

Environmental Impact Assessment Report

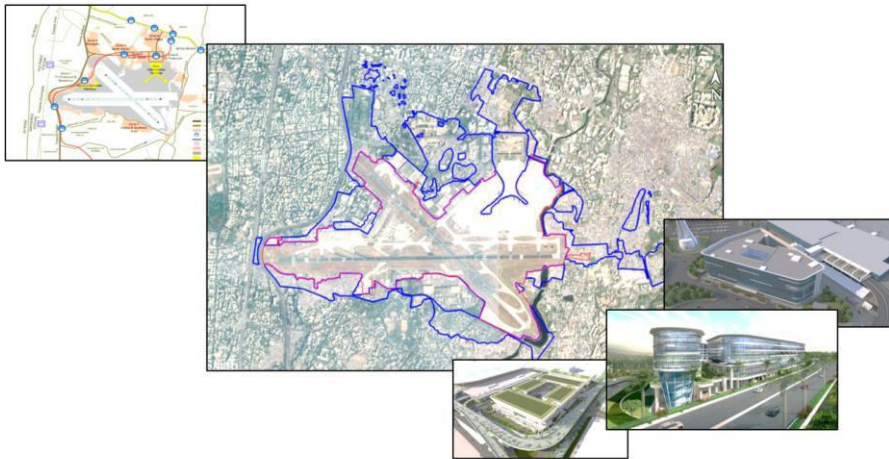
Amendment in Environment Clearance for Non-Operational Area (Landside) Development of Chhatrapati Shivaji Maharaj International Airport and construction of Six buildings

at

Landside of Chhatrapati Shivaji Maharaj International Airport,
Santacruz (E), Mumbai

Project Proponent

Mumbai International Airport Limited



Baseline Monitoring: Summer 2019

November 2019



Environmental Consultant

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Declaration by Experts contributing to the EIA of “Non-Operational Area (Landside) Development of Chhatrapati Shivaji Maharaj International Airport and construction of Six buildings” at Landside of Chhatrapati Shivaji Maharaj International Airport, Santacruz (E), Mumbai by Mumbai International Airport Limited (MIAL).

I, hereby, certify that I was a part of the EIA Team in the following capacity that developed the above EIA.



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“**Non-Operational Area (Landside) Development of Chhatrapati Shivaji Maharaj
International Airport and construction of Six buildings**” at Landside of Chhatrapati Shivaji
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Limited (MIAL).

I also confirm that I shall be fully accountable for any mis-leading information mentioned in
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NOTE :

(*) Full forms of abbreviations given on Next Page

(**) Tasks for each Functional Area Expert given in the following table.

S.N.	Functional Area Code	Complete Name of the Functional Areas	Tasks
1	AP	Air Pollution Prevention, Monitoring & Control	Assessing baseline ambient air quality, stack emission, possible impacts and control measures
2	WP	Water Pollution Prevention, Control & Prediction of Impacts	Assessing baseline surface/ ground water quality, possible impacts and control measures
3	SHW	Solid Waste and Hazardous Waste Management	Assessing solid/hazardous waste generation, treatment and disposal
4	SE	Socio-Economics	Assessing baseline Socioeconomic, demographic situation, impacts and CSR plan/ measures for upliftment
5	EB	Ecology and Biodiversity	Assessing baseline biodiversity situation in study area, impacts and Biodiversity management plans

S.N.	Functional Area Code	Complete Name of the Functional Areas	Tasks
6	HG	Hydrology, ground Water & Water Conservation	Assessing baseline hydrogeological situation in study area, impacts and management plans
7	GEO	Geology	Assessing baseline geological situation in study area, impacts and management plans
8	SC	Soil Conservation	Studying soil characteristics, assessing soil erosion, soil conservation
9	AQ	Meteorology, Air Quality Modeling & Prediction	Assessing nature and scale of impacts on ambient air quality through modelling and management plans
10	NV	Noise/ Vibration	Assessing baseline ambient noise quality, possible sources, impacts and control measures
11	LU	Land Use	Assessing baseline Land Use Land cover possible impacts and control measures
12	RH	Risk Assessment & Hazard Management	Assessing safety measures taken up by company modeling to assess scale of impacts, disaster management and control measures

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Abbreviations

AAQ	Ambient Air Quality
AESPL	Aditya Environmental Services Private Limited
BDL	Below Detectable Limit
BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
CO	Carbon Monoxide
CPCB	Central Pollution Control Board
CGWB	Central Ground Water Board
CMD	Cubic Meter Per Day
CSR	Corporate Social Responsibility
CRZ	Coastal Regulatory Zone
DG	Diesel Generator
DMP	Disaster Management Plan
EAC	Expert Appraisal Committee
EIA	Environment Impact Assessment
EMP	Environment Management Plan
EC	Environment Clearance
EHS	Environment Health and Safety
ETP	Effluent treatment plant
GoM	Government of Maharashtra
GIS	Geographic information system
HTL	High Tide Line
HW	Hazardous Waste
IAQ	Indoor Air Quality
ISO	International Organization for Standardization
IMD	India Meteorological Department
KLD	Kilo Litre per Day
LULC	Land Use Land Cover
MoEF&CC	Ministry of Environment, Forests and Climate Change
MPCB	Maharashtra Pollution Control Board
NBC	National Building Code

NOC	No Objection Certificate
NAAQS	National Ambient Air Quality Standard
NOx	Oxides of Nitrogen
O&M	Operation and Maintenance
PCB	Pollution Control Board
PM	Particulate Matter
PPE	Personal Protective Equipment
RWH	Rain Water Harvesting
SO ₂	Sulphur Dioxide
SEAC	State Level Expert Appraisal Committee
SEIAA	State Environmental Impact Assessment Authority
STP	Sewage Treatment Plant
WTP	Water Treatment Plant

Executive Summary

A. Project Background

Mumbai International Airport Limited (MIAL), submitted the application for Environmental Clearance for 'Non-Operational Area (Landside) Development of CSMIA and construction of six buildings' to State Level Expert Appraisal Committee (SEAC), Maharashtra on 16th October 2010. The proposal was considered by State Level Expert Appraisal Committee (SEAC), Maharashtra in its 41st Meeting under screening category 8(b) as per EIA Notification 2006 and was recommended to State Level Environmental Impact Assessment Authority (SEIAA). The project was considered by SEIAA in its 37th Meeting held on 18th April 2011 and accorded the Environmental Clearance on 1st July 2011.

Subsequently, Consent to Establish (CTE) for Building-5 (T1-P01) was obtained from MPCB vide consent dated 30th January, 2014, and construction work initiated. As on date, Building No.5 (Multi Level Car Parking-2) has already been constructed and is under operation since September, 2015 (MPCB Consent to Operate obtained vide letter dated 19th September, 2015).

The summary of proposal for which Environmental Clearance was granted to MIAL for development of Non-Operational Area & Construction of Six Buildings is as follows:

The proposal pertains to site development i.e. lateral/ area development (roads/ pedestrian infrastructure, storm water drainage, water supply, sewerage, STPs, other utilities etc.) in the Non-Operational area (landside) of CSMIA. The airport has a total area of 802.03 Ha out of which 506.39 Ha is aeronautical area, whereas, the area under encroachments is 125.03 Ha and Non-operational area is 170.61 Ha. The project area for clearance/ approval of this development shall exclude the airside area (for which environmental clearance is already obtained) and area under encroachments/ slums. The total plot area under lateral development is 170.61 Ha.

The proposed lateral development is planned for different uses and projects as part of proposed Non-Operational (cityside) development like retail, commercial, offices, hotels, entertainment, travel and tourism, banks, residential areas, public-semi public/ social infrastructure/ facilities along with utilities, support activities such as cabin catering, airlines offices, public and semipublic offices, residential quarters, parking etc.

The proposed non-operational area shall be developed over a period of approximately 15 years which shall provide required non-aeronautical uses and supporting functions, and shall be accessible to the general public.

The proposal pertains to site and infrastructure development on an area of 170.61 ha planned for construction of 28,15,737 Sqm (approximately 2.8 million Sqm) in the future. The proposed development mix for envisaged development of 2.8 million Sqm of built-up area is given in the following table:

Table 1: Details of Proposed Development Mix in Non-Operational Area as per Environment Clearance dated 01.07.2011.

S. No	Proposed Dev. Mix	Proposed Built-Up Area (Sqm)
1.	Hotels	11,61,288
2.	Convention Centre	1,09,194
3.	Entertainment, Retail, Leisure	4,99,818
4.	Offices, Travel & Tourism, Banks	6,92,128
5.	Hospital & Healthcare	92,903
6.	Social Infrastructure	1,37,497
7.	Residential	1,22,909
	Total	28,15,737

B. Proposed Project Amendments

The above proposal was based on the then proposed Master Plan for Non-Operational development in CSMIA which later became part of Interim Development Plan of CSMIA Notified Area, approved by Government of Maharashtra (GoM) vide Notification No. CMS/TPB/4312/1/CR-47/2012/I/UD-11, dated 17th May 2013. Subsequently Government of Maharashtra approved Modifications to Sanctioned Interim Development Plan & DCR of CSIANA for additional 1.0 FSI for Hotel and Convention Center vide Notification No. TPB/4313/1267/CR-183/2013/I/UD-11, dated 3rd March 2014 and similarly approved additional 1.0 FSI for other Commercial use at CSIANA vide Notification No. TPB/4313/1267/CR-183/2013/I/UD-11 dated 6th May 2015. Proposed development-mix and built-up areas in the proposal approved by SEAC/ SEIAA were based on maximum applicable FSI of 4.

In view of the above updates, the maximum applicable FSI shall be 5, with 15% additional built up area for staircase lobbies, Service Apartments, lift lobbies etc. MIAL has done assessment of adequacy of infrastructure provisions for expected changes in FSI/ built-up area for proposed uses.

Following are the updates in the Project due to change in FSI/ built-up area:

- Development mix of non-operational (landside) area of CSMIA shall have some modifications & Proposed overall Built up area is reduced from 2,815,737 Sqm to 2,419,188 Sqm i.e. decreased by 14.08%.
- Building No 5 (Multi-Level Car Park-2) is already constructed & operational.
- Building No 4 (Multi-Level Car Park-1) is dropped from proposal as it shall not be required.
- Building No 6 (T2-U01) is dropped as it shall not be required.
- Built-up area of the remaining 3 building projects is updated in view of updates in development mix/ proposed uses, etc.

Following section provides the details and comparison of updates to built-up areas, development mix / sub-uses, utility requirements and traffic & transportation aspects related to CSMIA non-operational area, w.r.t. proposals of Environment Approval granted by SEIAA.

Area Statement

Table 2: Comparison between previous sanctioned EC & proposed amendment

Proposed Development Mix	Built-up Area as per Env. Approval dated 1 st July 2011 (Sqm)	Updated Built-up area (Sqm)	Change in Built-up Area	
			Sqm	Percentage
Plot area	170.61 Ha	170.61 Ha	No change	
Non-Aeronautical/ Commercial Area	63.15 ha	50.25 ha	Decreased (-20.42 %)	
Total Construction/ BUA area for Entire Area Development (Sqm)	28,15,737	24,19,188.0	Decreased (-14.08 %)	
Development Mix for Entire Development (Built-up Areas in sq.m.)				
Hotels	11,61,288	7,15,297	-4,45,991	-38.40%
Convention Centre	1,09,194	0	-1,09,194	-100.0%
Entertainment, Retail, Leisure	4,99,818	3,78,527	-1,21,290	-24.26%
Offices, Travel & Tourism, Banks	6,92,128	11,24,318	4,32,190	+62.44%
Hospitals & Healthcare	92,903	32,765	-60,137	-64.73%
Social Infrastructure	1,37,497	1,13,760	-23,736	-17.26%
Residential Areas	1,22,909	54,518	-68,390	-55.64%
Grand Total	28,15,737	24,19,188	-3,96,549	-14.08%

- The total Built-up area of Non-Operational area in CSMIA has decreased from 28,15,737 Sqm to 24,19,186 Sqm i.e. decrease of 3,80,257 Sqm (-14.08%).

- When MIAL submitted proposal for Environmental clearance dated 1st July 2011, the demand assessment for hotels was assumed entirely for 5 Star category hotels. Therefore entire built-up area of 11,61,288 Sqm was assumed for development of 5 Star category hotels.
- However based on subsequent demand assessment and economic feasibility of hotel development at CSMIA, MIAL has revised proposed hotel demand as under
 - a) Five Star category hotels - 15%
 - b) Four Star category hotels - 30%
 - c) Three Star & others, Service Apartments - 55%

Table 3: Update in Construction area of 6 buildings

Development Mix	Built-up Area as per Env. Approval dated 1 st July 2011	Proposed Built-up (as per EC Amendment)	Total Construction Area as per Env. Approval dated 1 st July 2011	Total Construction Area (for EC Amendment)	Change in Total Construction Area (Sqm)	Percentage Change (± %)
Building-1 (T1-C04)	43,649	57,956	73,338	87,868.92	+14,53	+ 19.81 %
Building-2 (T2-C05)	2,61,593	3,27,378	5,26,514	5,38,000.0	+11,486	+ 2.18 %
Building-3 (NS-C01)	1,09,194	1,55,201.58	1,93,774	2,20,647.85	+26,873	+ 13.87 %
Building-4 (T1-P02) (Multi Level Car Parking)	28,380	Project dropped	31,759	Project dropped	-31,759	- 100.0 %
Building-5 (T1-P01) (Multi Level Car Parking)	39,624	4,023.19 Already constructed	43,474	31,180.0 Already constructed	-12,294	- 28.28 %
Building-6 (T2-U01) (Multi Level Car Parking)	16,000	Project dropped	18,024	Project dropped	-18,024	- 100.0 %
Total	4,98,440	5,44,558.77	8,86,883	8,77,696.77	-9,186.23	-1.04

- Total construction area has decreased from 8,86,883 Sqm to 8,77,696.77 Sqm i.e. change of - 9,186.23 Sqm (- 1.04%)
- Construction area of above six buildings are included in Table-1 and 2, indicating the overall reduction in Construction Area.
- This has resulted in reduction in resource demand as mentioned in the following section.

Water Supply and Waste Water Management

Approval for Source of fresh water for entire development is granted by MCGM vide letter No. HE/1421/EEWW(P&R)/IR dated 21st Nov'2012.

Table 4: Comparison of water demand for entire development 'as per Environmental clearance granted dated 1st July 2011' and 'as per submission for EC Amendment'

	Water Demand as per previous EC 2011 (CMD)	Water Demand as per required EC Amendment (CMD)	Change in Water Demand (CMD)	Percentage Decrease
Total	20,392	16,498	-3,894	-19.09%

Total fresh water requirement for entire development is reduced from previous 20,392 CMD to now 16,498 CMD i.e. by 3,894 CMD.

Table 5: Comparison of water demand for four buildings 'as per Environmental clearance granted dated 1st July 2011' and 'as per submission for EC Amendment'

	Water Demand as per Env Approval (CMD)	Water Demand (including updated built-up) (CMD)	Increase/ Decrease in Quantity (CMD)	Percent Increase /Decrease
Domestic Water Demand (Source-MCGM)	1,366	1,338	-28	-2.05%
Treated Water Demand (Source-MIAL STP)	1,058	1,796	738	71.27%
Total Demand	2,424	3,134	710	29.29%

Fresh water requirement for four buildings is reduced from previous 1,366 CMD to now 1,338 CMD i.e. by 28 CMD. Additional requirement of Treated Water has been met from existing MIAL STPs and is not a burden on existing public water sources.

The fresh water demand has reduced from previous requirement due to the following reasons:

- In the initial Environmental Clearance granted to MIAL dated 1st July 2011, the fresh water demand assessment for hotels was assumed entirely for 5 Star category hotels.
- Subsequently, demand assessment and economic feasibility of hotel development at CSMIA was carried out, based on this MIAL has finalized the below hotel categorization for the proposed EC amendment:
 - a) Five Star category hotels - 15%
 - b) Four Star category hotels - 30%
 - c) Three Star & Others, Service Apartments - 55%
- Due to the above reasons there is an overall decrease of 19.09% in water demand.

Table 6: Comparison of Waste Water Generation for Entire development ‘as per Environmental clearance granted dated 1st July 2011’ and ‘as per submission for EC Amendment’

	Waste Water Generation as per Env Approval 2011 (CMD)	Waste Water Generation (Required EC Amendment) (CMD)	Decrease in Quantity (CMD)	Percent Decrease
Total	9,768	9,497	271	-2.27%

Table 7: Comparison of Wastewater Generation for four buildings ‘as per submission for Environmental clearance dated 1st July 2011’ and ‘as per submission for EC Amendment’

	Waste Water Generation as per Env Approval 2011 (CMD)	Waste Water Generation (Required EC Amendment) (CMD)	Increase in Quantity (CMD)	Percent Increase
Total	1,058	1,996	938	88.66%

Total waste water requirement for entire development is reduced from previous 9,768 CMD to now 9,497 CMD i.e. by 271 CMD.

Water balance (amended) for entire development as well as for the proposed 4 buildings after amendment are given in fig. 1 and 2 below.

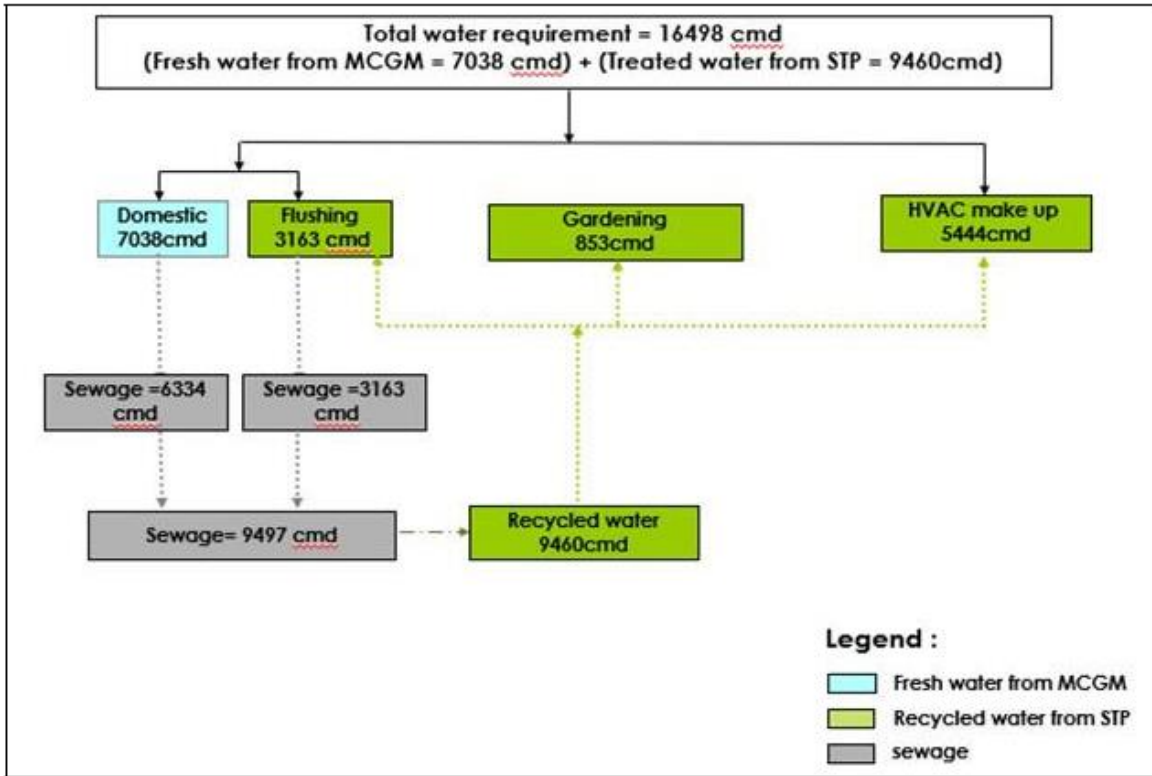


Figure 1: Water Balance for entire development

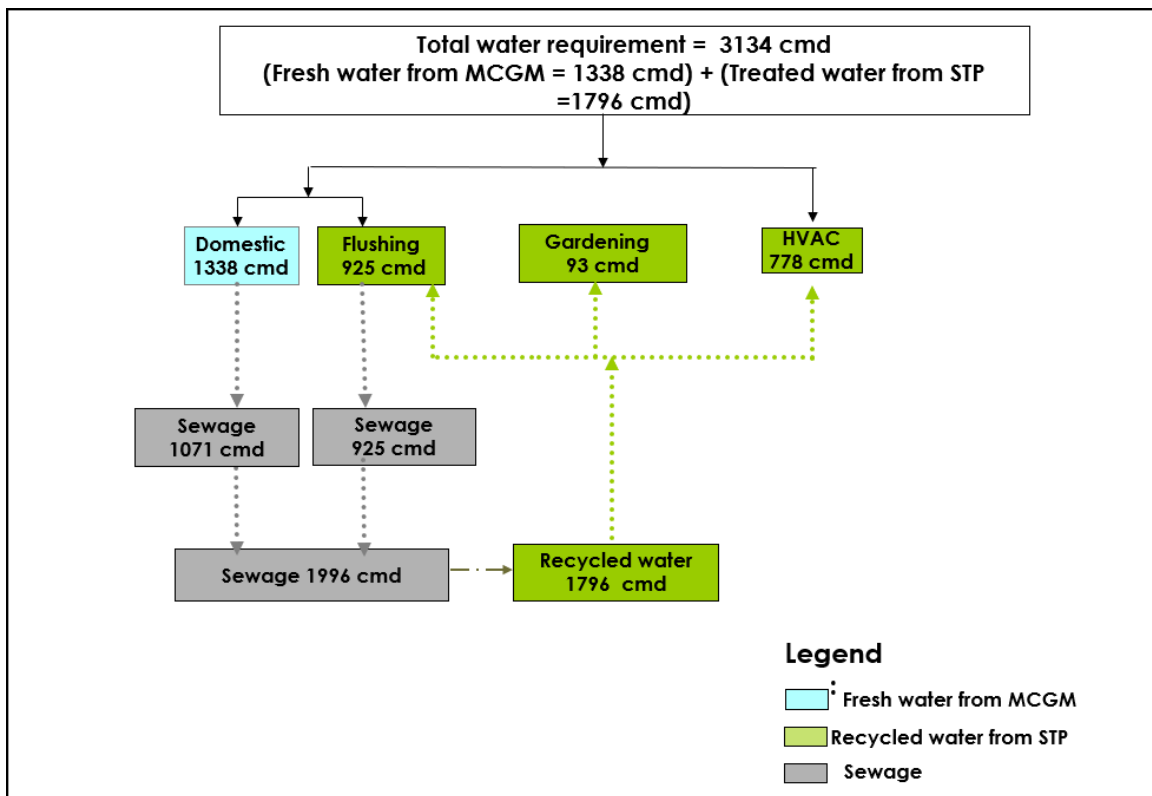


Figure 2: Water Balance for four buildings

Solid Waste Management

Table 8: Comparison of solid waste generation for Entire development 'as per submission for Environmental Clearance dated 1st July 2011' and 'as per submission for EC Amendment'

	Solid Waste Generation (as per Env Approval in MT)	Solid Waste Generation (Required EC Amendment in MT)	Decrease in Quantity (MT)	Percent Decrease
Solid Waste Generation	30.18	21.35	8.83	29.25%

Table 9: Comparison of solid waste generation for four buildings 'as per submission for Environmental clearance dated 1st July 2011' and 'as per submission for EC Amendment'

	Solid Waste Generation (as per Env Approval in MT)	Solid Waste Generation (Required EC Amendment in MT)	Increase in Quantity (MT)	Percent increase
Solid Waste Generation	4.17	5.5	1.33	31.89%

Table 10 : Comparison of trip generation / traffic for entire development 'as per submission for Environmental clearance dated 1st July 2011' and 'as per submission for EC Amendment'

	Traffic Trips as per Env Approval	Traffic Trips (Required EC Amendment)	Change in Traffic Trips	Percent Decrease
Total Non-Aero Trips	2,40,000	2,14,520	-25,480	-10.62%
Total Aero Trips	5,85,000	5,85,000	0	0.00%
Total Trips	8,25,000	7,99,520	-25,480	-10.62%

Power Demand

Table 11: Comparison of power demand for Entire development 'as per submission for Environmental clearance dated 1st July 2011' and 'as per submission for EC Amendment'

	Power Demand (Original) (MVA)	Power Demand (Required EC Amendment) (MVA)	Change in Demand (MVA)	Percent Decrease
Power Demand	140	120	-20	-14.28%

Table 12: Comparison of power demand for proposed four buildings ‘as per submission for Environmental clearance dated 1st July 2011’ and ‘as per submission for EC Amendment’

	Original Power Demand (MVA)	Power Demand Required for EC Amendment (MVA)	Change in Demand (MVA)	Percent Increase
Power Demand	22.5	35.0	+12.5	+55.55%

C. Description of the Environment

The existing baseline environmental status (land, air, noise, water, biodiversity and socio-economy) was assessed within the study area (10km radius) and was based on the analysis results of monitoring carried out during summer 2019 of various environmental parameters.

