution Control Board, Mumbai vide notification no. MPCB/AS(T)/TB/B-4363 on 7th November, 2016. The Contractor shall also follow the “Guidelines on use of Ready Mixed Concrete” published by RDSO which specifies quality of raw material to be used and material storage in RMC.

10. **Excavation works and Foundation works (Pile and concrete):** Excavation will start after locating and identifying all utility services, such as electrical, water and add other utilities in the area. The excavated material can be re-utilized in filling, preparing embankments, etc. Excavation and filling can be carried out simultaneously to avoid
double handling. Open foundation will be used for most of the structures whereas Pile foundation is considered for construction of flyovers.

11. **Earth works/Landfill works:** Earthwork of approximately 12 lakh m³ of raw material to be procured. Cutting of 1 lakh m³ of soft rock is expected near Mohope area. The remaining stretches have only hard rock formation. Boulders generated from hard rock cannot be used in embankment as it leaves loose pockets in the surrounding. Thus, the Contractor will be required to handle the excavated material in environment friendly manner. In Panvel-Karjat stretch, the proposed embankment will be at similar elevation level as existing. The proposed design has consideration for provision of additional storm water drains along the proposed tracks wherever required. Slope protection measures such as stone gabions, retaining walls are also included in the design of proposed track.

12. **Laying of Railway Tracks:** New railway tracks will be built on earthen embankment which will form the rail foundation. Ballast consists of crushed stone which is placed and packed below sleepers for load distribution, longitudinal and latitudinal stability and to provide drainage to the railway. Continuous welded rails will be formed by welding rails together to form a seamless rail track. Concrete rail sleepers are placed along the rail alignment as a base support for the rail. Temporary railway track will be laid on which the track mountable machinery will be used to place the continuous welded rails. Temporary tracks will then be removed once continuous rail tracks are placed properly.

13. **Assembling and its Mechanical installation of pre-fabricated components for Foot over bridge (FOB), ROBs, RUBs and bridges near/around work site:** Prefabrication is preferred in most projects as it reduces bridge construction costs and life-cycle costs. Steel and pre-tensioned concrete beams are two of the most common prefabricated elements on typical bridges. Steel girders from Research Designs and Standards Organisation (RDSO) approved workshops will be used for major bridges. Girders will be fabricated at any of the RDSO approved Workshop.

14. **Operation & Maintenance (O&M) of all machineries:** O&M of all heavy vehicles and machinery will carried out as based on type of machinery and vehicle, maintenance schedule. Waste generated during O&M of machinery will be handled as per applicable rules. Diesel Generator(DG) sets will be used as emergency power source. Various types of vehicles as tanker, dumper, dozer, roller, and grader will be used in construction which would need regular maintenance.

15. **Electrical works as installation of overhead electrical structures (distance 50-60 m), Signaling post (400 m), power sub-station:** New Traction substation is planned at Mohope and substation at Panvel is being relocated in connection with DFCCIL work. Additional SP/SSP are proposed at Chikhale, Chouk and Karjat. Shifting of transmission lines will be involved.

16. **Landscaping:** Landscaping activity in the project would focus on enhancing the appearance and creating useable space. Trees which can be relocated will be relocated to the maximum possible extent. Landscaping will create user friendly spaces near station.
Operational Phase

1. **Improved Infrastructure such as new Tracks & Railway Stations, other facilities:**

   Construction of this suburban corridor will facilitate introduction of suburban services between Panvel and Karjat. Suburban corridor via Panvel will reduce the distance of Karjat from Mumbai Chhatrapati Shivaj Maharaj Terminal (CSMT).

2. **Operation and Maintenance of new Tracks & Railway Stations, other ancillary facilities, landscaping:** Maintenance facilities required for additional trains will be developed in the existing car shed or by augmentation of the existing facilities.
Figure 1: Monitoring Indicators for Various Environment Parameters Considered for Impact Identification

**AIR**
- Fugitive dust emissions in atmosphere
- Dust and Gaseous emission from heavy machinery and vehicles
- Emissions from diesel DG sets
- Odour nuisance
- Increased air pollution along nearby roads due to newly introduced vehicular traffic
- Traffic congestion at rail crossings
- Emissions due to use of wood or other biomass fuels in camps
- Toxic emissions: odour of chemicals, paints, fumes, lubricants etc. during rolling stock maintenance
- New landscaping/plantations improving ambient air quality

**WATER**
- Excessive water withdrawal/consumption from ground and surface water sources
- Impact on quality of ground and surface water
- Loss of seasonal flood plains
- Flooding/erosion due to flow obstruction/changes in stream courses in canals/creeks/natural courses and increased sedimentation
- Railway embankment affecting local drainage
- Washing of trains: sending contaminants in storm water
- Water stagnation and creation of temporary breeding habitats for mosquito/other vectors of disease
- Impact on existing storm water management

**FLORA & FAUNA**
- Felling of large trees
- Disturbance in local ecology and bio-diversity due to cuttings of tree branches and shrubs
- Effect on endemic and endangered species
- Loss of forest land and mangroves
- Effect on migratory birds
- Effect on estuarine and riverine ecology
- Disturbance to breeding locations/nesting sites/habitats
- Disturbance to aquatic flora, fauna breeding during construction additional piling for doubling
- Disturbance to migratory corridors and impact on animal crossings
- Lack of proper maintenance during operation phase of greenbelt and landscaping created as part of MUP-Th project
- Possibility of invasive species growth, unwanted vegetation growth in ROW

