1. **OBJECTIVE**

The objective of Environmental Management Plan (EMP) is to formulate measures which will:

1. Mitigate adverse impacts on various environmental components, which have been identified during the rapid environmental impact assessment study.
2. Protect environmental resources where possible.
3. Enhance the value of environmental components where possible.

EMP also includes a monitoring plan to enable evaluation of the success or failure of environmental management measures, and to carry out reorientation of the plan if found necessary.

It is emphasized that many of the protective and enhancement measures can be implemented by adopting suitable planning and design criteria for construction of the project.

2. **LAND ENVIRONMENT**

2.1. **Traffic Management**

**Construction Phase**

There will be no major impact on the land environment during construction phase as identified during studies. The internal roads will be designed with adequate widths to minimize traffic congestion due to the movement of trucks carrying raw materials required for construction.

Special care will be taken during transportation of construction material like cement, sand, aggregate etc. as considerable quantities of such material would be transported from various material suppliers.

The material will be sourced from the nearest available government approved contractor. Since the road transport is unavoidable, such movement will be carried out during non-peak hours as far as possible.

**Operation Phase**

The impact on land environment during operation phase will be due to movement of vehicles of residents and users of the hotels, commercial facilities and amenity area.

Precautions to be taken to minimize impacts on land environment will be as follows:

- Development will be as per local guidelines for Residential Development.
- Adequate measures will be taken considering the natural drains by incorporating design elements like steep land landscaping etc.
- There will be minimum amount of cut and fill to reduce disturbance to the existing surface water hydrology
- Natural drain lines which fall in the path of proposed roads will be maintained as far as possible through construction of culverts.
- Adequate provisions will be made through provision of internal roads of minimum 9m width for smooth vehicle entry and exit.
- Approach road (external road) and internal roads for onsite traffic movement will be planned as per project development.
2.2. Solid Waste Management

The salient features of the proposed solid waste management strategy are as follows:

- For waste generated during the construction phase, gross segregation of waste into roadwork materials, structural building material and salvaged building parts will be made. Additional segregation to facilitate reuse/recycling will be made.
- Material wastes like bricks, cement etc. will be used as fill material and concrete will be recycled and reused at the site.
- Adequate facilities for the storage of these waste materials would be made on site.
- Management of solid waste generated during the operation phase would include collection, transportation and disposal in a manner so as to cause minimal environmental impact.
- It will be made mandatory for waste to be segregated right at the source of waste generation. Collection of segregated waste would be made from the residential areas, resorts, hotels and commercial and amenity areas.
- There would be manual collection & storage of biodegradable waste at the ground level; and Reusable and recyclable waste would be manually collected and stored in closed rooms at ambient temperatures.
- Biodegradable waste from residential buildings, commercial blocks would be transferred to mechanical composting units within the site for disposal. Compost from the same will be used for landscaping.
- Reusable and recyclable waste will be disposed by selling to scrap dealers and private contractor for resale.
- Non-degradable waste will be transferred to municipal solid waste management system.

3. AIR POLLUTION

3.1. Construction Phase

a) Mobile source emissions

1. Transportation of raw materials required for construction will be carried out during non-peak hours.
2. Idling of delivery trucks or other equipment will not be permitted during unloading or when not in active use.
3. To minimize dust emissions due to trucks carrying cement, gravel, sand to site, ready mix concrete carried in enclosed container will be used which is a better option as compared to on site batch mixing.
4. Dust covers will be provided on trucks used for transportation of materials prone to fugitive dust emissions.
5. Covering scaffolding and cleaning of vehicles which can reduce dust and vapor emissions will be used.

b) Stationary source emissions

1. Most of the machinery related to construction will be located close to construction area for ease of handling.
2. Machinery such as conveyers and mixers will be screened with sheets of suitable material to reduce transport of suspended particulate matter and noise.

3. All stationary construction equipment will be located as far away as possible from sensitive receptor locations in order to allow maximum dispersion of emitted pollutants.