LULC study of the study area around the site, shows that most of the study area i.e. 41.90% falls under the class Built up Land. The existing Airport covers 1.08% area. The Sanjay Gandhi National Park is at about 5km from the site and the landuse Class Forest covers about 6.53% of the total study area. Barren/ Unculturable /Waste Lands cover 1.81%. Arabian Sea being in close vicinity, the area under the class Water body and Wetlands comprise of approximately 25.76% and 10.10% of the total area, whereas area under mangroves is about 12.10% of the total area under 10 km.

The predominant soil cover in Mumbai city is in general sandy; whereas in the suburban district, the soil cover is alluvial and loamy. Soil quality has been studied at 3 locations and it was observed that soil is mostly clay loam. Organic Carbon, Nitrogen and Potassium is low; indicating poor fertility status and requirement of nutrition supplement to grow crops and other vegetation. AAQM results were studied for PM₁₀, PM_{2.5}, SO₂, NO_x, CO at 4 locations and it was observed that all parameters are well within the prescribed limits of NAAQS. Although dust generation was observed on site due to construction activity in the surrounding, it can be seen from the readings that there is no significant air pollution. Noise monitoring was carried out at 4 locations and the readings show the noise levels to be above the standards during day time and night time for few of the locations. 4 and 2 samples were studied for both surface and ground water respectively. The results were checked against the Water Quality Standards for Best Designated Usage as categorized by MPCB. The results indicate that water quality broadly meets the requirements of Class C that is use of water permitted after Conventional Water Treatment. The readings of groundwater quality monitoring were checked against the limits as per IS 10500-2012. The results show a higher level of chloride content at one of the location. Presence of coliforms and *E. Coli* was also not detected.

During the biodiversity study, it was found that the status of vegetation was mix deciduous forest, littoral forest of mangroves and dense vegetation. Sanjay Gandhi National Park is situated about 4.5 km from project site, and is habitat for various mammals, reptiles, birds, insects etc. the forest is of mix deciduous type to subtropical hill forests. The presence of Schedule I species includes

Panthera pardus fusca, *Felias rubiginosa* within study area, *Tetracerus quadricornis*, *Tragulus meminna*. Indian Flying Fox found in study area which comes under Schedule V Indian Wildlife (Protection) Act, 1972. There is no endangered species of Botanical flora as mentioned in Schedule VI of Indian Wildlife (Protection) Act, 1972. Few species of mangroves were found near the creek within study area.

Socio-economic shows that the average family size is 4.52 persons per household as per Census of India, 2011. Literacy rate of the study area is 80.42%. The total working population in the study area is 58.61% of which 37.50% are main workers and 2.40% are marginal workers. The area has good transportation facility, infrastructure, education, banking and health facilities. Water, solid waste management facilities and power supply provided by MCGM are well in place.

D. Anticipated Environmental impacts and mitigation measures

Environmental impact matrix evaluation shows that the proposed development will have minor negative impacts due to dust generation and transportation of materials during construction work. Air and noise pollution from construction equipment will be mitigated. Workers will be provided personal protective equipment like earmuffs and ear plugs and machinery shall meet standards under EP Act, 1986.

Felling of trees shall be done with prior permission of competent authority. Green areas will be developed and a total of about 16,890 trees are proposed to be planted, out of which 12,000 trees are already planted. Tree species will be selected based on their ecological/ medicinal/ economic significance.

During operation phase, there is overall reduction in the resource requirements and hence no major impact is anticipated. Reuse of waste water after treatment, solid waste management after due segregation of waste, green area development etc. are part of the proposal which will reduce negative impact on the environmental parameters. Major impact is anticipated from increase in traffic and due studies in order to mitigate the impacts are proposed. Adequate parking facility and road signage will also be provided to maintain traffic during operation phase.

E. Environmental Monitoring Programme

Monitoring of environmental parameters like ambient air, noise, water, soil etc. will be carried out for identification of areas in need of restoration and also to understand the nature and magnitude of pollution control required. An Environmental Management Committee consisting of core staff including an environmental engineer, mechanical/electrical /civil engineer etc. will be set up. This body will oversee, inspect, co-ordinate and implement the entire environmental aspects of the proposed development. All the members will be given specialized training to take care of operation and maintenance of environmental infrastructure, fire fighting and emergency operations. Committees will be set up during the construction as well as operation phases.

F. Additional Studies

Disaster Management Plan: A Disaster Management Plan has been prepared to mitigate any kind of disasters (manmade or natural) beforehand. All the line authorities are assigned with their proper role and responsibilities, which are clearly indicated. Information about actions to be taken and rehabilitation camp/ relief assistance are outlined with special reference to flood risk management.

Traffic Management Plan: Traffic analysis due to the additional 1.0 FSI on the newly proposed 'Other Commercial Uses' has been reviewed in detail in the study. It can be concluded that the traffic due to landside development of CSIA on the key surrounding roads connecting the airport is within range and can be accommodated within the road expansions & new road proposals of Interim DP.

This is achieved due to the fact that the Interim Development Plan of CSIA has envisioned high capacity transport network such as Metro line 3, along with high speed, efficient circulation and dispersal system such as Sahar Elevated Road; transport facilities such as MLCPs, taxi staging etc. In addition, in order to cater to the peak hour flows additional capacity augmentation of important arterial roads is provided in the Interim Development Plan together with required new internal collector roads with adequate lane configuration.

In view of this it is observed that the provisioning of transport network made in the Interim development Plan of CSIA is sufficient and there shall be no traffic congestion with the envisaged 5.0 FSI landside developments.

G. Project Benefits

Restructuring of the Non-operational (cityside) land is important to guide the lateral development or redevelopment by defining the future development and land use patterns, areas of open spaces & social facilities, the layout and nature of infrastructure (including transportation links), and other key features. It will help to accommodate contemporary Nonoperational uses related to airport needs, efficient use of land and integrated lateral development by way of comprehensive master planning of Non-operational area.

Proposed landuse plan of Non Operational Area defines proposed cityside development approach with special emphasis on adequate land allocation for Non-operational (cityside) uses. Existing activities also are accommodated in the site to serve the airport as well as surrounding area/ localities. The envisaged mixed-use development as part of the Non Operational Area shall have the primary aim of becoming a true attraction point in Mumbai, a vibrant world class mixed-use commercial, recreational, hospitality centre for the passengers as well for the people of Mumbai.

Strategically located outside the existing airport, the landside development is intended to become a unique destination, an Urban Activity Centre for a wide range of compatible hospitality, commercial, recreational, entertainment, cultural and business functions. It will have a world class

architectural and urban design character and shall involve relocation of few existing functions, review of existing on-site traffic and road-network and planning of new road network and utility infrastructure.

H. Environment Management Plan

The Environmental Management Plan is prepared with the main objective of enlisting all the requirements to ensure effective mitigation of adverse impacts for all the components of the proposed project. The predicted negative impacts will occur mostly during the construction stage and operation stage. The impacts are also manageable and almost all of them can be minimized through engineering solutions incorporated in the design and implementation of the EMP and the proposed monitoring plan.

A total budget of INR 1,190.0 lakh (capital cost) and INR 176.5 lakh as annual recurring cost for maintenance and operation has been envisaged for the implementation of the EMP. For all works, the project proponent will, however, have to obtain applicable clearances from the MPCB and other concerned authorities. It is also recommended that the proposed EMP is improvised during implementation if there is any change in design or realignment (if deemed necessary).

I. Conclusion

1. MIAL has been granted EC for landside development and construction of 6 buildings by SEEIA on 1st July, 2011. The EC is valid upto 1st July, 2018 and MIAL has received an extension of EC as per Clause 9 (ii) of EIA Notification 2006.
2. The project is under implementation and Building No.5 (MLCP-2) has already been constructed and is under operation.
3. In the meanwhile, GoM has approved modification/changes in permissible FSI due to which the project has undergone marginal/minor changes in Builtup area and construction area as detailed in Table 1 & Table 2. The total construction area of the 4 Buildings has slightly increased whereas the total construction area of entire Landside development has reduced.
4. Due to the reduced construction area and modified development mix, the water demand has reduced from the initial 20,392 CMD to 16,498 CMD i.e. an overall decrease of 19.09% . Correspondingly, the waste water generation has also reduced.
5. Similarly, the solid waste generation for entire development (in terms of MT) has been reduced by 29.25%.
6. The traffic movement for entire development is reduced by 10.62%.
7. Power demand for entire development has been reduced by 14.28%.
8. It shall be noted that the change in demand of utility is well within the current Environment approval. Moreover, demand for most of the utilities has been reduced because of decisions in project development based on the demand assessment of proposed development mix.

9. The projected demand for utility infrastructure shall be met in phases.
10. Since the planned infrastructure is more than the current requirement considering redundancy, development-mix and connected factors, the proposed minor modifications in built-up and demand shall not impact the development and environment unfavourably.

The EIA report has thoroughly assessed all potential environmental impacts likely to be generated due to the amendment in the project proposal based on the existing baseline environmental status (monitoring period of summer 2019). These impacts are identified to be of temporary and reversible nature for which suitable mitigation measures are recommended.

The proposed mitigation measures recommended in this report are sufficient. It can also be observed that all negative impacts, envisaged during the “post-construction and operation” phase of the project, present no major environmental and ecological concerns, and hence it can be concluded that the project is socio-economically and environmentally sustainable.

CHAPTER 1. INTRODUCTION

1.1 BACKGROUND OF STUDY

Environmental Impact Assessment (EIA) as the name suggests is a process of meticulous assessment of environmental impacts for the purpose of identifying /evaluating the potential benefits or adverse impacts of development projects on the surrounding environment; consisting of land, air, water and biological factors, taking in to account environmental, economic, social, cultural and aesthetic considerations. All activities associated with planning, design, site preparation, construction, operation and maintenance within the proposed project are considered to help decision makers and project planners to develop proper mitigation measures at an early stage in the project.

The aim of an EIA is to ensure that potential impacts are identified and addressed. For this purpose, an Environmental Impact Assessment (EIA) Report has been prepared to assess baseline environmental conditions at the site and an Environment Management Plan (EMP) has been prepared to execute the project with minimum pressure on the natural resources and negligible impacts on the environment.

The scope of work for EIA includes:

- Assessment of the present status of air, water, noise, land, biological and socio-economic components of the environment;
- Identification and quantification of the impacts due to the proposed project on the environmental components (in the pre-construction, construction and operation stage);
- Assessment of environmental impacts;
- Preparation of Environmental Management Plan (EMP) outlining additional control technologies to be adopted for mitigation of adverse impacts and
- Delineation of post-project environmental quality monitoring to be pursued by the project proponent.

1.2 IDENTIFICATION OF PROJECT & PROJECT PROPONENT

1.2.1 The Project

The Chhatrapati Shivaji Maharaj International Airport (CSMIA) located at Mumbai serves as a gateway to India for international passengers, tourists and business travellers and also as a major domestic aviation hub. The project proponent Mumbai International Airport Ltd. (MIAL), is at present developing and upgrading the 'Non Operational Area' of the airport premises. Non Operational Area (landside area) development in CSMIA is the area outside aeronautical area/ zone and is independent of aviation/ aeronautical area.

The project pertains to site development i.e. lateral development in the Non-Operational area (landside) of CSMIA. The project area excludes the airside area. In addition to lateral development, several uses and projects have been identified as part of proposed Non-Operational (cityside) development.

The entire area is being developed over a period of approximately 15 years which shall provide required non-aeronautical uses and supporting functions for airport development and shall be accessible to the general population. Implementation of the project as per already obtained environmental clearance is already underway and this study pertains to the amendment to the proposal.

1.2.2 Project Proponent

In January 2006, the Airport Authority of India (AAI) entered into agreement with Mumbai International Airport Limited (MIAL) and entrusted the responsibility of operation, management and development of CSMIA to MIAL for 30 years, extendable by another 30 years. Mumbai International Airport Pvt. Ltd. (MIAL) is a joint venture between the GVK-led consortium and Airports Authority of India. MIAL was awarded the mandate of modernizing and upgrading Chhatrapati Shivaji Maharaj International Airport (CSMIA) in 2006.

The proponent of the present development, MIAL, is actively progressing on the development of CSMIA with the objective of creating world class airport and related aviation infrastructure facilities for people of Mumbai and Maharashtra. CSMIA is being developed to serve as 'Gateway to India' for international passengers, tourists, business travelers and as a major domestic aviation hub.

Development shall generate large employment opportunity for people of Mumbai in addition to creation of an international landmark for the city.

1.3 BRIEF DESCRIPTION OF NATURE, SIZE, LOCATION OF THE PROJECT AND ITS IMPORTANCE IN THE COUNTRY, REGION

1.3.1 Nature and Size of the Project

The present proposal is for amendment in existing area development project. Earlier, the project has received environmental clearance dtd. 1st July, 2011 which has been revalidated on 20th December, 2018 (vide letter no SEIAA-2018/CR-138 Est). *[Please refer to Annexure I: Previous Environmental Clearance and Extension letter].*

The project consists of area development (roads/ pedestrian infrastructure, storm water drainage, water supply, sewerage, STPs, other utilities etc.) in the Non-Operational area (landside) of CSMIA. The project area excludes the airside area. The proposal pertains to site and infrastructure development on an area of 170.61 ha planned for construction of 27,99,446 sq.m. (approximately 2.8 million sq.m.) in the future.

The proposal was initially based on the then proposed "Master Plan for Non-Operational development in CSMIA" which later became the part of Interim Development Plan of CSMIA Notified Area, approved by Government of Maharashtra (GoM) vide Notification No. CMS/TPB/4312/1/CR-47/2012/I/UD-11, dated 17th May, 2013. Subsequently, the Government of Maharashtra approved Modifications to Sanctioned Interim Development Plan & DCR of CSIANA for additional 1.0 FSI for Hotel and Convention Center vide Notification No. TPB/4313/1267/CR-

183/2013/I/UD-11, dated 3rd March, 2014 and similarly approved additional 1.0 FSI for other Commercial use at CSIANA vide Notification No. TPB/4313/1267/CR-183/2013/I/UD-11 dated 6th May 2015. Proposed development-mix and built-up areas in the proposal approved by SEAC/ SEIAA were based on max applicable FSI of 4.

[Please refer to **Annexure II: Master Plan for Non-Operational development in CSMIA**]

In view of the above updates, the maximum applicable FSI shall be 5, with 15% additional built up area for staircase lobbies, Service Apartments, lift lobbies etc.

As part of the development, several uses and projects have been identified like retail commercial, offices, hotels, entertainment, offices, travel and tourism, banks, hospital and health care, social infrastructure, residential areas etc. Work on Building -5 (Multi-Level Car Park -2) with construction area of approx. 39,624.00 sq.m. is completed as per previous EC. Roads, drains, STPs and power cabling has also been completed on part of site.

The following table gives the comparison between Landuse Area Statement as per previous sanctioned EC and amendment sought:

Table 1-1: Area Statement of Non-Operational Area
(Comparison between previous sanctioned EC and amendment sought)

Proposed Development Mix	Built-up Area as per Env. Approval dated 1 st July 2011 (sq.m)	Updated Built-up area (sq.m)	Change in Built-up Area	
			sq.m	Percentage
Hotels	11,61,288	7,15,297	-4,45,991	-38.00
Convention Centre	1,09,194	0	-1,09,194	-100.00
Entertainment, Retail, Leisure	4,99,818	3,78,527	-1,21,290	-24.26
Offices, Travel & Tourism, Banks	6,92,128	11,24,318	4,32,190	62.44
Hospitals & Healthcare	92,903	32,765	-60,137	-64.73
Social Infrastructure	1,37,497	1,13,760	-23,736	-17.26
Residential Areas	1,22,909	54,518	-68,390	-55.64
Grand Total	28,15,737	24,19,188	-3,96,549	-14.08

Following are the updates in the project due to change in FSI/ built-up area:

- Development mix of non-operational (landside) area of CSMIA shall have some modifications & Proposed overall Built up area is reduced from 28,15,737 Sq m to 24,19,188 sqm. i.e. decreased by 13.60%.
- Building No 5 (Multi-level car park-2) is already constructed & operational.
- Building No 4 (Multi-level car park-1) is dropped from proposal as it shall not be required.
- Building No 6 (T2-U01) is dropped as it shall not be required.
- Built-up area of the remaining 3 building projects is updated in view of updates in plot area, development mix/ proposed uses etc.

When MIAL submitted the proposal for Environmental Clearance on 1st July 2011, the demand assessment for hotels was assumed entirely for 5 Star category hotels. Therefore, the entire built-up area of 11,61,288 sq.m. was assumed for development of 5 Star category hotels.

However, based on subsequent demand assessment and economic feasibility of hotel development at CSMIA, MIAL has revised the proposed hotel demand as under:

- Five Star category hotels - 15%
- Four Star category hotels - 30%
- Three Star & others, service apartments - 55%

Due to above reasons, there is an overall decrease of resource requirements as can be seen from the below table:

Table 1-2: Resource requirement for entire area development

Sr. No	Project Details	As per EC dtd. 1 st July 2011, revalidated on 20 th Dec., 2018	Proposal with Amendment	Remarks
A	Water requirement	20,392 cmd	16,498 cmd	Decreased (-19.1 %)
B	Wastewater generation	9,768 cmd	9,497 cmd	Decreased (-2.8 %)
C	Municipal solid waste generation	30.18 MT	21.35 MT	Decreased (-29.25 %)
D	Power demand	140 MVA	120 MVA	Decreased (-14.28 %)

The built-up area of the remaining 3 building projects is updated in view of updates in development mix/ proposed uses etc. The total built-up area of proposed buildings has increased from 4,98,440 sq.m. to 5,44,558.77sq.m. and the total construction area has decreased from 8,86,883 sq.m. to 8,77,696.77sq.m. i.e. change of - 9,186.23 sq.m. (-1.04%).

The following table (**Table 1.3**) presents the comparison between Area Statement of the proposed buildings as per previous sanctioned EC and amendment sought.

**Table 1-3: Area Statement of 4 buildings
(Comparision between previous sanctioned EC and amendment sought)**

Development Mix	Built-up Area as per Env. Approval dated 1st July 2011	Proposed Built-up (as per EC Amendment)	Total Construction Area as per Env. Approval dated 1st July 2011	Total Construction Area (for EC Amendment)	Change in Total Construction Area (Sqm)	Percentage Change (± %)
Building-1 (T1-C04)	43,649	57,956	73,338	87,868.92	+14,53	+ 19.81 %
Building-2 (T2-C05)	2,61,593	3,27,378	5,26,514	5,38,000.0	+11,486	+ 2.18 %
Building-3 (NS-C01)	1,09,194	1,55,201.58	1,93,774	2,20,647.85	+26,873	+ 13.87 %
Building-4 (T1-P02) (Multi Level Car Parking)	28,380	Project dropped	31,759	Project dropped	-31,759	- 100.0 %
Building-5 (T1-P01) (Multi Level Car Parking)	39,624	4,023.19 Already constructed	43,474	31,180.0 Already constructed	-12,294	- 28.28 %
Building-6 (T2-U01) (Multi Level Car Parking)	16,000	Project dropped	18,024	Project dropped	-18,024	- 100.0 %
Total	4,98,440	5,44,558.77	8,86,883	8,77,696.77	-9,186.23	-1.04

The built up areas of above proposed four buildings are included in Table 1.1, indicating overall reduction.

This has resulted in overall reduction in resource demand as mentioned in Table 1.2, but an increase can be seen in the resource requirement for the 4 buildings as indicated in the table below:

Table 1-4: Resource requirement for 4 buildings

Sr. No	Project Details	As per EC dtd. 1 st July 2011, revalidated on 20 th Dec., 2018	Proposal with Amendment	Increase in Quantity (lit)	Percent Increase/ Decrease
A	Domestic water demand [Source-MCGM] (cmd)	1,366	1,338	-28	-2.05%
	Treated Water demand [Source-MIAL STP] (cmd)	1,058	1,796	738	71.27%
	Total (cmd)	2,424	3,134	710	29.29%
B	Wastewater generation (cmd)	1,058	2,129	1071	101.2%
C	Municipal solid waste generation (MT)	4.17	5.5	1.33	31.89%
D	Power demand (MVA)	22.5	35.0	12.5	55.55%

Though the total water requirement is increased by 29%, the fresh water requirement to be sourced from MCGM has decreased by 2%.

It shall also be noted that the change in demand of utility is well within the current environment approval.

1.3.2 Site Location and Connectivity

The site is located on the landside of Chhatrapati Shivaji Maharaj International Airport. It is accessible from the Western Express Highway (WEH), the Sahar & Andheri-Kurla road and the Jawaharlal Nehru road located to the south of the site.

1.3.3 Importance of the Project to the Country, Region

Restructuring of the Non-operational (Landside) area is important to guide the lateral development or redevelopment by defining the future development and land use patterns, areas of open spaces & social facilities, the layout and nature of infrastructure (including transportation links), and other key features. It will help to accommodate contemporary. Non-operational uses related to airport needs, efficient use of land and integrated lateral development by way of comprehensive master planning of Non-operational area.

The envisaged mixed-use development as part of the Non-Operational Area shall have the primary aim of becoming a true attraction point in Mumbai, a vibrant world class mixed-use commercial, recreational, hospitality centre for the passengers as well for the people of Mumbai.

Strategically located outside the existing airport, the landside development is intended to become a unique destination, an Urban Activity Centre for a wide range of compatible hospitality, commercial, recreational, entertainment, cultural and business functions. It will have a world class architectural and urban design character and shall involve relocation of few existing functions,

review of existing on-site traffic and road-network and planning of new road network and utility infrastructure.

The project shall provide required non-aeronautical uses and supporting functions for airport development and shall be accessible to the general population. Proposed development in non-operational (landside) area is conventional urban development, independent of airside operations. Traditional Transit Oriented Hospitality development is also a feature of the proposed development.

1.4 REGULATORY SCOPING AND ITS COMPLIANCE

1.4.1 Terms of Reference for EIA Studies

Since the development covers an area >50 ha., the proposed activity falls under 'Category 8(b)- Townships & Area Development Projects under the EIA Notification of 14th Sept. 2006, for which prior Environmental Clearance (EC) is required. Accordingly, the project has obtained environmental clearance dtd. 1st July, 2011, revalidated on 20th December, 2018.

The EIA study has been carried out for the proposed amendment in Environment Clearance for the modifications in the development mix and overall reduction in built up area by 13.58% (**Table 1.1**).

The Standard ToR published by MoEFCC has been referred to for carrying out the EIA study and the compliance to the same is shown in the following table:

Table 1-5: Compliance to Standard ToR for 8(b) category projects

S.No.	Term of Reference	Compliance
1.	Examine details of land use as per Master Plan and land use around 10km radius of the project site. Analysis should be made on latest satellite imagery for land use with raw images.	Please refer to Chapter 3: Baseline Env. Monitoring, Section 3.2.5 : Landuse Pattern describing the LULC studies for the study area of 10 km around the site
2.	Submit details of environmentally sensitive places, land acquisition status, rehabilitation of communities/ villages and present status of such activities	Details of environmentally sensitive places are given under Section 3.2.1, table 3.2 . Land acquisition status: The proposed development is as per the sanctioned DP of CSMIA Notified Area approved by GoM.
3.	Examine baseline environmental quality along with projected incremental load due to the project	Monitoring carried out during the summer season (2019). The baseline environmental quality is described in Chapter 3: Description of the Environment . Projected incremental load due to the project is covered in Ch 4: Environmental Impacts and Mitigation Measures .
4.	Environmental data to be considered in relation to the project development would be (a) land, (b) groundwater, (c) surface water, (d) air, (e) biodiversity, (f) noise and vibrations, (g) socio	Please refer to Ch 3: Description of the Environment , separate sections for each environmental parameter are mentioned.