**NOISE & VIBRATION**
- Increase in Noise level
- Noise and vibration due to train movement on sensitive receptors
- Noise and Vibrations due to Metal Fabrication and assembling etc.
- Noise due to FMI Maintenance activities in the workshops/airsheds
- Vibration impact on existing structures due to additional train movements
- Noise & Vibration due to diesel DG sets

**LAND**
- Land value appreciation
- Soil erosion and flooding due to change in regional physical settings such as alterations/excavations/high embankments. Filling in low lying areas. Altered topography, drainage problem
- Change in landuse pattern due to fragmentation of land and Strip/ribbon development
- Loss of productive soil due to construction activities
- Compaction of land due to movement of heavy vehicles
- Soil contamination due to Fuel /oil spills

**EHS**
- Impact on Health and Safety of communities
- Exposure of workers & passersby to hazardous materials / risk involved used
- Community severance due to lack of access
- Impact on amenities/facilities in an area including cultural and community properties (markets, gathering spaces, playgrounds, cemeteries, gasohar land)
- Impact on common infrastructure in an area including hand pumps, common wells, toilets, electric lines/poles, access roads, pedestrian routes etc.
- Impact on sensitive receptors like religious places, hospitals, schools, places of heritage importance etc.
- Disturbance to tribal / sensitive / vulnerable PAPS / settlements
- Impact on existing railway operations
- Temporary reduction in income due to placing of construction equipments, activities in the areas around the project site
- Improved income and economic profile of the area
- Visual blight / aesthetic issues due to construction, signage, demolition afflicting people
- Change in demographic configuration
- Design safety and associated impacts
- Visual Impacts due to use of reflective materials/signages
- Impact on mobility of differently abled people
Environmental Monitoring Plan:
The objective of environmental monitoring plan is to:

- Evaluate the performance of mitigation measures proposed in the EMP
- Suggest improvements in management plan, if required.
- Enhance environmental quality
- Comply with the Statutory and community obligations
- Warn significant deteriorations in environmental quality for further preventive action

1. Air Quality Monitoring:
The air quality monitoring is recommended through National Accreditation Board for Testing and Calibration Laboratories (NABL) accredited and MoEFCC approved laboratory during the construction phase of the project. The monitoring of air shall be conducted at the location of worksite, material stockyards, and haul roads. The parameters recommended for monitoring during construction are: Particulate Matter (PM), PM10, PM2.5, Sulphur Oxide, Nitrogen Oxides, Carbon Monoxide

Air quality shall be monitored once in 3 times in a year (3 seasons) during construction phase and once in a year in winter season during operation phase and compared with the Ambient Air Quality monitoring results obtained during the baseline monitoring to record changes in the air quality and undertake suggested measures to mitigate the adverse impacts.

2. Water Quality Monitoring:
Water quality shall be monitored once in 3 months (4 times a year) throughout the project duration to cover seasonal variations and one year after the completion. Water quality shall be monitored through NABL accredited and MoEFCC approved laboratory. Both Surface and groundwater should be monitored for the parameters of IS:10500.

3. Noise and Vibration Level Monitoring:
Noise and Vibrations are to be monitored for 24 hours at each location to cover maximum train traffic in a day. Following parameters will be recorded while monitoring: Noise levels in decibelA (dBA), Peak Particle Velocity (PPV) in mm/s. Acceleration, Displacement, Vibration Decibel (dB)

Proposed Implementation Mechanism for EMP:

MRVC is the project implementing agency for MUTP-III projects. In that role, MRVC is accountable for satisfactory completion of the project works proposed under this Project. As the project implementing agency, MRVC, on behalf of Indian Railways & Government of Maharashtra is responsible for financing and procuring all the contracts financed by the World Bank loan, as well as for executing the identified works in the field, with due safeguards in consultation with the Western Railways (WR) and Central Railways (CR). MRVC will have contractors for implementation of Civil/Electrical/S&T works. Also, MRVC will have a Project Management Consultants (PMC) to supervise the work at all the stages including successful implementation and monitoring of EMP during construction stage. The time line for procurement works, implementation of Civil/Electrical/S&T works and activities to be carried out by the respective agencies (i.e. MRVC, Project Management Consultants and Contractors) will be set up between MRVC and the contractor with support of Project Management Consultants.
For the implementation of the proposed projects under MUTP-III, it is proposed to have Environmental Management Group (EMG) within PMC for environmental management and monitoring. EMG should comprise of Environmental Managers, Environmental Inspectors and Emergency Response Cell. Figure 2 presents the organizational structure of the proposed Environmental Management Group (EMG) for environmental management and monitoring. The proposed institutional framework for implementing and monitoring the works proposed under the EMP is shown in Figure 3.

**Figure 2: Organizational Structure of the Proposed Environment Management Group**

**Figure 3: Proposed Institutional Framework for Monitoring of EMP**