4. Areas prone to fugitive dust emissions due to activities such as excavation, grading sites and routes of delivery vehicles across patches of exposed earth, will be frequently water sprinkled to prevent re-entrainment of dust.

5. Hosing down road surfaces especially if they are unfinished surfaces also helps to prevent fugitive dust emissions.

6. Other measures include appropriate containment around bulk storage tanks and materials stores to prevent spillages entering watercourses.

7. Apart from these, equipment/machines and vehicles will be always kept in good state of repair to minimize emissions. Construction areas will be enclosed, wherever possible.

3.2. Operation Phase

1. Plantation along the roadside helps to reduce effects of air/ noise pollution. A row of trees will be planted along the plot periphery to screen the site from air/ noise pollution.

2. Regular maintenance and upkeep of the internal road within project will ensure smooth traffic flow and will help to reduce air pollution.

3. As per the project analysis, the impact of proposed project would be positive when proper traffic flow is maintained. The entrance/ exit to the site will be maintained so that there are no obstructions to traffic flow as also road side parking will be avoided.

4. NOISE POLLUTION

4.1. Construction Phase

1. Construction contract specifications will specify use of equipment generating noise of not greater than 90 dB (A).

2. Contract specifications for construction will stipulate levels of maximum noise generation in various zones based on CPCB Noise Standards.

3. High noise generating construction activities like, compacting etc. will be carried out only during day time.

4. Workers working near high noise construction machinery will be provided with ear muffs/ ear plugs.

5. Provision of temporary barricading around site.
4.2. Operation Phase

During operation phase it is important to maintain the noise levels within the plot for the safety and better health of residents and users. The various precautions to be taken to maintain acceptable noise level within the project area are as under:

1. Buffer in form of wall or tree plantation will be provided along the main roads
2. Green belt would be essential adjacent to sensitive locations like reserve forest areas, lakes etc.
3. Smooth flow of traffic will be ensured on the internal road to avoid idling of vehicles.

5. WATER ENVIRONMENT

5.1. Construction Phase

1. Construction area will be isolated and care will be taken to divert the run-off to storm water drainage, so possibility of pollution from construction run-off is prevented. Also, subsurface work will be carried out only during non-monsoon period.
2. Precaution will be taken to ascertain that no waste material like cement, paint and solid material like iron rods and any other material is dumped into storm water system.
3. No accumulation of stagnant water will be allowed to prevent breeding of mosquitoes.

5.2. Operation Phase

1. Adequate measures will be taken considering the natural drains by incorporating landscape design elements like steep land landscaping etc.
2. A well engineered storm water drainage system will be provided as a part of this development.
3. A well designed rain water harvesting system will be implemented as a part of the project. The harvested water will be utilized.
4. The daily water requirement would be met from MCGM. After the analysis of the site, it is recommended that the project proponent installs scientifically designed rain water harvesting system and sewage treatment plants with facilities to recycle sewage to reduce load on natural water sources.
5. Existing natural drainage lines on site will be maintained as far as possible.

6. GUIDELINES FOR BIO-AESTHETIC MANAGEMENT

6.1. Protection of trees on site

Protection of existing trees within the plot which would not be affected by the proposed layout will be the first priority during construction. The precautions to be taken are as under:

1. The detailed design of the proposed development will be in accordance with the Development Control Regulations. Care will be taken to maintain the form such that the aesthetics of the region is maintained and the skyline is not modified.
2. Precaution would be taken while transporting construction material to the site to prevent accidental damage or spillage.

3. The work force will be briefed about importance of preserving and protection of exiting trees before starting the construction work.

4. Trees propagation/plantation will be initiated by project proponent from project initiation stage for better results.

5. Specifically, large and healthy trees will be given maximum weight age in tree protection than giving importance to merely the number of trees, as is not possible to avail such full grown and mature trees in short span of time with any efforts and cost.

6. The existing trees will be removed only when it is a must and all other options are thoroughly considered and exhausted.