S.No.	Term of Reference	Compliance
	economic and health	
5.	Submit a copy of the contour plan with slopes, drainage pattern of the surrounding area.	Contour plan with slopes, drainage pattern of the surrounding area is given under section 3.2.4 and Digital Elevation Model (DEM) of the site and surrounding area is enclosed as fig. 3.3 and fig. 3.4 .
6.	Submit the details of the trees to be felled for the project	Total 12,000 no of trees are planted on site. Details are enclosed under section 2.4.16
7.	Submit the present land use and permission required for any conversion such as forest, agriculture etc.	As per GoM approved modifications to Sanctioned Interim Development Plan & DCR of CSIANA for additional 1.0 FSI for Hotels vide Notification No. TPB/4313/1267/CR-183/2013/I/UD-11, dated 3rd March 2014 and similarly approved additional 1.0 FSI for other Commercial use at CSIANA vide Notification No. TPB/4313/1267/CR-183/2013/I/UD-11 dated 6th May 2015, there is an increase in FSI/ built- up area.
8.	Submit Roles and responsibilities of the developer etc. for compliance of environmental regulations under the provisions of the EP Act.	Please refer to Ch 10: Environmental Management Plan, Section 10.3: Responsibilities for Environmental Management
9.	Ground water classification as per the Central Ground Water Authority.	Please refer to Section 3.5.2 for Ground water classification as per CGWB Year Book.
10.	Examine the details of source of water, water requirement, use of treated waste water and prepare a water balance chart.	Please refer to Section 2.4.8 for water requirements and sources of water during construction and operation phase of the project (Table 2.20). Water balance chart is presented as fig. 2.31 .
11.	Rain water harvesting proposals should be made with due safeguards for ground water quality. Maximize recycling of water and utilization of rain water. Examine details.	Please refer to Section 2.4.10 for details of Rain water harvesting proposal.
12.	Examine soil characteristics and depth of ground water table for rain water harvesting.	Please refer to Section 3.2.6 and 3.2.7 for soil characteristics. Ground water table details are given under section 3.5.2 .
13.	Examine details of solid waste generation treatment and its disposal.	Please refer to Section 2.4.11 for solid waste generation treatment and its disposal during construction and operation phase of the project.
14.	Examine and submit details of use of solar energy and	Proposal for alternative source of energy

S.No.	Term of Reference	Compliance
	alternative source of energy to reduce the fossil energy consumption.	is described under section 2.4.12.
15.	DG sets are likely to be used during construction and operational phase of the project. Emissions from DG sets must be taken into consideration while estimating the impacts on air environment. Examine and submit details.	Impacts of DG sets and relevant mitigation measures are mentioned under section 4.2.2.
16.	Examine rail/ road connectivity to the project site and impact on the traffic due to the proposed project. Present and future traffic and transport facilities for the region should be analysed with measures for preventing traffic congestion and providing faster trouble free system to reach different destinations in the city.	A brief summary of the same is given in Ch. 7, Section 7.2.
17.	A detailed traffic and transportation study should be made for existing and projects passenger and cargo traffic.	Same as above
18.	Examine details of transport of material for construction which should include source and availability	Please refer to Section 2.4.5: Raw Material requirement and table 2.14.
19.	Examine separately the details for construction and operation phases both for Environmental Management Plan and Environmental Monitoring Plan with cost and parameters	Details for construction and operation phases for proposed EMP are covered in Ch 10. Environmental Monitoring Plan for construction and operation phases are given in Chapter 6: Environmental Monitoring Program, table 6.1.
20.	Submit details of a comprehensive Disaster Management Plan including emergency evacuation during natural and manmade disaster.	Comprehensive Disaster Management Plan is attached as Annexure VII. A brief summary of the same is given in Ch. 7, Section 7.1.

1.4.2 Permits and Approvals

The Government of Maharashtra approved Modifications to Sanctioned Interim Development Plan & DCR of CSIANA for additional 1.0 FSI for Hotel and Convention Center vide Notification No. TPB/4313/1267/CR-183/2013/I/UD-11, dated 3rd March 2014 and similarly approved additional 1.0 FSI for other Commercial use at CSIANA vide Notification No. TPB/4313/1267/CR-183/2013/I/UD-11 dated 6th May 2015.

Since the project is an Area Development project as per the EIA Notification, 2006 and falls under the 8B category, Mumbai International Airport Ltd. (MIAL), submitted the application for prior Environmental Clearance for '*Non-Operational Area (Landside) Development of CSMIA and construction of six buildings*' to State Level Expert Appraisal Committee (SEAC), Maharashtra on 16th October, 2010. The proposal was considered by State Level Expert Appraisal Committee (SEAC), Maharashtra in its 41st Meeting under screening category 8(b) as per EIA Notification, 2006, and was recommended to State Level Environmental Impact Assessment Authority (SEIAA).

The project was considered by SEIAA in its 37th Meeting held on 18th April, 2011 and accorded the Environmental Clearance on 1st July, 2011. The EC was revalidated on 20th Dec., 2018 (valid upto 29th June, 2025).

Subsequently, Consent to Establish (CtE) was obtained from MPCB vide consent dated 30th January, 2014, and construction work initiated. As on date, Building No.5 (Multi Level Car Parking- 2) has already been constructed and is under operation since September, 2015 (MPCB Consent to Operate obtained vide letter dated 19th September, 2015).

Approvals received for the project are presented in the table below:

Table 1-6: List of NOCs and Approvals

Sr. No.	Description	Dated
1	Government of Maharashtra Notification for Mumbai Metropolitan Region Development Authority (MMRDA) as Special Planning Authority (SPA)	14.05.2009
2	Layout Approval for land bearing CTS No. 7723 (pt) of village Kolekalyan, Santacruz (East), Mumbai - 400029 for MIAL. Ref. No: TCP(P-2)/MIAL/CC/3.5/94/2010	29.03.2010
3	Major Nallah Approval for T2 Forecourt. Ref. No: Dy.Ch. E/S.W.D./1002/PC	02.07.2010
4	Revised Major Nallah remarks for Cargo Complex Nallah Ref. No: Dy.Ch. E/S.W.D./2941/PC	21.01.2011
5	Environmental Clearance for CSIA Non-Operational Area (SkyCity) Ref. No. SEAC-2010/CR.53/TC-2	01.07.2011
6	Layout Approval for land bearing CTS No. 145 (A) village Sahar, Andheri (East), Mumbai - 400099 for MIAL. Ref. No: TCP(P-2)/MIAL/CC/3.7/I/821/2011	12.07.2011
7	Layout Plan for Sewerage Approval/ Remarks in MCGM for land bearing CTS No. 1405 (pt), 145 (A), 2085 (pt) & 7723(pt) of village Marol, Sahar, Vile Parle & Kolekalyan, Mumbai for MIAL. Ref. No: MIAL/DIR.(UP)/272/2011/369	29.11.2011
8	Layout Approval for land bearing CTS No. 1405 (pt) village Marol, Andheri (East), Mumbai-400099 for MIAL. Ref. No: TCP(P-2)/MIAL/CC/3.11/1413/2011	08.12.2011
9	Storm Water Drain Approval/ Remarks for land bearing CTS No. 1405 (pt) of Village Marol, Andheri (East), Mumbai - 400099 for MIAL. Ref. No: Dy.Ch. E/6036/S.W.D./W.S.	08.12.2011
10	Storm Water Drain Approval/ Remarks for land bearing CTS No. 145 (A) of Village Sahar, Andheri (East), Mumbai - 400099 for MIAL. Ref. No: Dy.Ch. E/4019/S.W.D./W.S.	08.06.2012
11	Layout Plan Approved/ Remarks (for water pipeline network) in MCGM for land bearing CTS No. 7723 (pt) of village Kolekalyan, Mumbai for MIAL. Ref. No:HE/504/HEWW(P&R)/IR	03.07.2012
12	Layout Plan Approved/ Remarks (for water pipeline network) in MCGM for land bearing CTS No. 145 (A) of village Sahar, 1405 (pt) of village Marol Mumbai for MIAL. Ref. No:HE/721/HEWW(P&R)/IR	28.08.2012
13	Storm Water Drainage Approval for land bearing CTS No. 2085 (pt) of Vile Parle (T1 Forecourt), Mumbai.	09.11.2012

Sr. No.	Description	Dated
	Ref. No: Dy.Ch. E/4264/S.W.D./W.S.	
14	Layout Approval for land bearing CTS No. 2085 (pt) of village Vile Parle (East), Mumbai - 400099 for MIAL. Ref. No: MIAL/DIR.(UP)/267/2011/172	16.01.2013
15	Storm Water Drainage Approval for land bearing CTS No. 2085 (pt) of village Vile Parle , CTS No. 41 of village Bamanwada & CTS No. 523 of village Chakala ,Mumbai. Ref. No: Dy.Ch. E/1084/S.W.D./W.S.	25.03.2014
16	Layout Plan Approved/ Remarks (for water pipeline network) in MCGM for village Sahar, Mumbai for MIAL. Ref. No:HE/1421/HEWW(P&R)/IR	21.11.2012
	Part Certification and Completion Certificate. Ref. No:HE/1421/HEWW(P&R)/IR	27.09 .2014
17	Approval for Widening & Upgradation of International Airport Road (I.A. Road) in village Sahar, Mumbai. Ref. No: TCP(P-2)/MIAL/NOC/4.2/2259/2013	10.10.2013
18	Approval for road through IAD Colony in CSIA, Mumbai. Ref. No: TCP(P-2)/MIAL/NOC/4.3/176/2014	05.02.2014
19	Approval for Upgradation & Beautification of Sahar (at Grade) Road from MIAL colony to Hyatt Hotel near Terminal-II in at CSIA, Mumbai. Ref. No: TCP(P-2)/MIAL/NOC/4.4/175/2014	05.02.2014
20	Approval for (R1-R2-R3) Road in MIAL colony at CSIA, Mumbai. Ref. No: TCP(P-2)/MIAL/NOC/4.6/1172/2015	25.08.2015
21	MMRDA Approval for New Cargo Road in MIAL colony at CSIA, Mumbai. Ref. No: TCP(P-2)/MIAL/NOC/4.5/1171/2015	25.08.2015
22	Sewerage Remarks for proposed sewerage Network in North Sahar layout.	28.03.2016
23	Sewerage Remarks for proposed sewerage Network in T-1 Forecourt layout.	30.05.2016
24	Approval from Dy.Ch.Engg (SWD Planning) Dept for Proposed Upgradation of existing Operational Construction of Fuel Farm at Santacruz.	14.07.2016
25	Installation of Solar Panels on Lelwadi Nalla near T2 at CSIA.	03.10.2016
26	Sewerage Remarks from MCGM for networks of sewage for North Village at Sahar.	27.10.2016
27	Re-alignment of 1800mm dia sewer line in MIAL colony / North Sahar at CSIA, Mumbai.	13.02.2017
28	Approval received from K-East ward for developing of Existing Talao at Navpada.	26.05.2017
29	Cargo Nala Remarks received from Dy. Ch. Engg (SWD Planning Cell) MCGM.	01.09.2017
30	Sewerage Remarks from MCGM for Sewage network for west gate.	05.02.2018
31	Sewerage Remarks from MCGM for Sewage network for T2 Forecourt & South Sahar Areas.	05.02.2018
32	Approval for (NVR 02-NVR 03-NVR 05) Road at CSIA, Mumbai. Ref. No: TCP(P-2)/MIAL/NOC/4.10/1686/2017	31.07.2017
33	MMRCL Provisional NOC for Proposed development on Plot No:T1-C03,T1-C05 & T1-C06, T1-C08, NS-C01, NS-C02, NS-C03, SS-C05, SS-C06, SS-C07,T2-C01,T2-C05,T2-U01,T2-C02 /03, WG-C08, WG-C09, WG-C10 Ref. No: TCP(P-2)/MIAL/NOC/4.5/1171/2016	25.08.2017
34	Approval for New Cargo Road at CSIA, Mumbai. Ref. No: TCP(P-2)/MIAL/NOC/4.5/1171/2017	25.08.2018

Table 1-7: List of NOCs and Approvals

Sr. No.	Description	Dated	Remarks
1	Building No1 (T1-C04)		
I	MMRCL NOC received	17.05.2017	Proposal is in process for MMRDA Approval.
II	AAI NOC received	04.07.2014	
III	Deficiency Letter issued by MMRDA	23.05.2019	
2	Building No2 (T2-C05)		
I	MMRCL NOC received on	04.02.2019	Formation of Proposal is in progress to submit in MMRDA
II	AAI NOC received on	27.02.2018	
3	Building No 3 (NS-C01)		
I	MMRCL NOC received	17.05.2017	Proposal is in process for MMRDA Approval.
II	AAI NOC received	09.01.2018	
III	Deficiency Letter issued by MMRDA	24.05.2019	
4	Building No 5 (T1-P01)		
I	Commencement Certificate up to Plinth	16.01.2013	Project Completed and Operational
II	Commencement Certificate for Superstructure	22.04.2014	
III	Occupancy Certificate.	24.05.2016	

1.4.3 Scope of the EIA Study

This EIA study has been carried out as per the Standard TOR and covers a study area of 10 km from the project boundary.

1.4.4 Methodology of EIA

The methodology adopted for the environmental impact study consists of the following stages:

Identification of significant environmental components and assessment of their baseline (pre-project or existing) status within the study zone. This is carried out by site visits to study geographical/ topographical features followed by a study of environmental conditions (viz. air quality, water quality, noise levels etc.) at the site.

Prediction of impacts on various identified and significant environmental parameters due to the proposed project. Data pertaining to the proposed construction activities, water consumption, solid waste/ sewage generation, treatment and disposal were studied to identify those activities causing environmental impacts through an environmental impact matrix.

Evaluation of most significant impacts and delineation of an Environmental Management Plan to mitigate adverse impacts (if any) on the quality of surrounding environment.

The detailed methodology for the environmental impact study is outlined below:

Baseline Environmental Studies

This study includes an understanding of environmental conditions within 10 km area around the site. Details of various components covered therein are as under:

Land Environment

It includes study of preliminary information regarding topography of the study area, location aspects of site, land-use pattern, sub-stratum characteristics (through resistivity surveys and studying the soil investigation reports), development pattern and landscape features within the study zone (through reconnaissance survey) and review of data obtained through various primary / secondary sources.

Air Environment

Preliminary information regarding the location of the proposed project and possible air pollution sources is gathered through reconnaissance survey as well as data obtained through primary and secondary sources.

Major project related primary air pollutants were identified as Respirable Particulate Matter (RSPM or PM₁₀), Particulate Matter less than 2.5 ug/cum (PM_{2.5}), Sulfur Dioxide (SO₂), Carbon Monoxide (CO), and Oxides of Nitrogen (NO_x), mainly generated due to vehicular emissions and proposed construction activities. Assessment of the baseline status of these parameters in ambient air within the impact zone was undertaken during summer season of 2019.

Data on micro-meteorological parameters such as wind speed, wind direction, temperature and relative humidity was obtained from secondary sources.

Noise Environment

Noise level measurements were undertaken at site and in neighborhood areas to identify existing baseline status.

Water Environment

Reconnaissance studies, for identification of available water resources (ground/ surface) were carried out in the study area. Analysis of water samples were undertaken during the summer season of 2019. The sampling was an assessment for potability and to establish baseline characteristics.

Biological Environment

Assessment of the baseline status of flora and fauna in the study area was carried out through analysis of primary data collected through field surveys and secondary data sources.

Socioeconomic Environment

Data on demographic pattern, population density, educational facilities, employment opportunities, health status, water & sanitation and transport facilities in the study zone was collected through secondary sources such as, census records and other information available from local Government offices. Reconnaissance and questionnaire survey of the affected population within the study area was also conducted.

Impact Identification and Impact Assessment Matrix

From a study of the nature of activities during construction phase and after completion and knowledge of existing baseline / background levels of various environmental parameters viz. Soil/ Air / Water / Noise level / Social environment, the nature and severity of impact on environment was estimated.

Impact Matrix was prepared delineating activities v/s tangible impacts. The Environmental Management Plan was prepared for the project to reduce negative impacts of the project.

Environmental Management Plan

From the identified impacts, Environmental Management Plan is prepared to outline pollution control measures to be implemented in order to ensure minimum impact on environment due to proposed operation of the project.

1.5 REPORT ORGANIZATION AND STRUCTURE

The structure of the EIA report is based on the guidelines given in the EIA Notification at Appendix III under "Generic Structure of Environmental Impact Assessment Document".

Accordingly, the report has been organized in 12 chapters as below.

Chapter 1: Introduction gives the purpose of the report along with the identification of project and project proponent. A brief description of nature, size, location of the project and its importance is also mentioned. The scope of the study – details of regulatory scoping carried out (as per Terms of Reference) is also covered in this chapter.

Chapter 2: Project Description gives a condensed description of those aspects of the project, likely to cause environmental effects. Details include a description of the type and need of project, location maps and project specific project boundary and site layout. The project description, size of the project and associated activities required for the project including technology, drawings showing master plan, components of project etc. and schematic representations of the feasibility drawings which give information important for EIA purpose are mentioned in this chapter.

Chapter 3: Description of the Environment describes the study area, period of monitoring of environmental aspects, components and methodology. It establishes the baseline for valued environmental components, as identified in the scope, both in the core zone and the impact zone. Also gives the base maps of all environmental components.

Chapter 4: Anticipated Environmental Impacts gives the detailed assessment of environmental impacts due to project location, project construction, regular operations, final decommissioning or rehabilitation of the completed project. It also gives briefly the measures for minimizing and/ or offsetting adverse impacts identified. An assessment of significance of impacts (criteria for determining significance, assigning significance) has also been made.

Chapter 5: Analysis of Alternatives (Technology and Site) gives the analysis of alternatives which includes a description of each alternative, summary of adverse impacts of each alternative, mitigation measures proposed for each alternative and the selection of alternative.

Chapter 6: Environmental Monitoring Program: Technical aspects of monitoring the effectiveness of mitigation measures are outlined in this chapter, including monitoring of environmental aspects during construction phase and operation phase.

Chapter 7: Additional Studies pertaining to the project in respect of probable impacts and mitigative measures, location and environmental settings are covered in this chapter.

Chapter 8: Project Benefits: This chapter covers the benefits due to the project under improvements in the physical infrastructure, improvements in social infrastructure and employment potential.

Chapter 9: Environmental Cost Benefit Analysis: As recommended at the scoping stage

Chapter 10: Environmental Management Plan gives a comprehensive Environment Management Plan which states the administrative aspects of ensuring that mitigative measures are implemented and their effectiveness monitored, after approval of the EIA; along with the budgetary requirements for environmental protection.

Chapter 11: Summary and Conclusion summarizes the findings of the study and gives an overall justification for implementation of the project. An explanation of how adverse effects have been mitigated has been given in conclusion.

Chapter 12: Disclosure of Consultants Engaged outlines the names of the consultants engaged, and nature of consultancy rendered in preparation of this document.

CHAPTER 2. PROJECT DESCRIPTION

2.1 TYPE OF PROJECT

The proposal pertains to site and infrastructure development on an area of 170.61 ha planned for construction of 2,419,186 sq.m. Since the development covers an area >50 ha., hence the proposed activity falls under 'Category 8(b)- Townships & Area Development Projects under the EIA Notification of 14th Sept. 2006, for which prior Environmental Clearance (EC) is required. The present proposal is for amendment in existing area development project.

Earlier, the project development has received environmental clearance dtd. 1st July, 2011 which has been revalidated on 20.12.2018 (vide letter no SEIAA-2018/CR-138 Est). At present, the proponent seeks an Amendment in Environment Clearance.

2.2 NEED FOR THE PROJECT

Proposed landuse plan of Non-operational Area defines proposed cityside development approach with special emphasis on adequate land allocation for Non-operational (cityside) uses. The landside development will be independent, separate and distinct from aeronautical/airside development. The proposed landside/ Non-operational development in CSMIA is the land area outside the aeronautical area.

Existing activities in Non-operational Area are accommodated in the site to serve the airport as well as surrounding area/ localities. Most of the existing facilities and uses in Non-operational area of CSMIA were planned and developed in the early stages of airport development in 1960's/ 70's, and are therefore in need for transformation and upgradation. CSMIA is in need of world class landside infrastructure of the same quality and standard as Terminal 2, to support increasing demand and emerging opportunities for hotels/ hospitality, commercial/ offices, conference, retail, cultural, transportation facilities along with requisite utilities and green/open spaces. This shall not only make CSMIA an international destination, but shall provide much required support to re-position Mumbai as a global business and tourism destination, leading to creation of jobs and revenue for people of Mumbai.

In view of this vision and in accordance with the environmental clearance obtained in 2011, MIAL has undertaken construction of landside facilities like new roads, storm water drains, duct banks carrying power, IT, etc. and laying of mains and distribution network of water supply, sewerage network with modern STPs with 90% water recycling, and other utility network for effective functioning of Non-Operational (landside) area of CSMIA. This proposal creates opportunity for integrated, master planned development of Non-Operational (landside) area of CSMIA.

The proposal for development is in conformity with the Sanctioned Interim Development Plan & DCR of CSMIA Notified Area and subsequent approved modifications to it by Government of Maharashtra. The same is represented in the map below showing Sanctioned Interim Development Plan of CSMIA Notified Area.

2.3 LOCATION DETAILS

The proposed area falls under the village areas of Vile Parle, Sahar, Brahmanwada, Marol, Chakala, Kolekalyan and Kurla villages. The CTS numbers of the area under proposed redevelopment can be referred to for the exact locations. [*Please refer Annexure III for CTS numbers of the proposed plot under development*].

CSMIA's Non-Operational (landside) area is located in heart of Mumbai, surrounding by residential commercial suburbs, and is connected to all parts of Mumbai & Mumbai Metropolitan Region with both existing & proposed high speed-high volume traffic system like Western Express Highway, Sahar Road, Sahar Elevated Road, Andheri Ghatkopar Link Road, Metro Stations of Metro lines -1 & 3, as indicated in Figure 2.1.

The Non-Operational (landside) Area of CSMIA is highly accessible from Western Express Highway located along western edge of the site as well as from Sahar Road and Sahar Elevated Road; from Andheri-Ghatkopar Link Road on northern periphery of the site and the Nehru (Kalina) Road on south. Nearest railway station with suburban train services is Vile Parle located about 1.2 km towards the west of the site. The nearest intercity train station is located at Bandra Terminus about 5 kms from the site and Dadar Terminus at about 11km. The Non-Operational (landside) area of CSMIA is located in the village boundaries of Vile Parle, Sahar, Brahmanwada, Marol, Chakala, Kolekalyan and Kurla.

The site is accessible from the Western Express Highway (WEH) located along the western boundary of the site, the Sahar & Andheri-Kurla road which are located along the northern boundary of the site and the Jawaharlal Nehru road located to the south of the site. Dadar Railway Station (intercity) is located at about 11km from the site and Vile Parle is the nearest located sub-urban railway station (*refer Fig. 2.1*).

Location Details of proposed buildings

Approval for construction of six Buildings was received in EC of 2011, however two these buildings are now dropped from proposed scope of the project. The location of these buildings is described below and shown in **Figure 2.3**:

- Building No. 1 (T1C-04): The project is located in Santacruz area of CSMIA landside development, and the plot is accessible from Western Express Highway and Metro Line-3 CSMIA Terminal 1 UG station, with direct internal access
- Building No. 2 (T2C-05): The project is located in Sahar area of CSMIA landside development, and the plot is accessible from Sahar Road , Andheri Ghatkopar Link Road and Metro Line-3 CSMIA Terminal 2 UG station, with direct internal access. A direct access from Sahar Elevated road is also proposed as part of this project development.
- Building No. 3 (NSC-01): The project is located in Sahar area of CSMIA landside development, and the plot is accessible from Sahar Road, Marol pipeline Road and Metro Line-3 CSMIA Sahar UG station, with direct internal access.
- Building No 4 (T1P02-Multi-Level Car Park) - Project dropped.

- Building No 5 (T1P01-Multi-Level Car Park) has already been constructed, and is operational. This building is located near Terminal 1 and can be accessed from Western Express Highway
- Building No 6 (T2-U01- Multi-Level Car Park and Utility) - Project dropped.

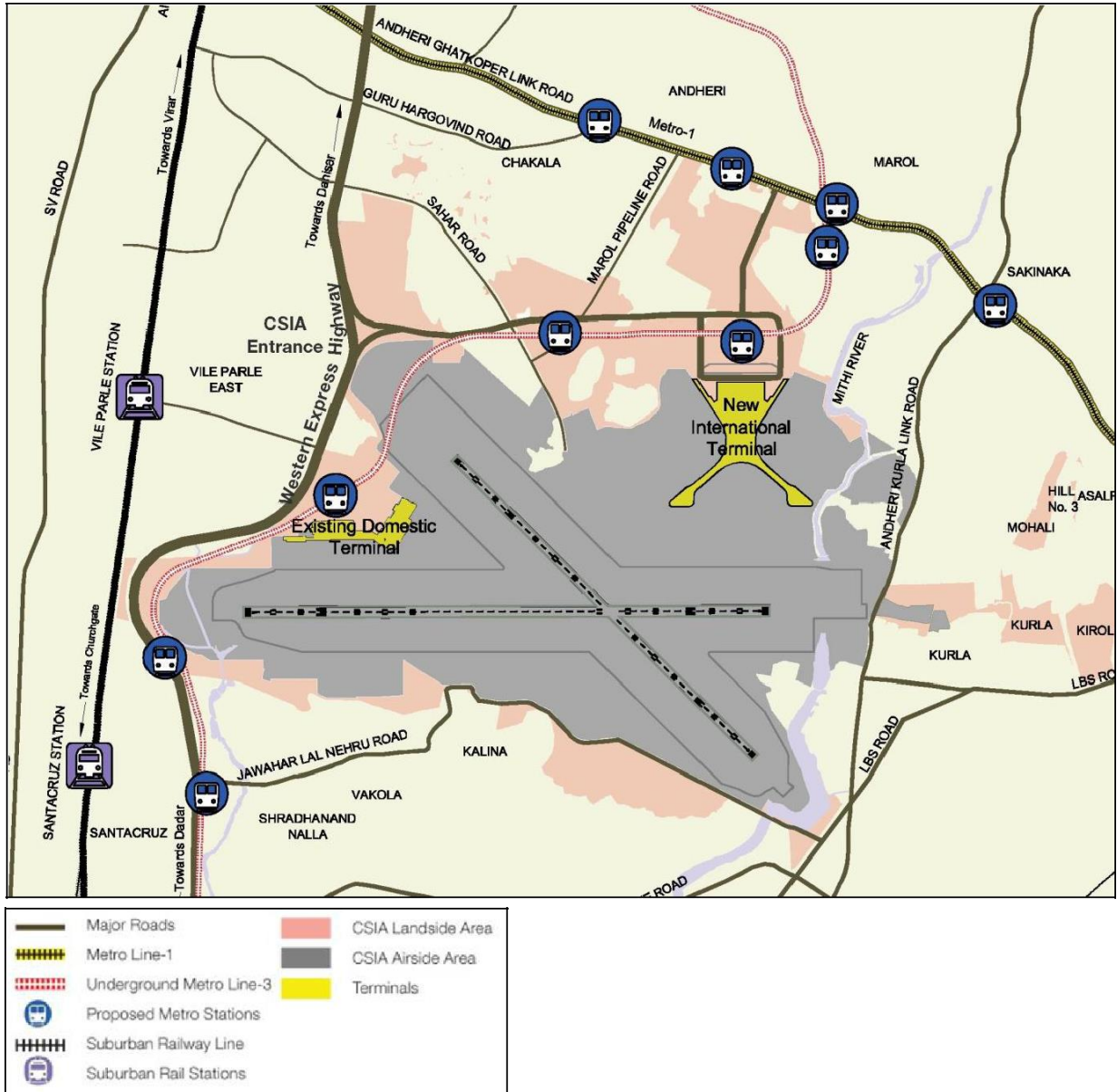


Figure 2-1: Site Location Map

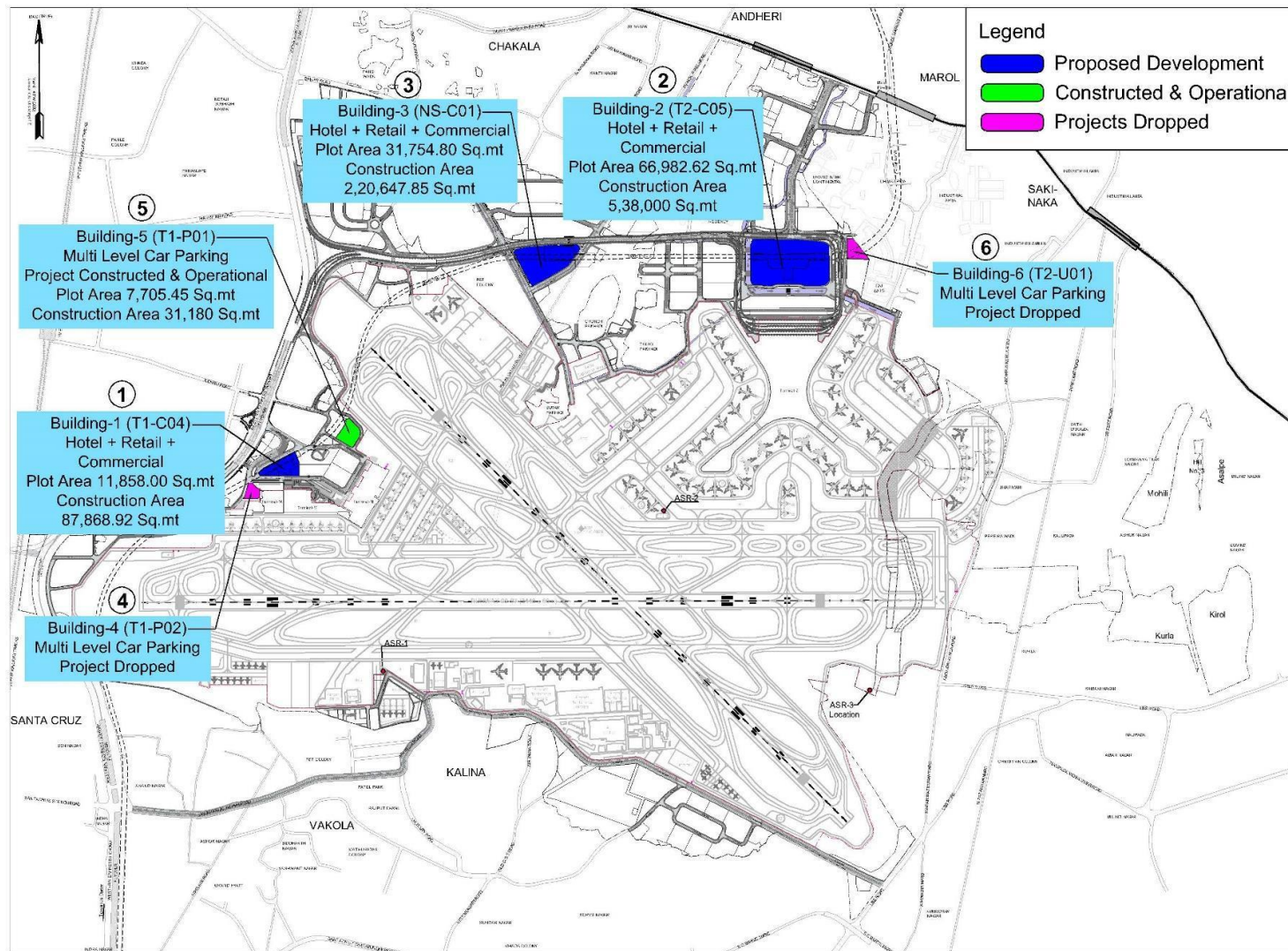


Figure 2-2: Location of Proposed Four Buildings (earlier six)

2.4 PROJECT COMPONENTS

2.4.1 Proposed Area Development

Environmental Clearance was granted in 2011 to MIAL for proposal for Development of Non-Operational Area of CSMIA which included site development i.e. lateral/ area development (construction of roads/ pedestrian infrastructure, storm water drainage, water supply, sewerage, STPs, other utilities etc.) in the Non-Operational area (landside) of CSMIA. The airport has a total area of 802.03 Ha out of which 506.39 Ha is aeronautical area, whereas, the area under encroachments is 125.03 Ha and Non-operational area is 170.61 Ha. The proposal was for site and infrastructure development on an area of 170.61 ha planned for construction of ,2,815,737 Sqm (approximately 2.8 million Sqm) in the future. Table mentions Landuse Area Statement of Non-Operational Area Development as per EC dtd. July, 2011:

Table 2-1: Proposed Landuse Area Statement of Non-Operational Area (2011)

S. No.	Landuse Zone	Approx. Area		Percentage (%)
		(Ha)	(Acre)	
1.	Non Aeronautical/Commercial	63.15	156.03	37.01%
2.	Residential	9.84	24.31	5.77%
3.	Utilities	8.54	21.10	5.00%
4.	Social Infrastructure/Facilities	7.83	19.34	4.59%
5.	Recreational Green	33.78	83.47	19.80%
6.	Roads and Parking	47.48	117.36	27.84%
	Total	170.61	421.62	100.00

Proposed Amendments to earlier Environmental Clearance dtd July, 2011

The proposal of Non-Operational Area Development submitted for EC in 2011 was based on the then proposed Master Plan for Non-Operational development in CSMIA which later became part of Interim Development Plan of CSMIA Notified Area, approved by Government of Maharashtra (GoM) vide Notification No. CMS/TPB/4312/1/CR-47/2012/I/UD-11, dated 17th May 2013 with FSI of 4.0 for all landuses. In view of this and demand assessment/ requirements of the project following updates/changes are proposed in Non-Operational Area Development :

1. In the sanctioned Interim Development Plan of CSMIA, the Notified Area 53.88 ha of Non-Aeronautical/ Commercial area has been approved by GoM, out of which 50.25 ha belongs to MIAL. Therefore in this updated proposal, proposed Non-Aeronautical/ Commercial area has been reduced from earlier 63.15 ha to 50.25 ha, i.e. reduction of 12.9 ha (approx. 20% reduction). This has consequential reduction in proposed overall built Up Area/ FSI for Non-Operational Area Development.
2. Development mix/ proposed uses of Non-Operational (Landside) Area of CSMIA have been marginally modified as per sanctioned Interim Development Plan of CSMIA Notified Area, wherein part of existing residential facilities are retained and earlier proposal for their commercial use is dropped.

3. As per EC 2011 the demand assessment for hotels was assumed entirely for 5 star category hotels which has now been revised considering reduction in demand of 5 star category hotels.
4. Convention Centre proposed earlier in 2011 proposal, have been dropped from this amended proposal.
5. Requirement of MLCP's has been optimized, and two MLCP projects are dropped in current proposal, thus reducing proposed number of buildings from six to four.
6. Proposed uses and built up area of proposed four buildings has been modified as per provisions of CSMIA DCR approved by GoM, with 5.0 FSI for hotel, Convention Center and other commercial uses.

Based on above updates MIAL has done assessment for adequacy of infrastructure provision for CSMIA landside Non-Operational Area Development in view of proposed changes in FSI/ built-up area, proposed uses and these are described in detail in further chapters.

The table below provides Landuse Area Statement of Non-Operational Area Development as per proposal for Amendment:

Table 2-2: Proposed Landuse Area Statement of Non-Operational Area (2019)

S. No.	Landuse Zone	Approx. Area		Percentage
		(Ha)	(Acre)	(%)
1.	Non Aeronautical/Commercial	50.25	124.18	29.45%
2.	Residential	7.99	19.74	4.68%
3.	Utilities	8.96	22.13	5.25%
4.	Social Infrastructure/Facilities	6.51	16.08	3.81%
5.	Recreational Green	34.24	84.61	20.07%
6.	Roads and Parking	45.38	112.17	26.60%
7.	Existing & Operational	17.28	42.71	10.14%
	Total	170.61	421.62	100.00

The earlier proposal for which EC was granted in 2011, was for site and infrastructure development on site area of 170.61 ha with proposed FSI/ Built Up Area of approx. 28,15,737 Sqm distributed across Non-Operational (landside) Area of CSMIA, with Sahar (northern part) with proposed FSI area of 2.089 million Sqm, Santacruz (western part) with approx. 0.293 million Sqm and Kalina (southern part) part with approx. 0.417 million Sqm amounting to 3.671 million Sqm.

The current proposal requesting amendment to EC for Non-Operational Area Development pertains to site and infrastructure development on an area of 170.61 ha with change (reduction) in Non-Aeronautical/ Commercial area from earlier 63.15 ha to 50.25 ha, and consequential reduction in potential built-up area / FSI from 28,15,737 Sqm to 24,19,186 Sqm (this excludes non-FSI area).

Following table provides the updates in project areas and Built up area.

Table 2-3:: Comparison between previous sanctioned EC & proposed amendment

Proposed Development Mix	Built-up Area as per EC dated 1 st July 2011 (Sqm)	Updated Built-up area (Sqm)	Change in Built-up Area	
			Sqm	Percentage
Plot area	170.61 Ha	170.61 Ha	No change	
Non-Aeronautical/ Commercial Area	63.15 ha	50.25 ha	Decreased (-20.42 %)	
Total Construction/ BUA area for Entire Area Development (Sqm)	28,15,737	24,19,188.0	Decreased (-14.08 %)	
Development Mix for Entire Development (Built-up Areas in sq.m.)				
Hotels	11,61,288	7,15,297	-4,45,991	-38.40%
Convention Centre	1,09,194	0	-1,09,194	-100.0%
Entertainment, Retail, Leisure	4,99,818	3,78,527	-1,21,290	-24.26%
Offices, Travel & Tourism, Banks	6,92,128	11,24,318	4,32,190	+62.44%
Hospitals & Healthcare	92,903	32,765	-60,137	-64.73%
Social Infrastructure	1,37,497	1,13,760	-23,736	-17.26%
Residential Areas	1,22,909	54,518	-68,390	-55.64%
Grand Total	28,15,737	24,19,188	-3,96,549	-14.08%

Although plot level permissible FSI has increased from 4.0 to 5.0, due to reduction in overall area under Non-Aeronautical/ Commercial use from earlier 63.15 ha to 50.25 ha, and also as few building projects have been dropped as per current demand assessment, total proposed overall built up area of Non-Operational Area Development has reduced from 28,15,737 Sqm to 24,19,188 Sqm i.e. decreased by 14.08%.

Therefore, in view of the utility and services provisions adopted for Non-Operational Area Development (based on higher area under Non-Aeronautical/ Commercial use and higher Built Up Area considered in EC 2011) being on higher side in relation to demand for utility and services as per reduced overall built up area, the proposed infrastructure and utilities planned and under implementation as per earlier demand shall be adequate, even with increase in permissible plot level FSI from 4.0 to 5.0.

The Non-Operational Area (cityside) development is envisaged, based on land availability, functionality, locational potential and suitability. For planning, and implementation purpose, the overall Non-Operational Area (cityside) area and landuse plan of Non-Operational Area (cityside) development in CSMIA is classified under four sectors - Northern Sector (Sahar), Western Sector (Santacruz), Southern Sector (Kalina, Agripada, etc), Eastern Sector (Kiroh, Kurla).

The site and infrastructure development strategy for the Non-Operational Area development broadly addresses the following major goals:

1. Tapping the opportunity of restructuring the current development pattern for efficient functioning and infuse the area with a required landuse that ensures sustainability, relevance, vibrancy and caters to growing needs and requirements of airport users.

2. Address existing deficiencies identified in terms of accessibility, traffic, pedestrian movement, location/ size of airport support facilities, landside airport facilities, parking etc.
3. Improving the environmental conditions of the area by proper drainage planning with focus on water harvesting and recycling of water, creating pedestrian and transit links that reduce demand on road infrastructure.
4. Integration of segregated land pockets in terms of common utility distribution for the purpose of integrated road network. Focus on environmental sustainability through rain water harvesting & recycling of waste water.
5. Establishing and ensuring seamless functional relationship between site level development, terminals and landside development. The landside of the terminals is very crucial in terms of landuse as all the major airport facilities required for the passenger handling, passenger movement, smooth transfer of air passengers, car parks and other airport users take place in this sector. The terminals thrust an over whelming effect in shaping the landuse of the area towards the landside.

The proposal for development is in conformity with the landuse as per the Sanctioned Interim Development Plan & DCR of CSIANA and subsequent approved modifications to it by the Government of Maharashtra (Refer Fig. 2.3).

Existing structures will be demolished and structures to be built will comprise of commercial, hospitality, public-semi public/ social infrastructure along with utilities, support activities such as offices, public and semi public offices, residential quarters, parking, roads and other infrastructure.

The following figure (Fig. 2.3) shows the locations of the initially proposed 6 buildings on the landside area of the CSMA. These are part of the Master Plan of the Non Operational Area. Of these buildings the buildings dropped from the proposal and the amendments in the other 3 buildings are mentioned in the table 2.2.

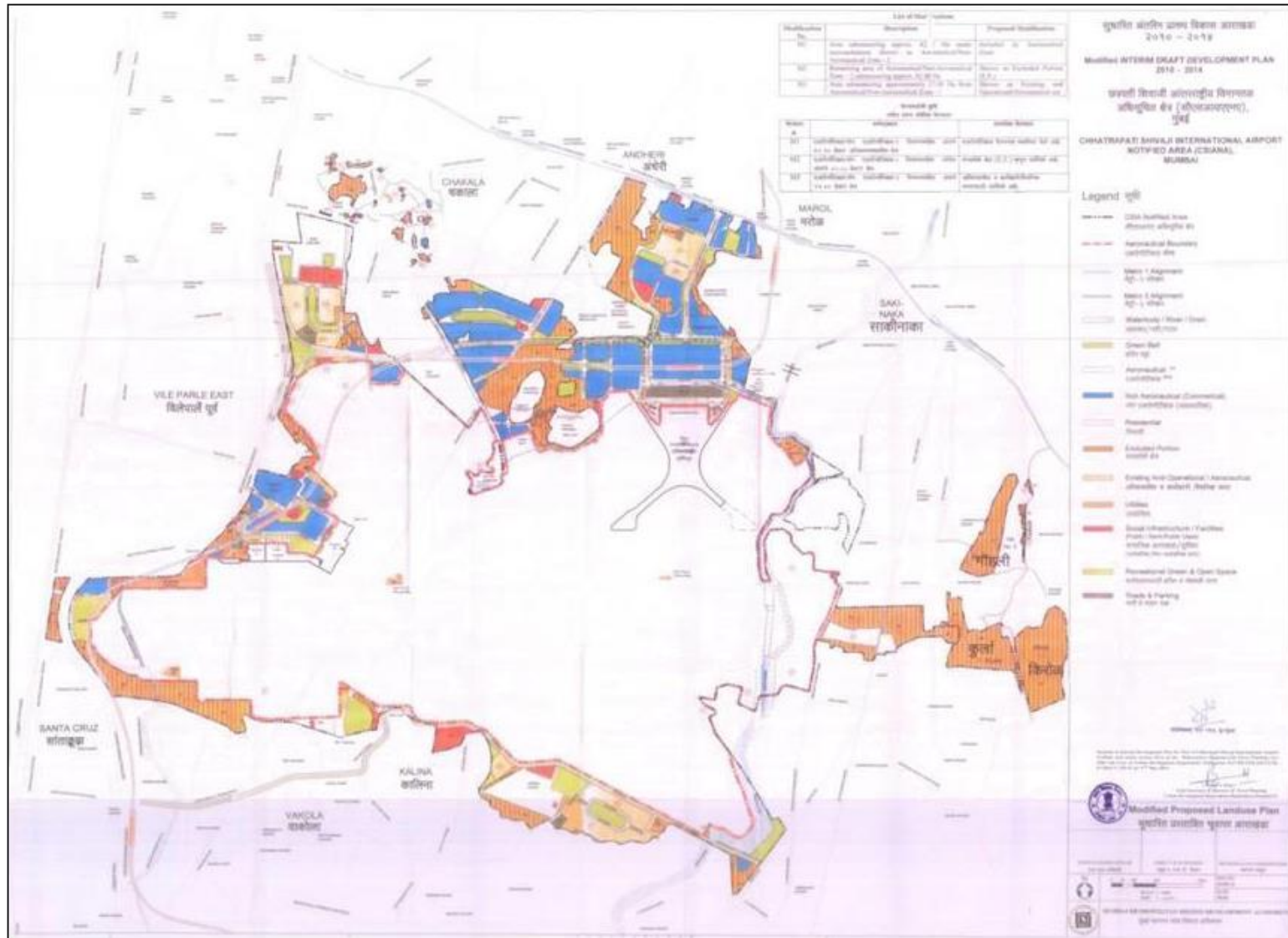


Figure 2-3: Master Plan of Non Operational Area



Figure 2-4: Non-Operational Area

2.4.2 Proposed Area Statement and Amendments

The proposal pertains to site and infrastructure development on an area of 170.61 ha with construction of 24,19,186 sq.m in the future. About 1,49,904 residents and 1,40,958 users of commercial spaces are estimated to use the facilities proposed as part of this development.

The landuse breakup sanctioned vide EC received on 1st July, 2011 and revalidated on 20th Dec., 2018 and the proposal with amendment is given in the following table. The proposed Master Plan [*also attached as Annexure IV: Master Layout*] of the proposed area development is shown in the table below.

Table 2-4: Landuse Area Statement of Non-Operational Area
(Comparison between areas in previous sanctioned EC and amendment sought)

Proposed Development Mix	Built-up Area as per Env. Approval dated 1 st July 2011 (Sqm)	Updated Built-up area (Sqm)	Change in Built-up Area	
			Sqm	Percentage
Plot area	170.61 Ha	170.61 Ha	No change	
Non-Aeronautical/ Commercial Area	63.15 ha	50.25 ha	Decreased (-20.42 %)	
Total Construction/ BUA area for Entire Area Development (Sqm)	28,15,737	24,19,188.0	Decreased (-14.08 %)	
Development Mix for Entire Development (Built-up Areas in sq.m.)				
Hotels	11,61,288	7,15,297	-4,45,991	-38.40%
Convention Centre	1,09,194	0	-1,09,194	-100.0%
Entertainment, Retail, Leisure	4,99,818	3,78,527	-1,21,290	-24.26%
Offices, Travel & Tourism, Banks	6,92,128	11,24,318	4,32,190	+62.44%
Hospitals & Healthcare	92,903	32,765	-60,137	-64.73%
Social Infrastructure	1,37,497	1,13,760	-23,736	-17.26%
Residential Areas	1,22,909	54,518	-68,390	-55.64%
Grand Total	28,15,737	24,19,188	-3,96,549	-14.08%

In view of the updates in the development mix/ proposed uses, the built-up area of the 3 building projects has increased.

Following are the updates to MIAL proposal which now includes proposed construction of 4 buildings (instead of earlier 6), due to latest demand assessment and change in FSI / Built up area:

- Change in Built-up area and design modifications of 3 building projects (Building No. 1 - T1-C04, Building No. 2-T2-C05 and Building No.3-NS-C01)
- Building No 4 (T1P01-Multi-Level Car Park-1) –Project dropped
- Change in Built-up area of Building No 5 (T1P02-Multi-Level Car Park-2) - Constructed &Operational.
- Building No 6 (T2-U01- Multi-Level Car Park and Utility) –Project dropped.

Summary of construction of six building projects as per EC, 2011 and as per current updated proposal in 2019 for EC amendment is given below:

Table 2-5: Update in Construction area of 6 buildings

Development Mix	Built-up Area as per Env. Approval dated 1 st July 2011	Proposed Built-up (as per EC Amendment)	Total Construction Area as per EC dtd. 1 st July 2011	Total Construction Area (for EC Amendment)	Change in Total Construction Area (Sqm)	Percentage Change (± %)
Building-1 (T1-C04)	43,649	57,956	73,338	87,868.92	+14,53	+ 19.81 %
Building-2 (T2-C05)	2,61,593	3,27,378	5,26,514	5,38,000.0	+11,486	+ 2.18 %
Building-3 (NS-C01)	1,09,194	1,55,201.58	1,93,774	2,20,647.85	+26,873	+ 13.87 %
Building-4 (T1-P02)	28,380	Project dropped	31,759	Project dropped	-31,759	- 100.0 %
Building-5 (T1-P01) (Multi Level Car Parking)	39,624	4,023.19 Already constructed	43,474	31,180.0 Already constructed	-12,294	- 28.28 %
Building-6 (T2-U01) (Multi Level Car Parking)	16,000	Project dropped	18,024	Project dropped	-18,024	- 100.0 %
Total	4,98,440	5,44,558.77	8,86,883	8,77,696.77	-9,186.23	-1.04

The following table (also shown with breakup in Table 1.3) presents the comparison between Area Statement of the proposed buildings as per previous sanctioned EC and amendment sought.

As shown in the above table, there is overall reduction in the built up areas of the proposed four buildings.

Break up of FSI and Non FSI area and the proposed development mix in the 4 buildings is indicated in the table below:

Table 2-6: Amendment proposal showing Area Statement of 4 buildings

.No	Proposed Buildings	Plot Area (Sqm)	Development Mix			FSI Area (Sqm)	Non-FSI Area (Sqm)	Total Construction Area for proposed amendment
			Retail (Sqm)	Hotel (Sqm)	Commercial / Offices (Sqm)			
			A1	A2	A3	(A)	(B)	(A + B)
1	Building 1 (T1-C04)	11,858.00	12,730	23,537	21,689	57,956	29,912.92	87,868.92
2	Building 2 (T2-C05)	66,982.62	1,44,911	57,265	1,25,202	3,27,378	2,10,622	5,38,000.00
3	Building 3 (NS-C01)	31,754.80	37,250	46,801.58	71,150	1,55,201.58	65,446.27	2,20,647.85
4	Building 4 (T1-P01)	7,705.45	--	--	4,023.19	4,023.19	27,156.,81	31,180
	Total	1,18,301	1,94,891	1,27,603.58	2,22,064	5,44,558.58	3,41,582.19	8,77,696.77

Development as per Earlier Approval (6 buildings)

As per EC granted in 2011, updates to six building projects proposal is as below.