7. Proposed green belt will consist of trees planted at the rate as specified in the Policy. The trees would be the fruit bearing type and native species suiting the local climate as far as possible.

It is recommended that tall trees will be planted to form an avenue along roads and to buffer the vehicular noise and dense canopy trees will be planted on the periphery of the plot to form a screen to reduce impact of air/noise pollution.

7. **Socio-Economic Environment**

Basic infrastructure facilities like water supply, sanitation, drainage etc. will be provided as part of the proposed project. Villages existing within the project demarcation area will be kept untouched and care would be taken to cause minimum disturbance to these sites. Thus, there would not be any adverse impact on local population; rather the settlements in the vicinity of the proposed project would be benefited because of the facilities provided by project construction. Public health & safety will be the priority of the project.

7.1. **Construction Phase**

The health and safety of the workers for the construction project will be ensured by:

1. Proper instructions about personnel safety will be given to all the labour working on the site by project manager before commencement of work.
2. The labourers will also be guided about the measures to be taken during emergency and accident like fire etc.
3. Safety equipment like gloves, helmet, mufflers etc. which will be made mandatory to use for all labourers on site.
4. Proper sanitation and water supply facilities will be provided to the labourers during construction phase.
5. Insurance cover will be provided to the workers working at site.

7.2. **Operation Phase**

During operation phase, precautions will be taken to ensure the health and safety of the local residents and the users. Fire fighting system comprising of smoke detectors and well designed hydrants will be
provided in each building. Fire water tanks with storage capacity as recommended will be provided. Maintenance of the systems will be carried out regularly to ensure proper functioning during emergencies. Periodic inspection and maintenance of all water storage tanks will be carried out at regular intervals to prevent outbreak of waterborne diseases.

8. **ENVIRONMENTAL MANAGEMENT PLAN- ORGANIZATION & IMPLEMENTATION**

During construction phase, contractors as well as site-in-charge will be responsible for implementing all the mitigation measures recommended. Planting of trees on open spaces and road-side will be initiated during construction phase itself. In operational phase, the work will be continued along with post-monitoring of planted area. An officer will be appointed by the project proponents to ensure monitoring and inspection during construction period. The following tables give the mitigation measure to be undertaken during construction & operational phase respectively with the agency responsible for implementation.