- 3 building projects (Building No. 1 - T1C04 / Building No. 2-T2C05 and Building No.3-NSC01) - updates in development mix/ FSI / proposed uses, etc.
- Building No 4 (T1P01-Multi-Level Car Park-1) dropped from proposal
- Building No 5 (T1P02-Multi-Level Car Park-2) is constructed & operational.
- Building No 6 (T2-U01- Multi-Level Car Park and Utility) dropped from proposal

2.4.3 Project Work Completed

The project work within the scope of the valid environmental clearance (received on date 1st July, 2011 and re validated on date 20th Dec., 2018) has commenced on site. The completed work is indicated below.

Building

Construction & Operation of T1B Multi Level Car Parking Building

Roads

- PO Road – 740m (4-Lane)
- North Sahar Roads NSR1 (76m 2-Lane), NSR2 (532m 4-Lane), NSR3 (448m 2-Lane) and NSR4 (358m 6-Lane)
- North Village Roads NVR3 (235m 4-Lane) and NVR5 (270m 2-Lane)

Utilities

- STPs – North Sahar (4 MLD), South Sahar (1 MLD), T1 Forecourt (4 MLD), T2 (10 MLD)
- Pumping Main and Collection Well – North Village
- 1800mm Sewer Line diversion

- Lateral Infra Development along all roads

Parks

- North Sahar Park Development
- Road side Landscape Development



Figure 2-5: Photographs of structures completed at site as part of landside development



Figure 2-6: Photographs of Building-5 (T1-P01) - Constructed and Operational



Figure 2-7: Photographs of constructed STPs on site as part of the sewerage layout of landside development

2.4.4 Proposed Project Description

Following section outlines the description of the 3 proposed buildings

1. Proposed Mixed Use development Building 1- (T1-C04)

1.1. Project Brief

Proposed Building-1 on parcel T1-C04 is in T1 Forecourt area next to CSIA Terminal-1A. This land parcel has direct connectivity from Western Express Highway, and is accessed by Terminal Loop Road on two sides. The development shall offer retail, hotels and office spaces along with, landscaped areas integrated with an underground Metro station of Metro Line-3 and direct pedestrian connection with CSMIA Terminal 1.

EC has been received for construction of building on this plot for proposed commercial use in 2011. However the amendment to the EC is sought in view of marginal variations in built-up area and due to updates to building plans proposed by MIAL.

A comparative area statement of proposal as per EC, 2011 and as per proposed amendment is given below:

Table 2-7: Comparative Area statement for Building no-1(T1-C04) as per EC 2011 and Proposal for Amendment

Sr. NO	Particulars	As per EC of 2011			Proposal for Amendment		
		Retail Area (Sq.m)	Hotel Area (Sq.m)	Commercial / Office Area (Sq.m)	Retail Area (Sq.m)	Hotel Area (Sq.m)	Commercial / Office Area (Sq.m)
01	Total Construction Area (Including Basement)	73,338 Sq.m.			87,868.92 Sq.m.		
02	Mixed Use Development Area	10,049	--	33,600	12,730	23,570	21,689

1.2. Plot/Site Details

The T1-C04 land parcel admeasuring 11,858.00 Sq.m. (1.186 Ha.), has frontage on major road from two sides. The site is accessed by Terminal Loop Road (18.0m wide) on two sides. The site shall be connected to the Terminal T1A by a proposed skywalk for seamless flow of passengers to & from the Terminal.

Entire plot, free of any encumbrances is available for the proposed commercial development and shall be accessible for airport users as well as non-airport users.

T1-C04 land parcel along with Underground Metro Station of Metro line-3 has strong opportunity for Transit Oriented Development (TOD) with retail, commercial / offices and hotel uses, based on Metro Line 3 transit system.

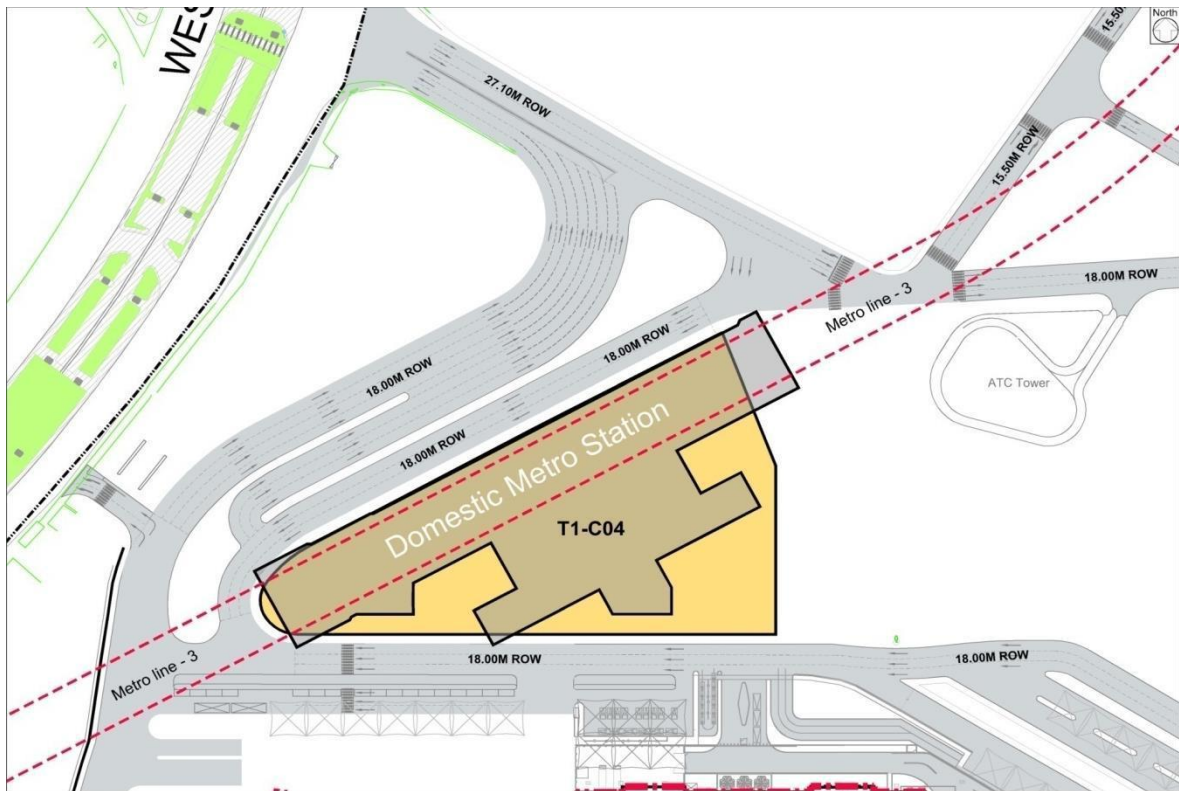


Figure 2-8: T1-C04 Land Parcel & T1 Metro Station

1.3. Interface with Metro-3 CSMIA Terminal-1 Station

The Metro station and its entrances are fully integrated into proposed development on the top of metro station. Metro structure starts almost at 28 m. below average ground level. With the height of about 16 m. required for Platform level and Concourse level, the roof of the concourse level of metro structure is about 12 m. below ground. Three basements of the proposed commercial development are planned above the concourse roof level. The emergency exits of metro station and commercial development are suitably segregated.

Considering the close interface between proposed commercial building on this plot and ongoing metro station works, construction of the basements is required to be implemented in coordination with Metro station construction schedule for operationalization of the metro station.

1.4. Building Details

Proposed commercial development on T1-C04 Parcel has three underground basements (Approx. 12 meter below existing ground level) and integrated superstructure having G+9 floors (Approx. 37.40 meter above existing ground level).

Subsequent to grant of EC to MIAL for landside development and construction of 6 buildings by SEEIA on 1st July, 2011, GoM has approved modification/changes in permissible FSI due to which the project has undergone marginal/minor changes in Built-up area and construction area.

The total construction area of the four Buildings has slightly increased whereas the total construction area of entire Landside development has reduced.

Building uses such as Convention and Entertainment have been dropped from the proposal.

1.5. Built Up Area Summary

Table 2-8: Construction Area details T1-C04

S. No.	Particulars	Details
1	Total Plot Area	11,858.00 Sqm.
2	Permissible FSI	5
3	Proposed Built-up Area	50396.50 Sqm.
4	Additional 15 % Staircase Lift, lobby Area	7559.47 Sqm.
5	Total Permissible Built-up Area (3+4)	57,955.97 Sqm.
6	Proposed Construction Area (Including Basement area)	87,868.92 Sqm.

Permissible FSI, Additional 15 % Staircase Lift, lobby Area and Total Permissible Built-up Area are in accordance with DC Regulations of CSMIA.

1.6. Proposed uses/Activities are as stated below:

- Retail
- Food Courts, Restaurants, Bars, kiosks
- Hotel
- Conferencing Areas, Meeting Rooms & Banquet Areas
- Commercial/ Office spaces
- UG Metro Station with all required spaces & facilities, Basement Car Park
- Pedestrian connections (skywalks & underpass) to the Terminal & surrounding Cityside development
- Landscape

Current Status of the Project:

- Drawings have been submitted to MMRDA for obtaining Building Permission
- MMRC (Metro Line-3) NOC received
- AAI height NOC received

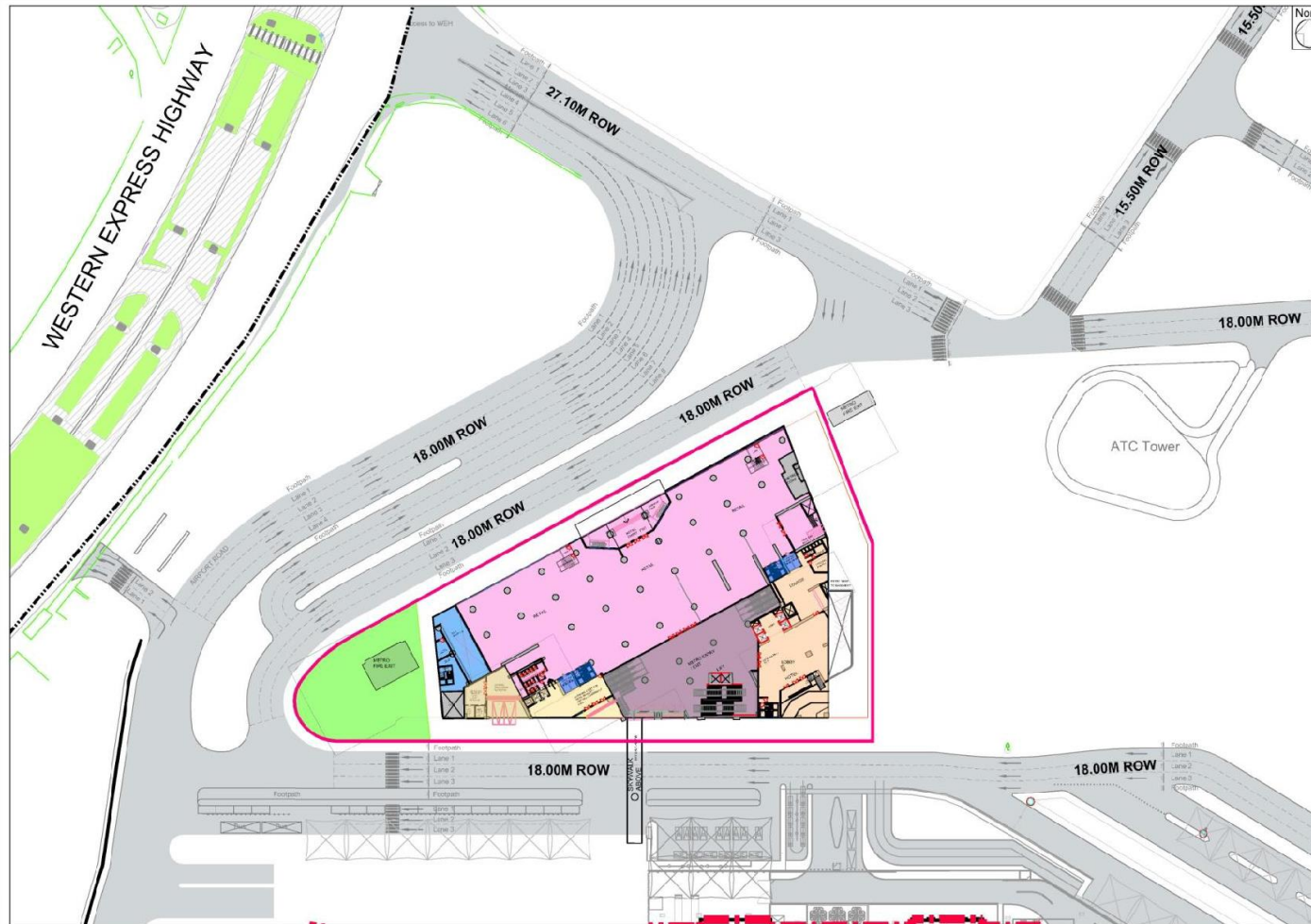


Figure 2-9: T1 C04 Site Plan

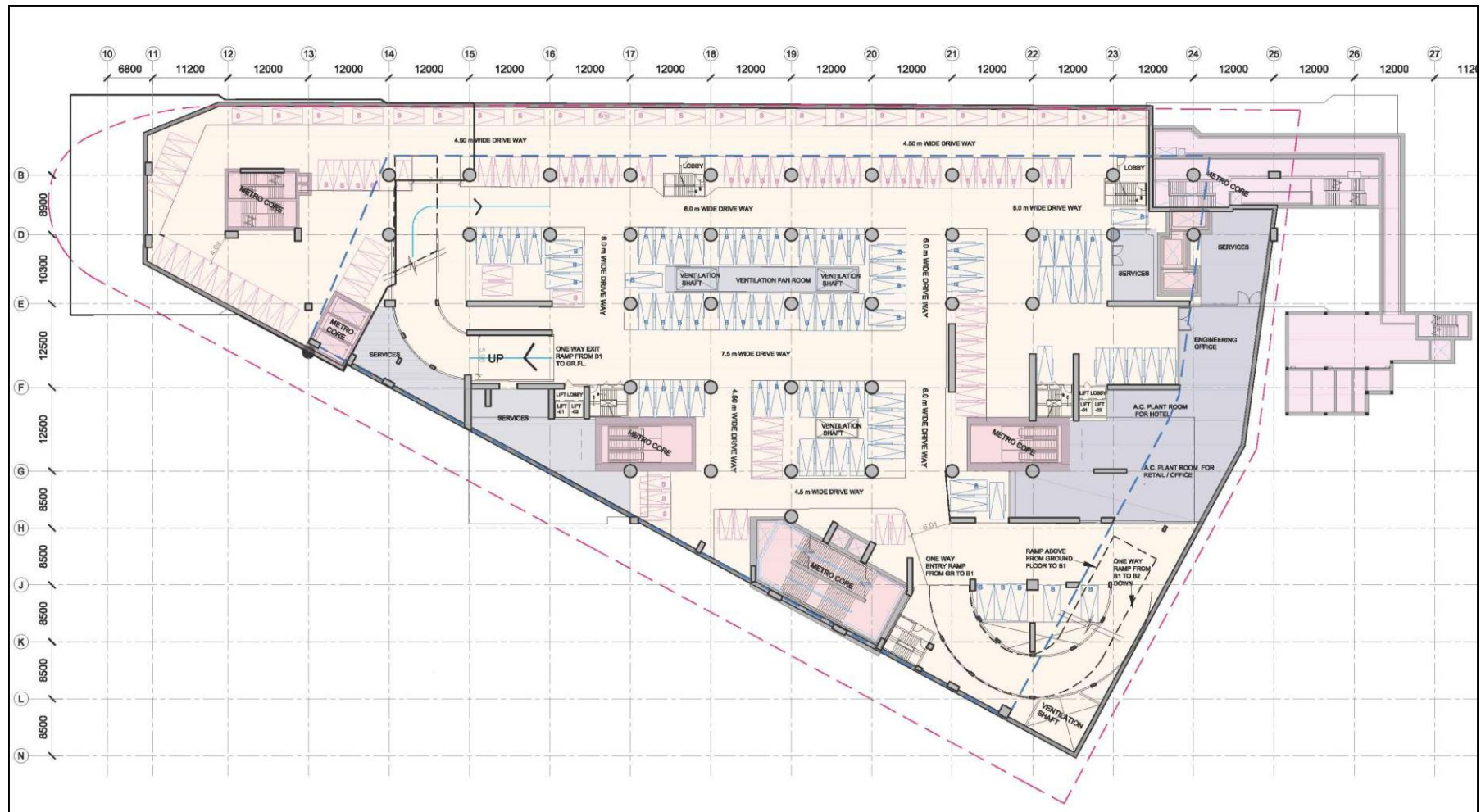


Figure 2-10: T1 C04 Basement Plan

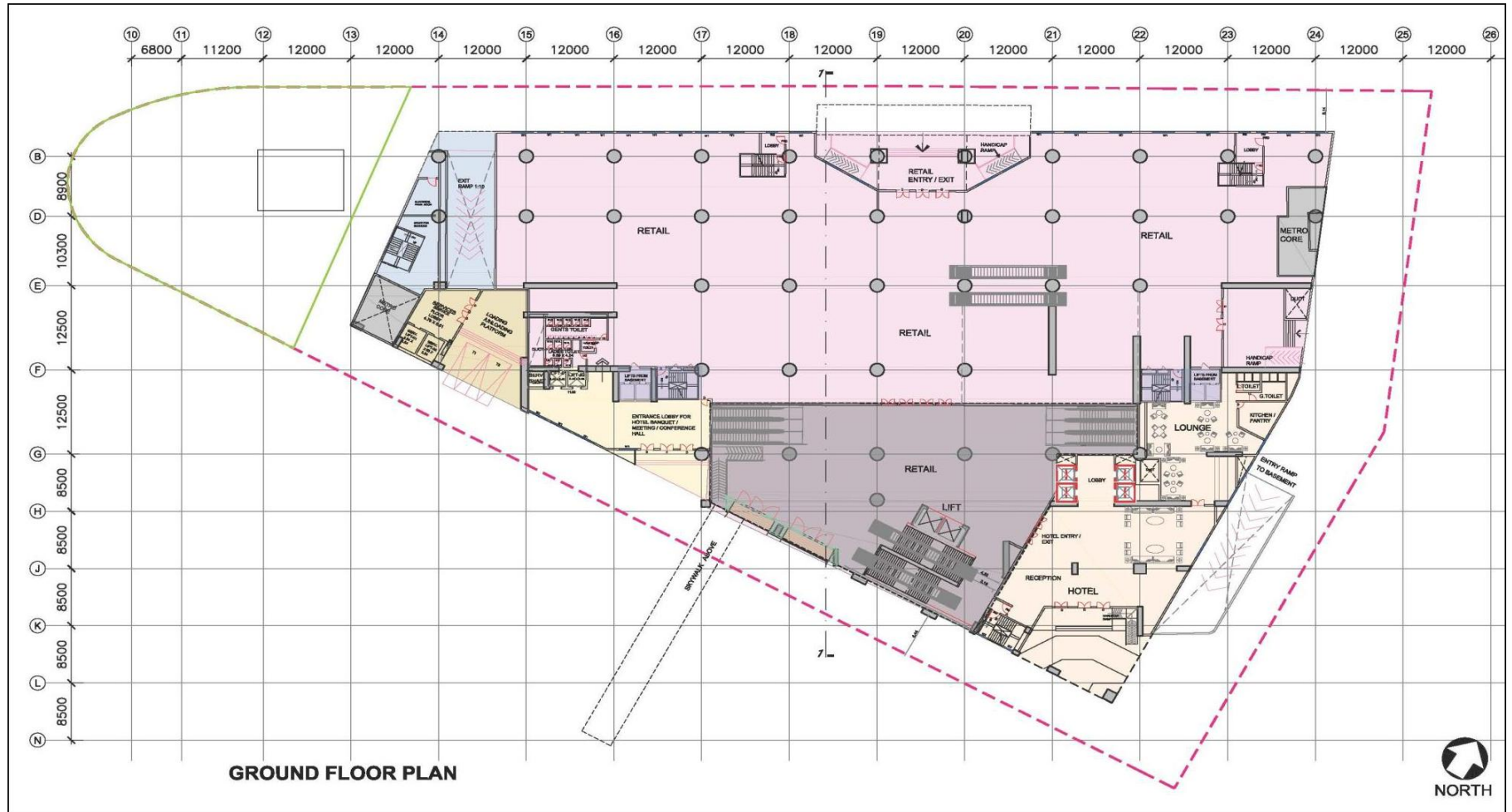


Figure 2-11: T1 C04 Ground Floor Plan



Figure 2-12: T1 C04 Typical Floor Plan

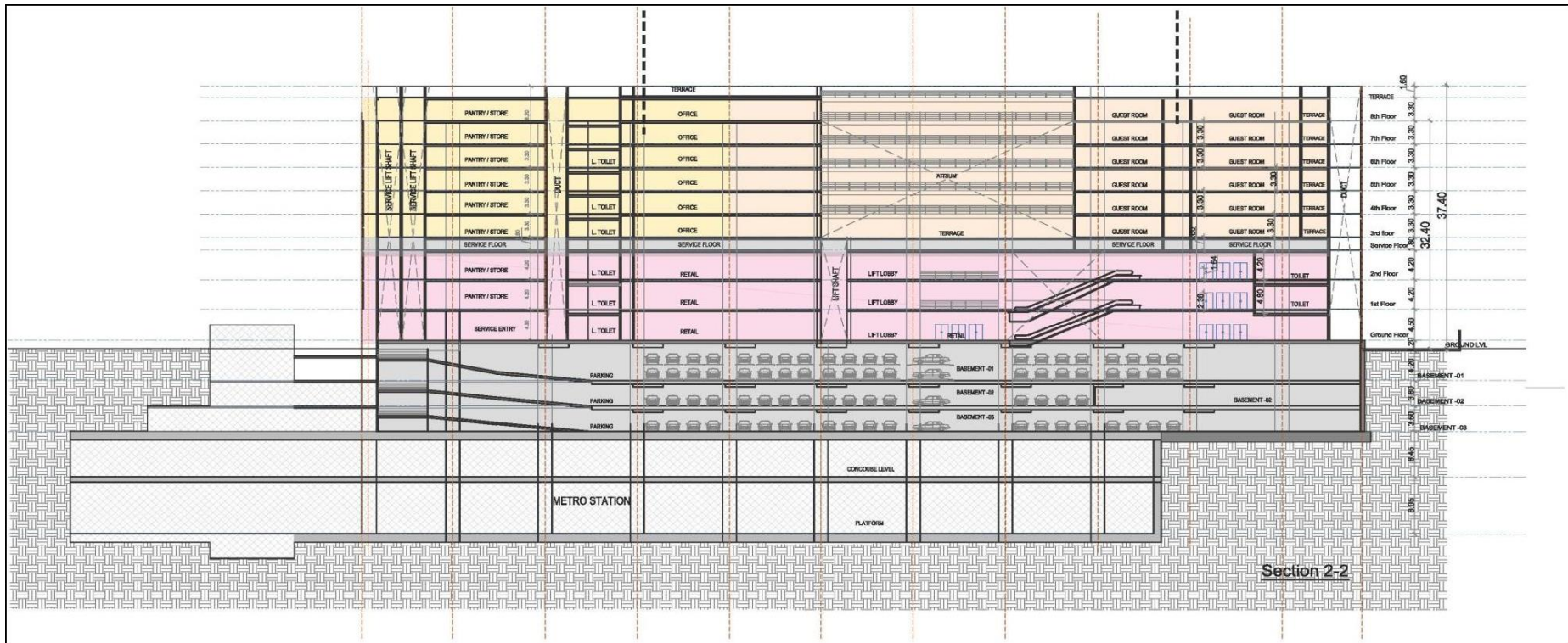


Figure 2-13: T1 C04 Indicative Section



Figure 2-14: T1 C04 Indicative View

2. Proposed Mixed Use development of Building 2 T2-C05

2.1. Project Brief

Proposed building -2 on parcel T2-C05, is in front of Terminal-2 at CSMIA, and shall be most important commercial development for all visitors, airport users. This land parcel has direct connectivity from Sahar at-grade road as well as Sahar Elevated road, and is accessed by Terminal 2 at-grade loop roads on three sides. The development shall offer retail, entertainment, Hotels and office spaces along with landscaped areas integrated with an underground Metro station of Metro Line-3 and direct pedestrian connection with CSMIA Terminal 2.

EC has been received for construction of building on this plot for proposed commercial use in 2011. However amendment to the EC is sought in view of marginal variations in built-up area and due to updates to building plans proposed by MIAL.

A comparative area statement for the proposal as per EC, 2011 and as per the amended proposal is as mentioned in the table below:

Table 2-9: Comparative Area statement for Building no-2 (T2C-05) as per EC 2011 and Proposal for Amendment

Sr. NO	Particulars	As per EC 2011				Proposal for Amendment		
		Retail Area (Sqm)	Hotel Area (Sqm)	Commercial / Office Area (Sqm)	Entertainment and Sports	Retail Area (Sqm)	Hotel Area (Sqm)	Commercial / Office Area (Sqm)
1	Total Construction Area (Including Basement)	5,26,514 Sqm.				5,38,000.00 Sqm.		
01	Mixed Use Development Area	97,993	69,300	69,300	25,000	1,44,911	57,265	1,25,202

Plot/Site Details

The T2-C05 land parcel admeasuring 66,982.62Sqm.(6.698 Ha.) has access from all sides. The T2-C05 site is located on the axis of International Airport (IA) Road (, in front of CSMIA International Terminal (T2) and surrounded by existing Sahar Elevated Road, and At-grade roads on all four sides. The site is proposed to be accessed from Sahar Elevated Road (through new entry ramp) along with pedestrian connection to CSMIA Terminal T2 by a Skywalk for uninterrupted flow of passengers to & from the Terminal 2.

Entire plot, free of any encumbrances is available for the proposed commercial development and shall be accessible for airport users as well as non-airport users.

T2-C05 land parcel along with Underground Metro Station of Metro line-3 has strong opportunity for Transit Oriented Development (TOD) with retail, commercial / offices and hotel uses, based on Metro Line 3 transit system.

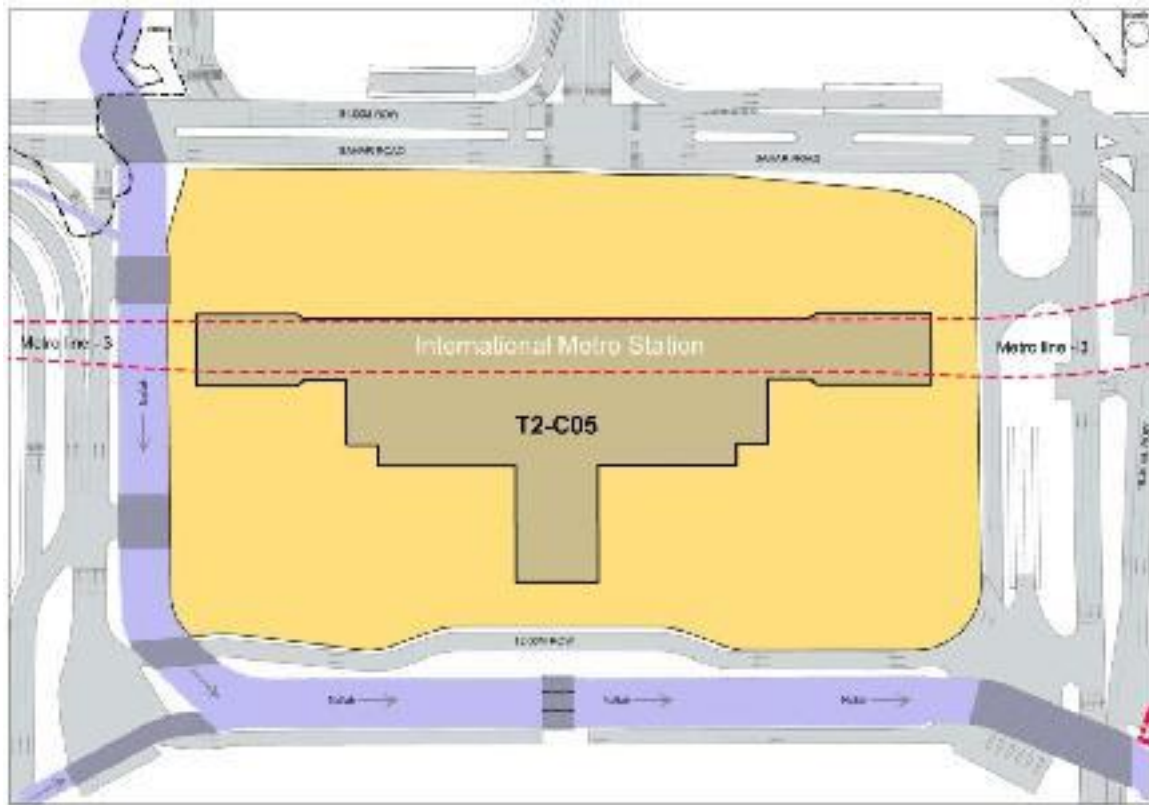


Figure 2-15: T2C-05 Land Parcel & Sahar International Metro Station

Interface with Metro-3 CSMIA Sahar Road Station

The Metro station and its entrances are fully integrated into proposed development on the top of metro station. Metro structure starts almost at 28 m. below average ground level. With the height of about 16 m. required for Platform level and Concourse level, the roof of the concourse level of metro structure is about 12 m. below ground. Three basements of the proposed commercial development are planned above the concourse roof level. The emergency exits of metro station and commercial development are suitably segregated.

Considering the close interface between proposed commercial building on this plot and ongoing metro station works, construction of the basements is required to be implemented in coordination with Metro station construction schedule for operationalization of the metro station.

Building Details

Proposed commercial development on T2-C05 Parcel has three underground basements (Approx. 12 meter below existing ground level) and integrated superstructure having G+10 floors (Approx. 41.40 meter above existing ground level).

Subsequent to grant of EC to MIAL for landside development and construction of 6 buildings by SEEIA on 1st July, 2011, GoM has approved modification/changes in permissible FSI due to which the project has undergone marginal/minor changes in Built-up area and construction area.

The total construction area of the 4 Buildings has slightly increased whereas the total construction area of entire Landside development has reduced.

Building uses such as Convention and Entertainment have been dropped from the proposal.

Built Up Area Summary is given below:

Table 2-10: Construction Area details T2-C05

Sr. No	Particulars	Details
1	Total Plot Area	66,982.62 Sqm.
2	Permissible FSI	5
3	Proposed Built-up Area	2,84,676.00 Sqm.
4	Additional 15 % Staircase Lift, lobby Area	42,702.00 Sqm.
5	Total Permissible Built-up Area (3+4)	3,27,378.00 Sqm.
6	Proposed Construction Area(Including Basement area)	5,38,000.00 Sqm.

Permissible FSI, Additional 15 % Staircase Lift, lobby Area and Total Permissible Built-up Area are in accordance with DC Regulations of CSMIA

Proposed uses/Activities are as stated below:

- Retail
- Entertainment facilities
- Food Courts, Restaurants, Bars, kiosks
- Rooftop/ terrace gardens
- Luxury Hotels
- Commercial/ Office spaces
- UG Metro Station with all required spaces & facilities,
- Pedestrian connections (skywalks & underpass) to the Terminal & surrounding landside development

Current Status of the Project:

- Drawings have been submitted to MMRDA for obtaining Building Permission
- MMRC (Metro Line-3) NOC received
- AAI height NOC received

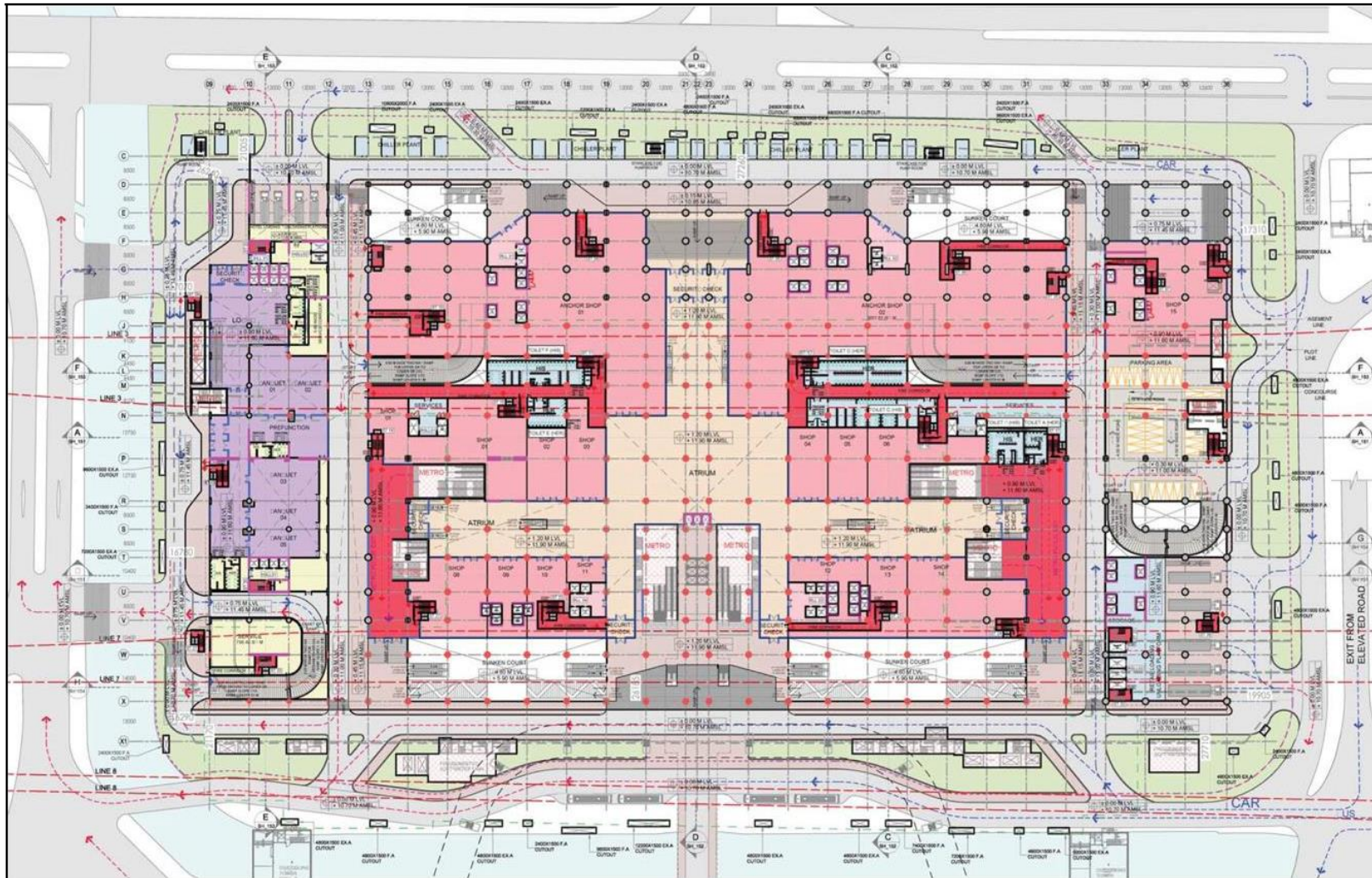


Figure 2-16: T2-C05 Proposed Ground Floor Layout

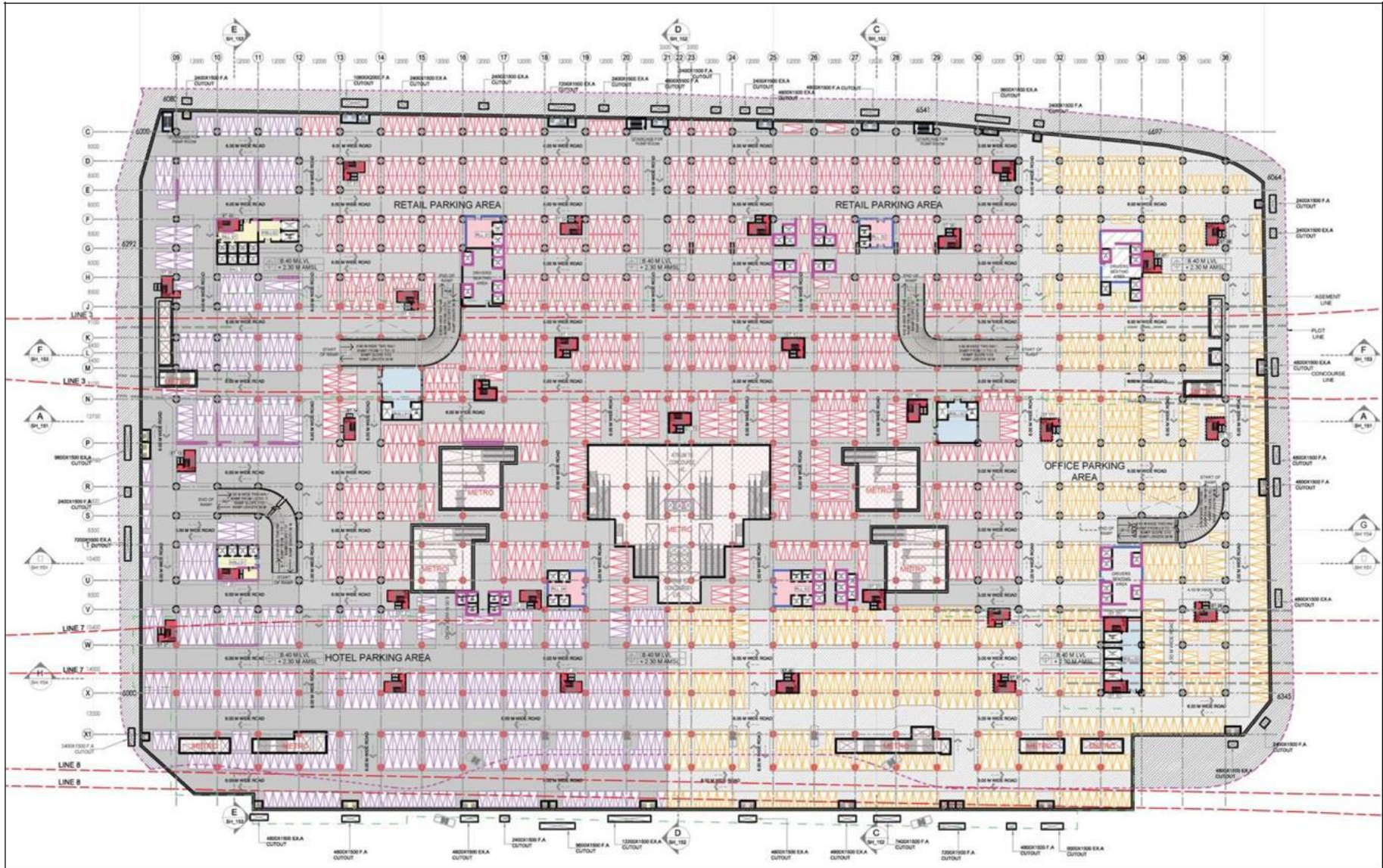


Figure 2-17: T2-C05 Proposed Basement 02

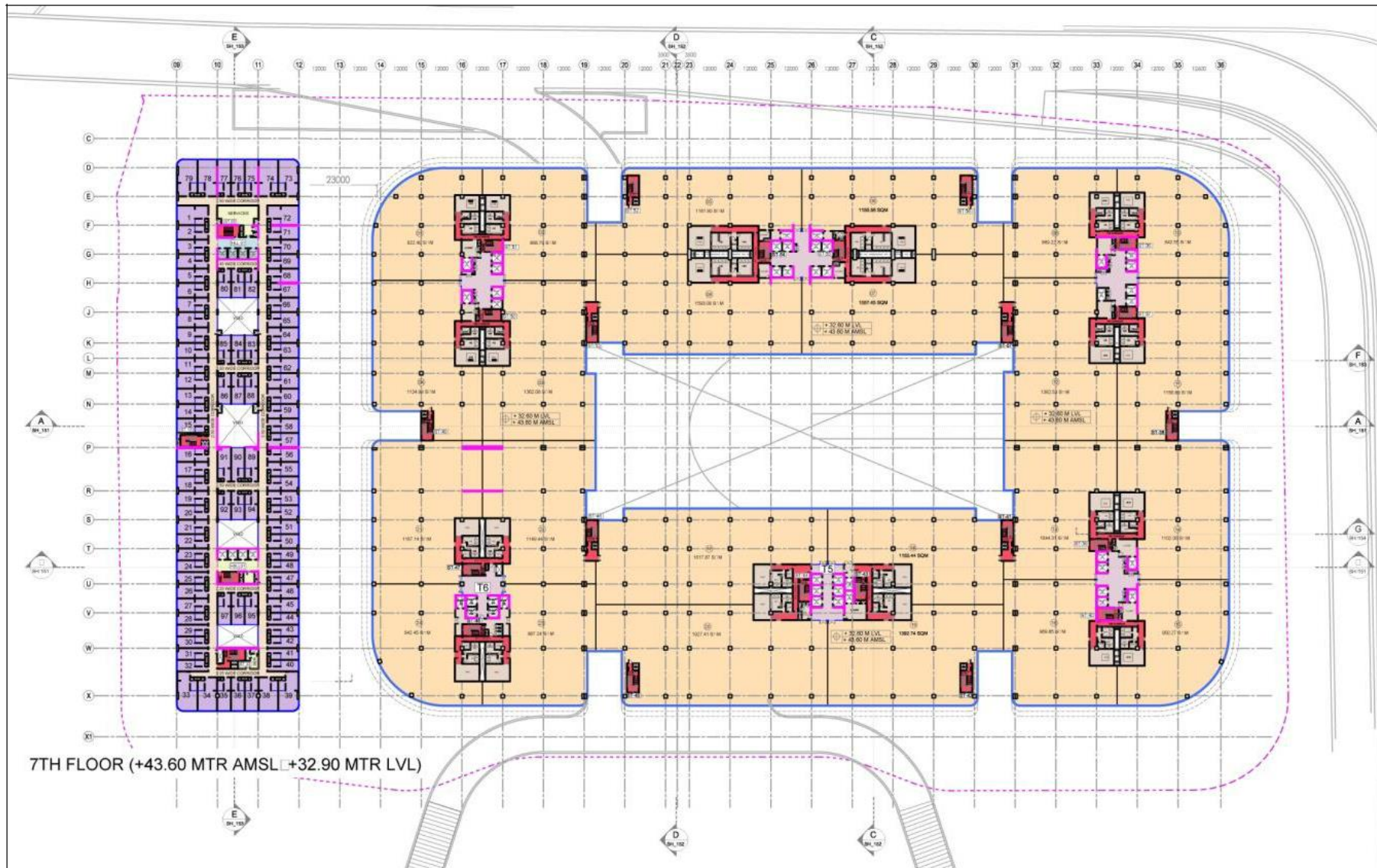


Figure 2-18: T2-C05 Proposed Seventh Floor Layout (Typical Floor)

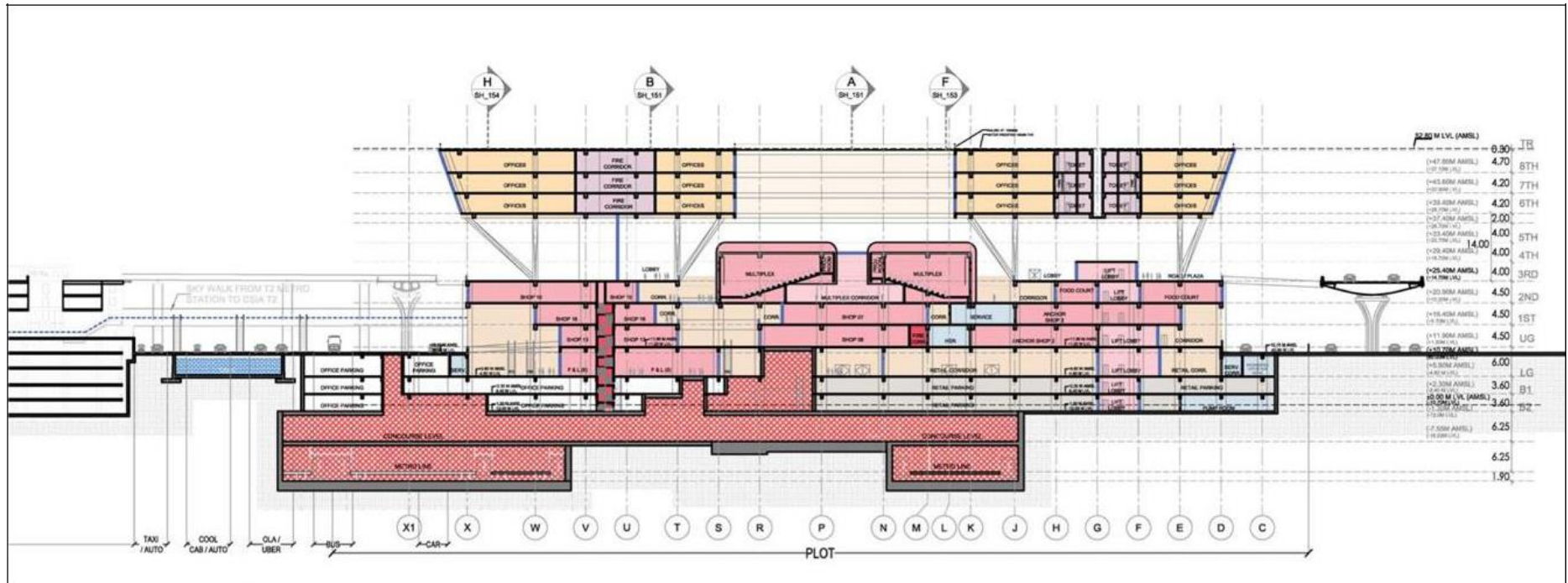


Figure 2-19: T2-C05 Typical Section



Figure 2-20: T2-C05 Indicative View

3. Proposed Mixed Use development of Building 3 NSC-01

3.1. Project Brief

Proposed Building-3 on parcel NS-C01 is in North Sahar Zone of CSMIA. This land parcel has direct connectivity to Western Express Highway, via new at-grade Sahar Road below the Elevated Road, and it has close proximity to Metro line-1 and Metro line-3 Stations.

EC has been received for construction of building on this plot for proposed commercial use in 2011. However the amendment to the EC is sought in view of marginal variations in built-up area and due to updates to building plans proposed by MIAL and earlier uses such as Convention, Entertainment and Sports has been dropped and Commercial/Office use has been added.

A comparative area statement for the proposal as per EC, 2011 and as per the amended proposal is as mentioned in the table below:

Table 2-11: Comparative Area statement for Building no-3 (NS-C01) as per EC 2011 and Proposal for Amendment

Sr. NO	Particulars	As per EC 2011					Proposal with Amendment		
01	Total Construction Area (Including Basement)	1,93,774Sq.m.					2,20,647.85 Sq.m.		
02	Mixed Use Development Area	Convention Area (Sq.m)	Retail Area (Sq.m)	Hotel Area (Sq.m)	Commercial / Office Area (Sq.m)	Entertainment & Sports (Sq.m)	Retail Area (Sq.m)	Hotel Area (Sq.m)	Commercial / Office Area (Sq.m)
		37100.0	5894.0	45200.0	-	21000.0	37,250.0	46,801.58	71,150.0

Plot/Site Details

The NS-C01 land parcel admeasuring 31,754.80 Sq.m. has frontage on major roads from all the sides. The site is accessed by Sahar Shadow Road on North side, Sahar Road on West side and Marol Pipeline road on South-East side. The site is connected to other land parcels across Shadow road by a proposed Underpass which further connects to Sahar Road Metro station at B1 level.

Entire plot, free of any encumbrances is available for the proposed commercial development and shall be accessible for airport users as well as non-airport users.

NS-C01 land parcel along with Underground Metro Station of Metro line-3 has strong opportunity for Transit Oriented Development (TOD) with retail, commercial / offices and hotel uses, based on Metro Line 3 transit system.