### Table 1: Mitigation Measures during Construction Phase

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Affected Environmental Parameters</th>
<th>Likely adverse impacts in absence of mitigation measures</th>
<th>Nature of impact</th>
<th>Proposed Mitigation Measures</th>
<th>Action to be taken</th>
<th>Implementing Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Land Environment</td>
<td>• Generation of solid waste and debris&lt;br&gt;• Aesthetically unpleasant&lt;br&gt;• Health problems of labourers</td>
<td>Temporary</td>
<td>• Segregation to facilitate reuse/recycling&lt;br&gt;• Construction material waste like bricks, cement etc. will be used as fill material&lt;br&gt;• Recyclable wastes will be segregated and sent for recycling.&lt;br&gt;• Adequate facilities for the storage of these waste materials on site</td>
<td>Contractor</td>
<td></td>
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<tr>
<td>2.</td>
<td>Air Quality</td>
<td>• Traffic congestion&lt;br&gt;• Increase in air pollution (Increase in levels of NOx, SPM, Dust hazards)&lt;br&gt;• Risks of accidents</td>
<td>Significant but Temporary</td>
<td>• Idling of the trucks and dumpers on the roads will not be allowed&lt;br&gt;• Raw materials will be procured from the nearest material supplier</td>
<td>Project manager &amp; Contractor</td>
<td></td>
</tr>
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<td>Sr. No.</td>
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</table>
| 3.      | Noise Quality                    | Increase in noise levels causing nuisance to lake and forest ecosystems | Significant but temporary | • Material will be brought in batches so that there is no sudden increase of traffic volume at one particular time.  
• On-site use of concrete batching plant  
• Use of dust covers over construction material during transportation  
• Keeping all stationary equipment downwind  
• Stabilization of dust prone areas by sprinkling water | Prohibition for use of equipment emitting noise of greater than 90 dB (A) for 8 hour operation  
• Prohibition of noise causing construction activities during night time  
• Provide workers on machinery with ear muffs/ear plugs  
• Provision of temporary barricading around site | Contractor |
<p>| 4.      | Water Environment                | Increase in water quality | Significant | Construction | Contractor |</p>
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<tr>
<td>5.</td>
<td>Other Impacts</td>
<td>- Turbidity and suspended solids due to soil erosion</td>
<td>Significant and temporary</td>
<td>- Construction of necessary scaffolding and retaining structure for protection from waste material and water.</td>
<td></td>
<td>Contractor</td>
</tr>
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<td></td>
<td></td>
<td>- Blocking of natural drains due to deposition of construction materials</td>
<td></td>
<td>- Tree plantation to enhance bio aesthetic value.</td>
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<td></td>
<td></td>
<td>- Soil erosion, additional exposure to noise/air pollution.</td>
<td></td>
<td>- Guidelines for planting saplings of trees to be strictly followed</td>
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<tr>
<td>1.</td>
<td>Land Environment</td>
<td>• Change in land use pattern due to induced development</td>
<td>Significant and permanent if not controlled</td>
<td>• Controlled and planned development</td>
<td>Project Proponent</td>
<td></td>
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<td></td>
<td></td>
<td>• Contamination of soil by fuel and lubricants from construction equipments and vehicles</td>
<td></td>
<td>• Avoiding spillage of oil and fuel to prevent seepage into ground</td>
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<td></td>
<td></td>
<td>• Increased solid waste generation in area</td>
<td></td>
<td>• Waste management practices like waste segregation at source, recycling and reuse, mechanical composting etc. will be adopted</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>• If not managed properly will affect the health of local residents</td>
<td></td>
<td>• Provision of mechanical composting units within the site</td>
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<td></td>
<td></td>
<td>• Aesthetically unpleasant</td>
<td></td>
<td>• Regular collection of non-degradable solid waste from the site.</td>
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<td></td>
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<td></td>
<td></td>
<td>• Provision of well engineered landfill site.</td>
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<tr>
<td>2.</td>
<td>Water Environment</td>
<td>• Water shortage within the area&lt;br&gt;• Water flooding during rainy season&lt;br&gt;• Increase in turbidity of water&lt;br&gt;• Reduced runoff due to increased paved areas</td>
<td>Significant and permanent</td>
<td>• Blockage of natural drains to be avoided and cleaning and maintenance to be carried out&lt;br&gt;• Regular maintenance of storm water drains, cleaning and effective soil erosion measures.&lt;br&gt;• Water harvesting to recharge ground water&lt;br&gt;• Prevent pollution from run-off&lt;br&gt;• Incorporating appropriate landscape design elements&lt;br&gt;• Rain water harvesting system will be installed.&lt;br&gt;• Sewage treatment plants to recycle domestic sewage and reuse for toilet flushing/</td>
<td></td>
<td>Project Proponent</td>
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<td>3.</td>
<td>Biodiversity</td>
<td>Disturbance due to noise generating activities and increased vehicular traffic</td>
<td>Significant and permanent</td>
<td>• Provision of green belt and buffer zone</td>
<td>Gardening, AC cooling etc.</td>
<td>Project Proponent</td>
</tr>
<tr>
<td>4.</td>
<td>Public Health and Safety</td>
<td>Health problems to people staying within the plot.</td>
<td>Moderate and Permanent</td>
<td>• Road side plantation and its maintenance to prevent air/noise pollution within site. • Adequate parking facility. • Provision of adequate road safety like signage- posts/road-crossings etc. • Fire fighting / Disaster Management Plan provisions for buildings.</td>
<td>Project Proponent</td>
<td>Project Proponent</td>
</tr>
</tbody>
</table>