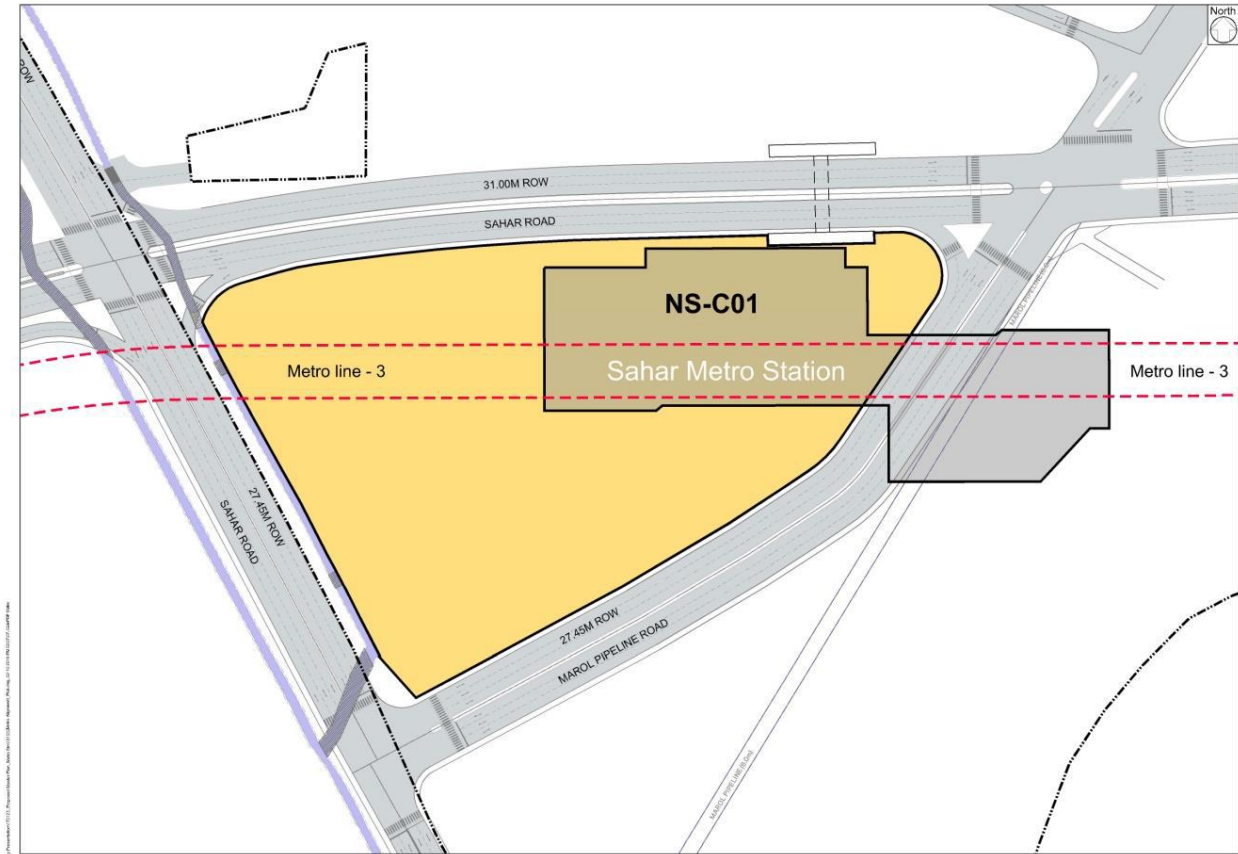


Figure 2-21: NS-C01 Land Parcel & Sahar Road Metro Station

Interface with Metro-3 CSMIA Sahar Road Station

the Metro station is partially located within NS-C01 land parcel and one of its entrances are fully integrated into proposed development on the top of metro station. Metro structure starts almost at 28m. below average ground level. With the height of about 16 m. required for Platform level and Concourse level, the roof of the concourse level of metro structure is about 12m below ground. Three basements of the proposed commercial development are planned above the concourse roof level. The emergency exits of metro station and commercial development are suitably segregated.

Considering the close interface between proposed commercial building on this plot and ongoing metro station works, construction of the basements is required to be implemented in coordination with Metro station construction schedule for operationalization of the metro station.

Building Details

Proposed commercial development on NS-C01 Parcel has three underground basements (Approx. 12 meter below existing ground level) and integrated superstructure having G+8 floors (Approx. 34.25 meter above existing ground level).

Subsequent to grant of EC to MIAL for landside development and construction of 6 buildings by SEEIA on 1st July, 2011, GoM has approved modification/changes in permissible FSI due to which the project has undergone marginal/minor changes in Built-up area and construction area.

The total construction area of the 4 Buildings has slightly increased whereas the total construction area of entire Landside development has reduced.

Building uses such as Convention and Entertainment have been dropped from the proposal.

Built Up Area Summary is given below:

Table 2-12: Construction Area details NS-C01

Sr. No	Particulars	Details
1	Total Plot Area	31,754.80 Sqm.
2	Permissible FSI	5
3	Proposed Built-up Area	1,34,957.90 Sqm.
4	Additional 15 % Staircase Lift, lobby Area	20,243.68 Sqm.
5	Total Permissible Built-up Area (3+4)	1,55,201.58 Sqm.
6	Proposed Construction Area(Including Basement area)	2,20,647.85 Sqm.

Permissible FSI, Additional 15 % Staircase Lift, lobby Area and Total Permissible Built-up Area are in accordance with DC Regulations of CSMIA

Proposed uses/Activities are as stated below:

- Retail
- Food Courts, Restaurants, Bars, kiosks
- Hotel
- Conferencing Areas, Meeting Rooms & Banquet Areas
- Commercial/ Office spaces
- UG Metro Station with all required spaces & facilities, Basement Car Park
- Pedestrian connections (skywalks & underpass) to the Terminal & surrounding Cityside development
- Landscape

Current Status of the Project:

Drawings have been submitted to MMRDA for obtaining Building Permission

- MMRC (Metro Line-3) NOC received



Figure 2-22: NS-C01 Proposed Ground Floor Layout

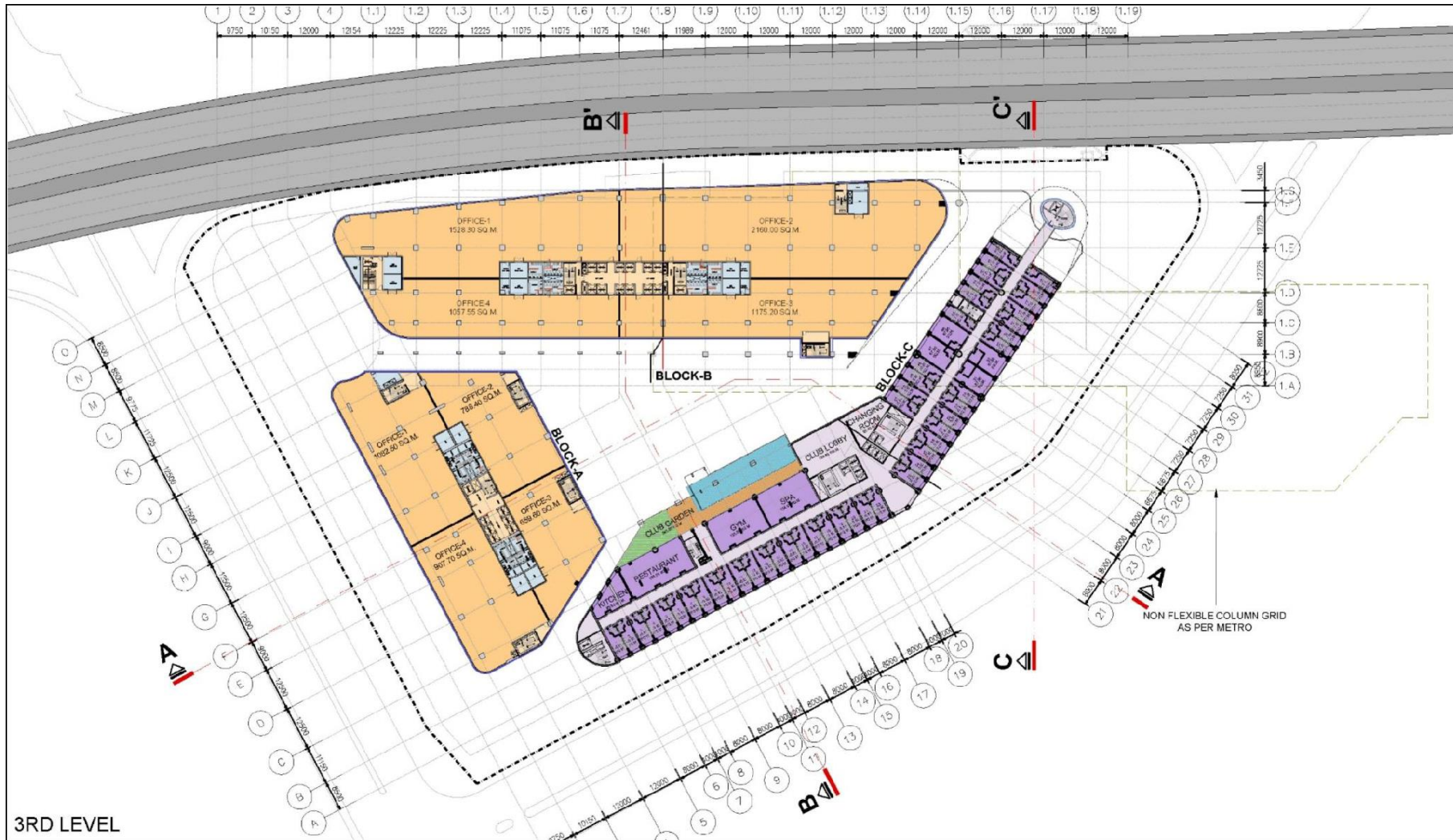


Figure 2-23: NS-C01 Proposed Basement Floor Layout



Figure 2-24: NS-C01 Typical Floor Plan

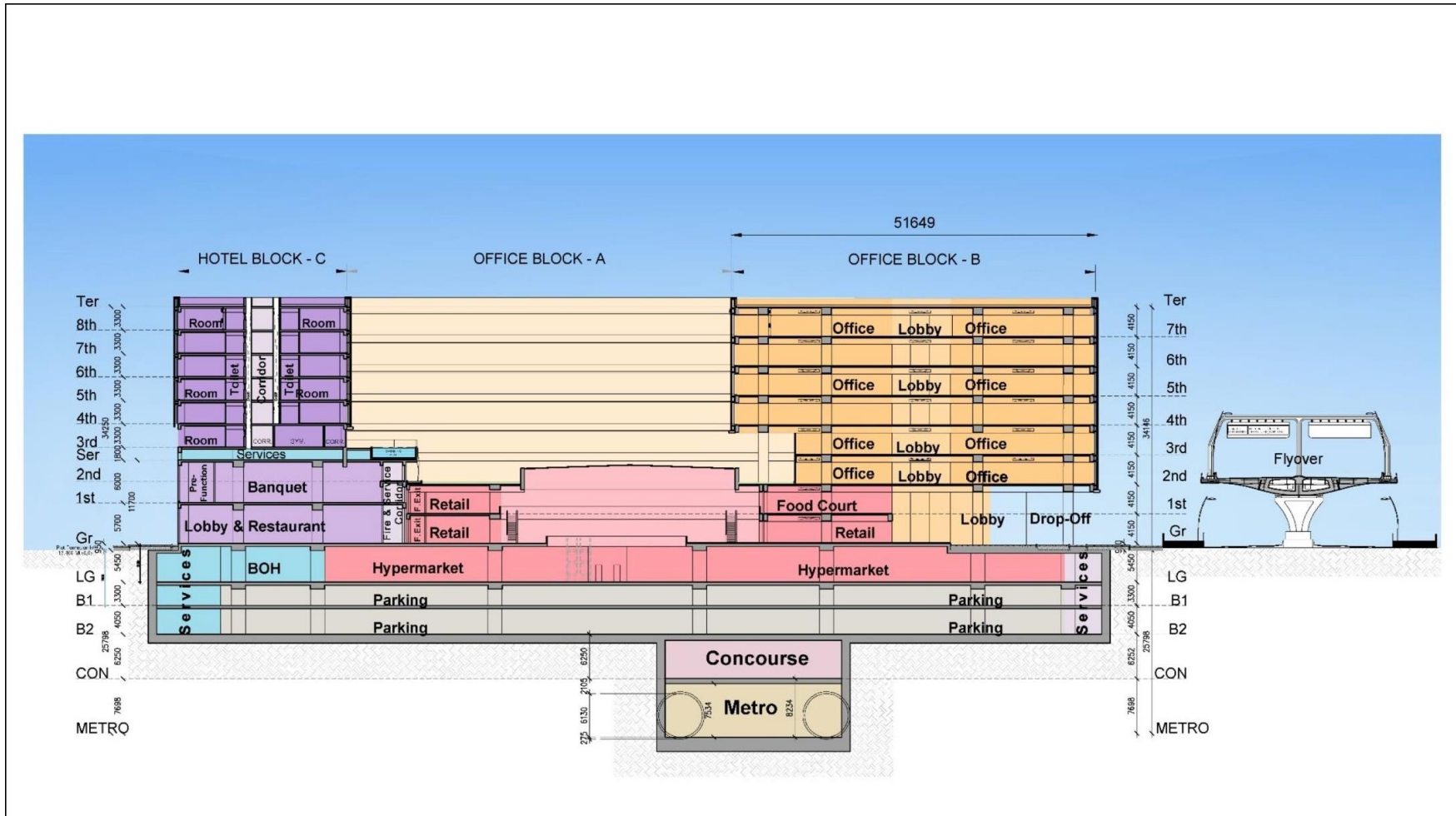


Figure 2-25: Indicative Section



Figure 2-26: NS-C01: Indicative 3D View

3.2. Construction of Building-5 (T1-P01) Multi level car parking facility

Project Brief

The Building-5 Multi level car parking facility on plot T1-P01 in T1 Forecourt, adjacent to CSMIA Terminal-1B is completed and operational . This land parcel has direct connectivity to Western Express Highway, and accessed by Terminal Loop Road and it has close proximity to Terminal 1 Building.

EC has been received for this MLCP in 2011. However the amendment to the EC is sought as built up area is reduced in the completed building due to height restriction

A comparative area statement for this Building as per EC, 2011 and as per the amended construction is as mentioned in the table below:

Table 2-13: Area details T1-P01

Sr. No.	Particulars	As per EC 2011	As Constructed
01	Basement Area	3,850 Sqm.	8,768 Sqm.
02	Total BUA Area	39,624 Sqm.	22,411 Sqm.
03	Total Construction Area	43,474 Sqm.	31,180 Sqm.
04	Parking Nos	972 Nos	900 Nos

Due to height restriction the building upper floors were to be excluded. In order to compensate the parking demand of upper deleted floors one basement was added. Hence the building is constructed as 2 Basement +G+4 Upper floor & Terrace.

Plot Detail/ site detail

The T1B MLCP land parcel admeasuring 7705.45 Sqm.(0.770 ha) & accessed by Terminal Loop Road on south side . The site is connected to the terminal T1 by pathway for seamless flow of passengers to & from the Terminal.

Building Details.

This MLCP Building is constructed to accommodate parking facility part commercial development has two basement and superstructure having G + 4 upper floor.



Figure 2-27: Location Plan T1-P01

Building uses and activities are as follows:

- All floors are primarily planned as parking facility required for current and future demand of Terminal 1
- Building Along Road frontage on ground and first floor are planned and use as commercial premises for stores, restaurant etc.
- Upper floors part corners areas as offices / store areas.
- Terrace is installed with solar panel.
- Basement has support services and utility (HVAC FAN rooms, pump rooms, UG tank. Meter room, electrical room)
- Staircase, lift lobby and lifts for building occupant use.
- Toilet facility on all floors.
- Car entry and exit independent ramp within building.
- Provision to accommodate future car lift requirement.
- Landscape

Current Status of the Project:

After completion of construction activity and receipt of Occupancy certificate (in May 2016) from statutory body (MMRDA) Building is operational.

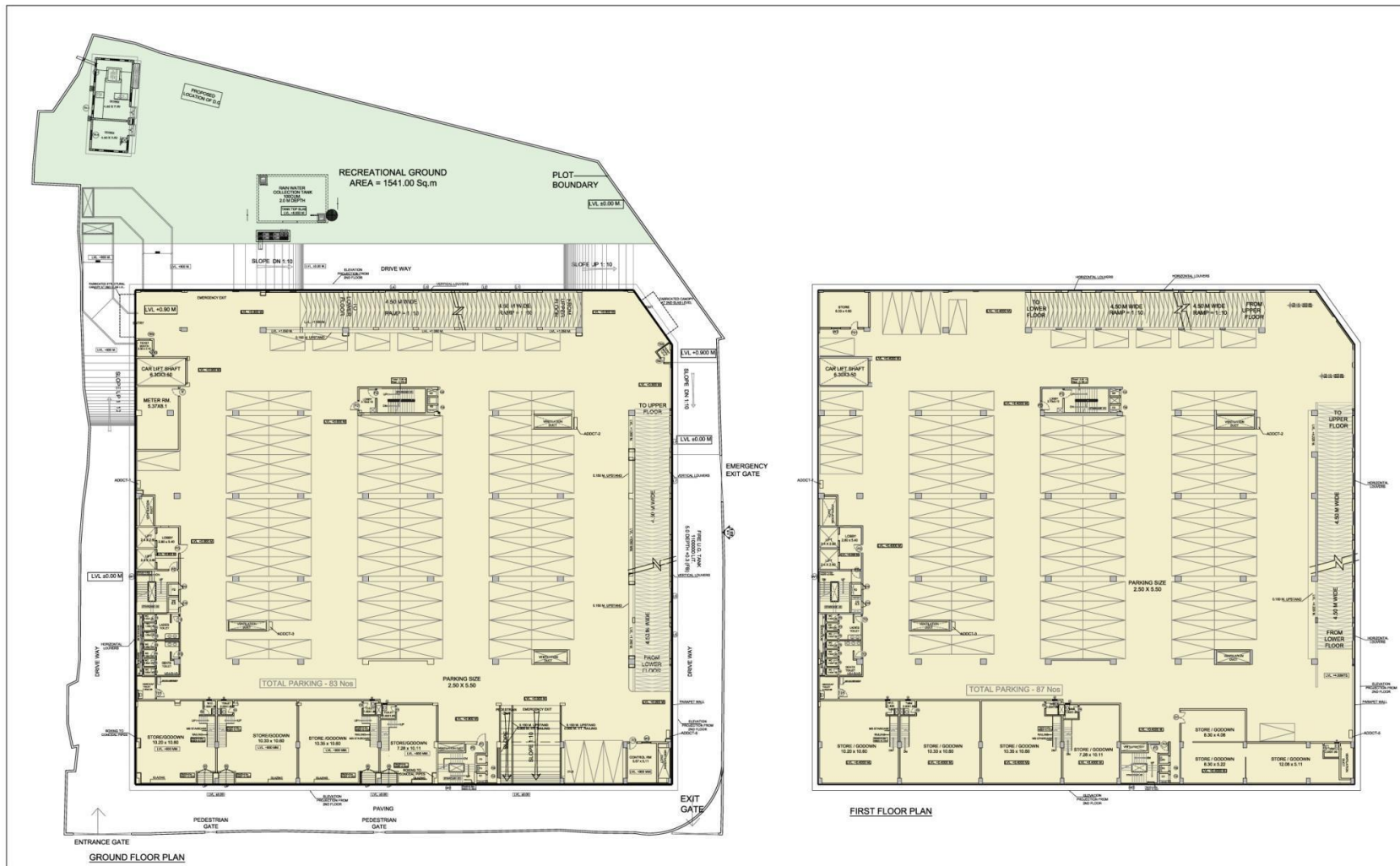


Figure 2-28: T1 P01 Ground Floor Plan & Typical Floor Plan

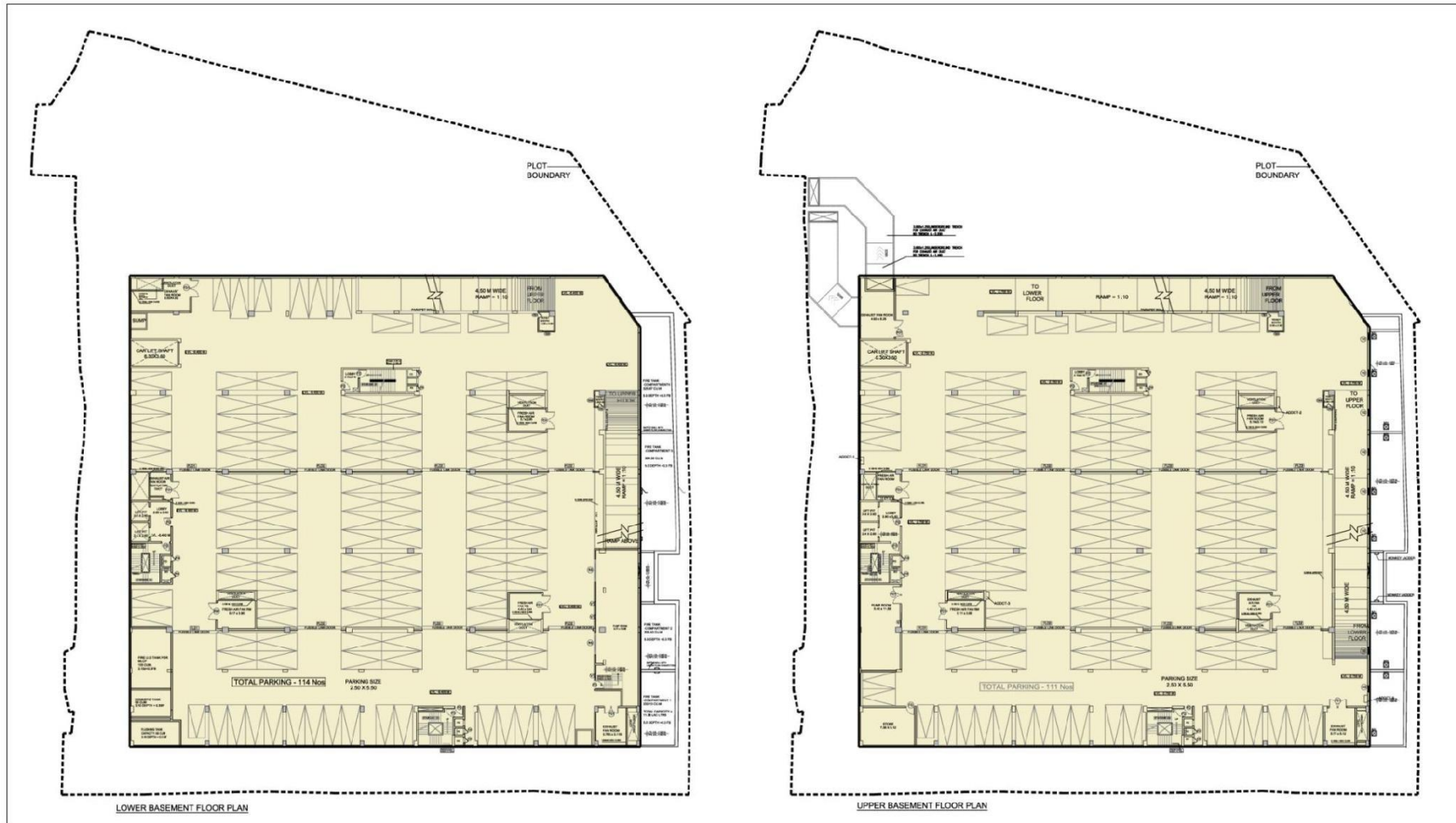


Figure 2-29: T1 P01 Basement1 & Basement 2 Floor Plans



Figure 2-30: T1 P01 Building Photograph

2.4.5 Project Phasing

Phasing of Area Development Works

In accordance with EC granted in the year 2011 and extension granted to the same in 2018, MIAL is implementing development of infrastructure and utility network in phased manner for Non-operational (landside) area of CSMIA, and some of the infrastructure and utility network projects have been implemented. Broad phasing for balance area development works of infrastructure, utilities and landscape is mentioned as below:

Sahar Zone: As part of area development works, approximately 70% of road infrastructure and utilities infrastructure at this zone are completed, and balance works are in the process of implementation and planned to be completed by December 2020.

Santacruz Zone: As part of area development works, approximately 40% of road infrastructure, utilities and landscape at this zone are completed, and balance works are in the process of implementation and planned to be completed by December 2022.

Kalina Zone: As part of area development works, approximately 20% of road infrastructure, utilities and landscape at this zone are completed. and balance works are in the process of implementation and planned to be completed by December 2024.

Phasing of Building Construction Projects

As per EC granted in the year 2011, construction of 6 buildings, Building-1,2,3,4, 5 & 6 was to be carried out. As per the amended proposal being submitted, building construction projects have been reduced to 4 buildings, as Building-4 & 6 have been dropped from the scope. Out of 4 buildings, construction of Building-5, i.e., MLCP building has been completed and the same is operational.

Broad phasing of balance 3 building projects is mentioned below:

Building No-1: T1C-04 - A part of commercial development, i.e. three basements for parking, services and Metro Interface ground and first floor areas above the underground Metro line-3 station at this site are planned to be completed by 2021. The super structure development beyond Metro area interface shall be completed by 2024, based on future demand assessment.

Building No-2: T2C-05 - A part of commercial development, i.e. three basements for parking, services and Metro Interface ground and first floor areas above the underground Metro line-3 station at this site are planned to be completed by 2021. The super structure development beyond Metro area interface shall be completed by 2026, based on future demand assessment.

Building No-3: NS-C01 - A part of commercial development i.e. three basements for parking, services and Metro Interface ground and first floor areas above the underground Metro line-3 station at this site are planned to be completed by 2021. The super structure development beyond Metro area interface shall be completed by 2024, based on future demand assessment.

Building No-5: (T1-P01) - The Building No-5 Multi level car parking facility on plot T1-P01 in T1 Forecourt, adjacent to CSMIA Terminal-1B is completed and operational.

2.4.6 Project Cost

Expected cost of the landside area development project is approximately INR 2,874 Cr. This includes cost of Lateral Infrastructure Development [INR 1052 Cr] and Estimated Cost for Three Buildings [INR 1822 Cr].

2.4.7 Raw material requirement

The demand for raw material requirement for building construction and development of infrastructure facilities like roads, water supply network, SWD network, sewerage network etc. will be as follows:

Table 2-14: Raw material requirement for the project

Raw material	Quantity	Unit
Cement	1,44,05,001	Bags
Steel	14,40,50,015	kg
Metal	5,76,20,006	cuft
Sand	11,52,40,012	cuft
Bricks	40,33,40,042	Nos

Potential sources of construction material will be identified and located in such a way as to ensure that:

- Areas are as close to the site as available to cut down on transportation and hence embodied energy.
- Availability of sufficient reserves of each material type and
- Where ever possible, sources for any one material type to be distributed on the project site to minimize haulage.

2.4.8 Water Supply

Water demand projections for CSMIA Non-Operational area development is based on norms of National Building Code -2016 and Central Public Health and Environmental Organisation (CPHEEO) for domestic (Potable) and non-domestic needs. Source of potable water supply to CSMIA Non-Operational area development is through MCGM water supply network. Source of water supply for non-potable purposes like flushing, HVAC, gardening shall be through piped network of treated water through MIAL STPs.

Water requirement during Operation Phase

For Entire landside development:

As described in EC, 2011, water demand projections are based on norms of National Building Code -2016 and Central Public Health and Environmental Organisation (CPHEEO) for domestic (Potable) and nondomestic needs.

Non-Operational area development at CSMIA consists of activities like residences, commercial/ office areas, retail, hotels and other entertainment activities. As described in EC 2011, total estimated water requirement for entire project was 20392 CMD (10583 CMD from MCGM and 9768 CMD recycled water from proposed STP and RWH).

When MIAL submitted the proposal for environmental Clearance in the year 2011, the demand assessment for hotels was assumed entirely for 5 Star category hotels. Therefore entire built-up area was assumed for development of 5 Star category hotels. However, based on subsequent demand assessment and economic feasibility, the hotel & service apartments demand at CSMIA landside development is being estimated as per below mentioned categories:

- Five Star category hotels - 15%
- Four Star category hotels - 30%
- Three Star hotels, Service Apartments & Others - 55%

Due to above and other facility requirement reassessment of Non-operational area development, based on updated proposed total BUA, the updated water demand for total Non-operational area development will be 16,498 CMD (7,038 CMD from MCGM and 9,460 CMD recycled water from STPs). There is a reduction of about 3,894 CMD of the total estimated water requirement, i.e. overall reduction of 19.09% in water demand as per updated demand, against estimated water demand of 20,392 CMD as described in EC 2011.

Water balance for the development is given in figure 2.31.

Table 2-15: Comparison of water demand for Non-Operational Area Development ‘as per Environmental clearance 2011’ and ‘as per updated demand proposed for Amendment’

	Water Demand as per EC 2011 (CMD)	Water Demand proposed for Amendment (CMD)	Change in Water Demand (CMD)	Percentage Decrease
Total	20,392	16,498	-3,894	-19.09%

Proposed water supply network & recycled water supply network as updated 2019 is shown in following drawings respectively and are being implemented in phases along with lateral infrastructure.

Table 2-16: Water Requirement and Reuse for Non-Operational Area Development during Operation Phase (Updated 2019)

Sr No	Description	Occupancy	Water requirement				Waste Water generated (cum)
			Standard (lpcd)	Domestic (cum)	Flushing (cum)	Total (cum)	
1	Hotels						
	5 Star 15%	2,146	320	579	107	687	629
	4 Star 30%	4,292	320	1,159	215	1,373	1257
	3 Star 55%	7,868	180	944	472	1,416	1322
2	Entertainment, Retail, Leisure	12,618	15	38	151	189	185
3	Offices, Travel & Tourism, Banks	93,693	45	2,811	1,405	4,216	3935
4	Hospital & Healthcare	655	450	252	43	295	270
5	Social Infrastructure	2,275	45	68	34	102	96
6	Sub Total (1-5)	1,23,545		5,852	2,428	8,279	7694
7	Supporting Services	12,355	15	37	148	185	182
8	Total: Commercial Areas	1,35,900		5,889	2,576	8,464	7876
9	Residential area	12,729	135	1,146	573	1,718	1,603
10	Visitors	1,273	15	4	15	19	18
11	Total: Residential Areas	14,002		1,149	588	1,738	1,622
12	Grand Total	1,49,902		7,038	3,163	10,202	9,497

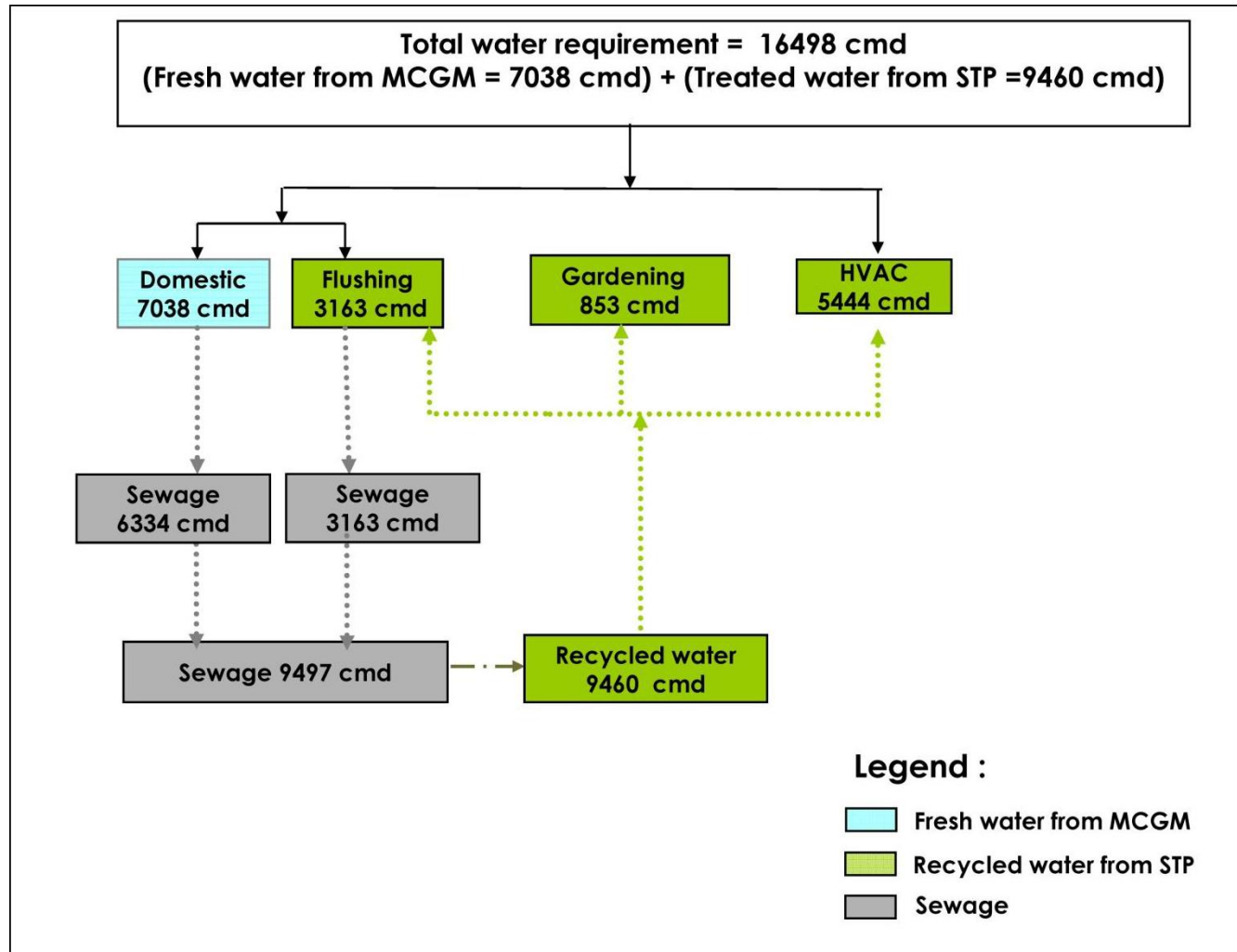


Figure 2-31: Water Balance for entire project development (Updated 2019)

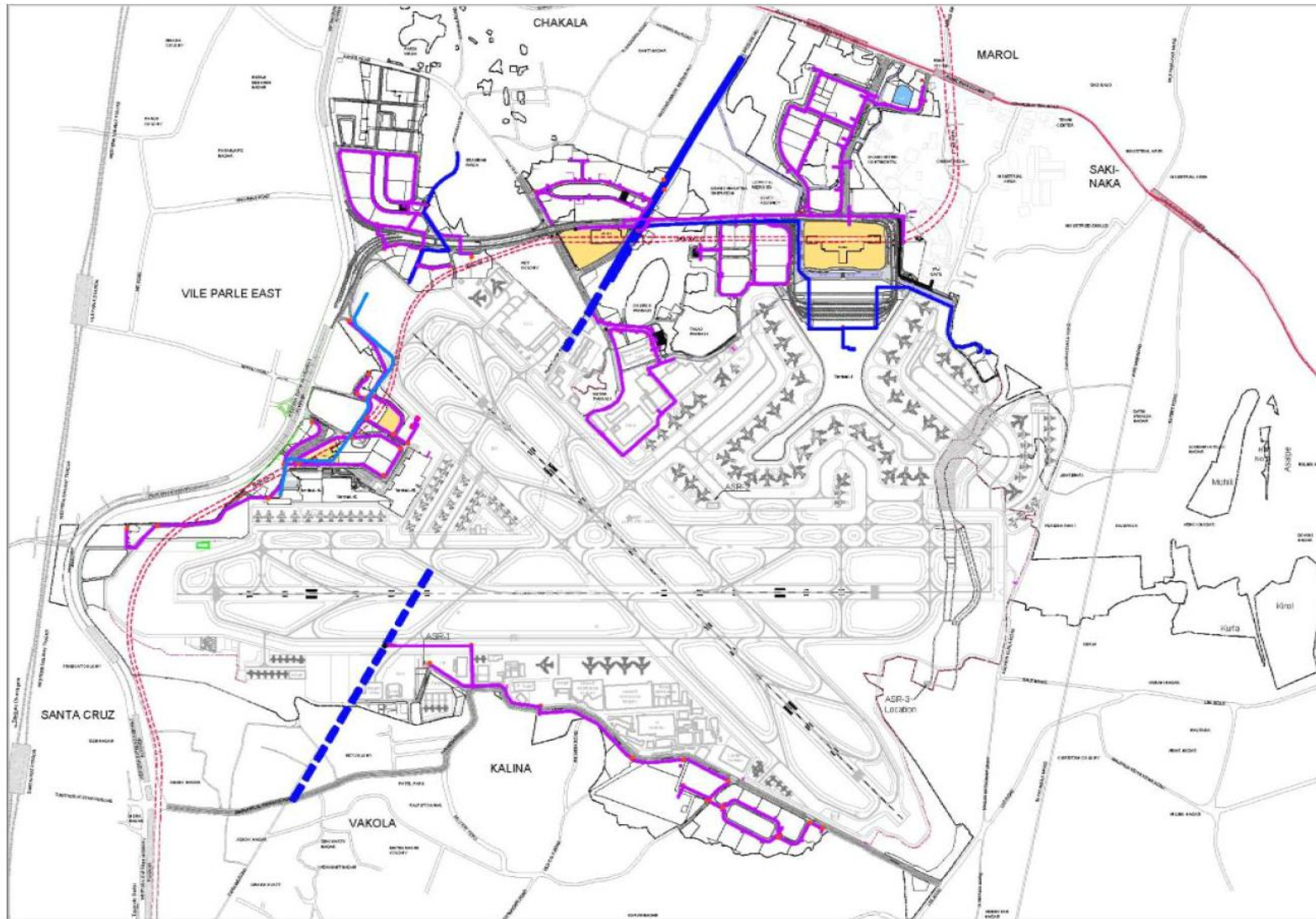


Figure 2-32: Plan showing water supply Network.

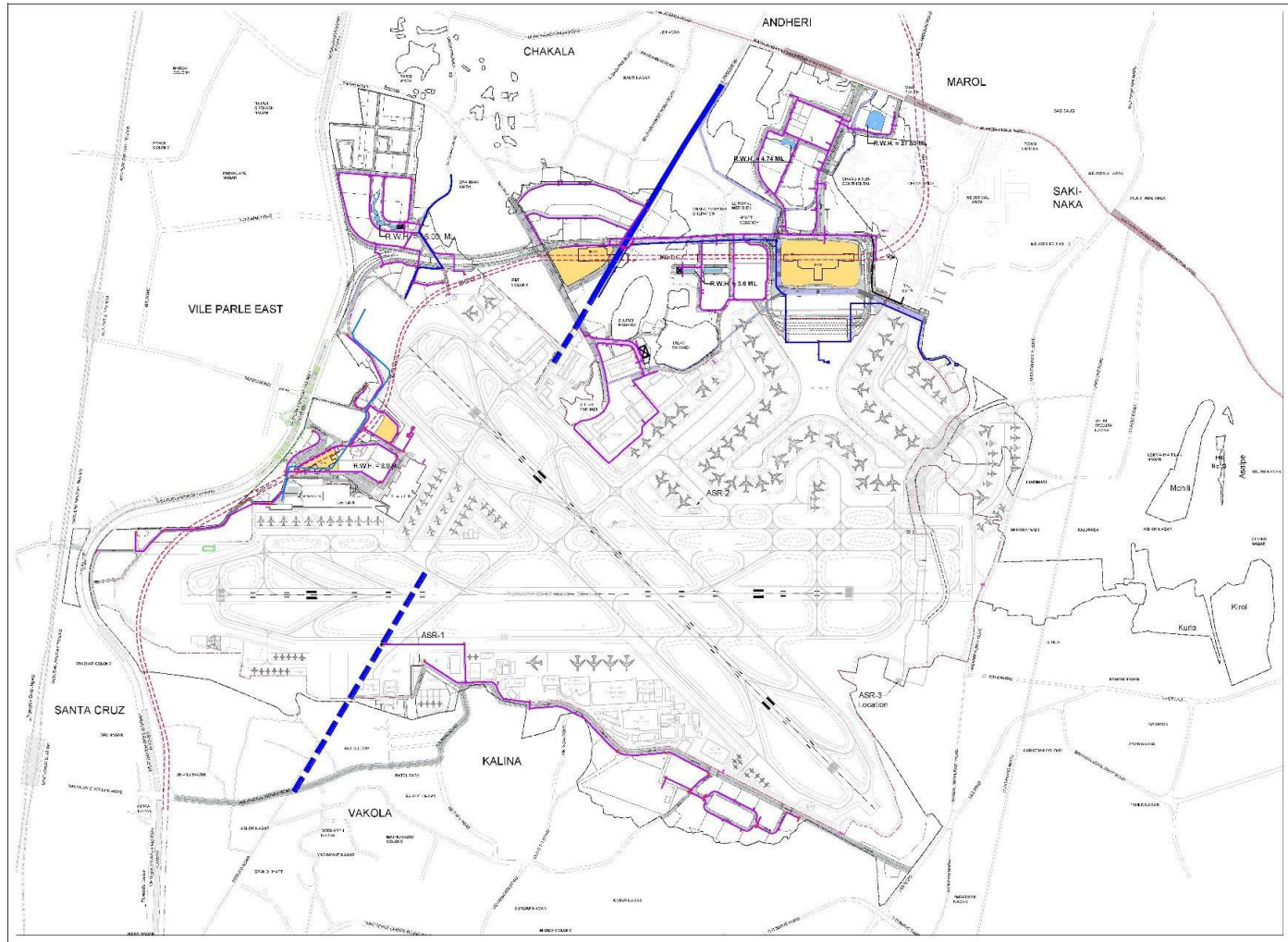


Figure 2-33: Plan showing water supply Network (updated 2019)

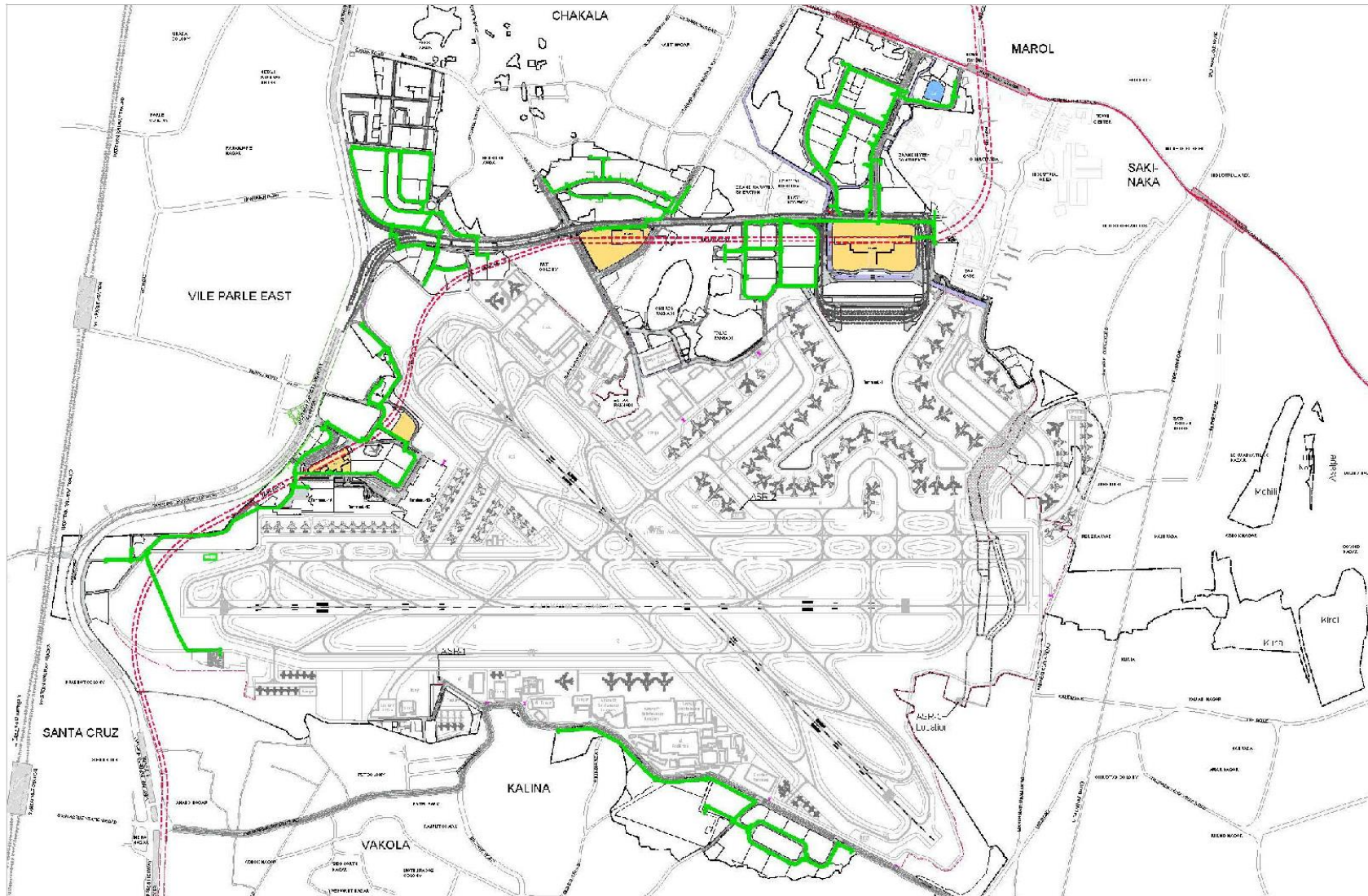


Figure 2-34: Plan showing Recycled water supply Network

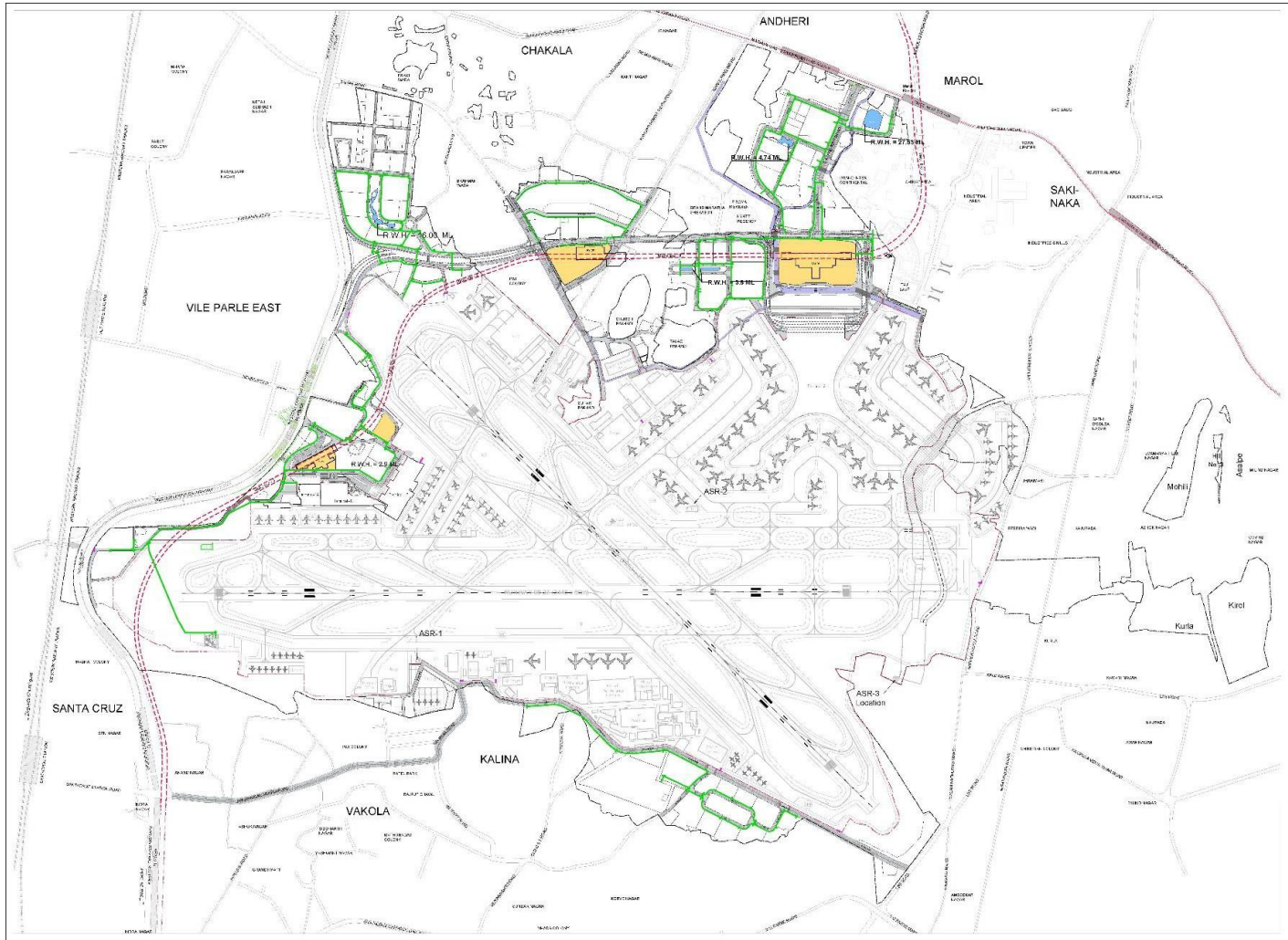


Figure 2-35: Plan showing Recycled water supply Network (Updated 2019)

Waste Water Collection & Treatment

As described in the previous EC dtd July, 2011, the estimated sewage generation was 9,768 CMD. For Non-operational area development at CSMIA, along with upgradation of existing infrastructure, the waste water from existing developments is being collected through a network of underground sewerage pipes, chambers and manholes and transported through the sewer network to constructed and operational new Sewage Treatment Plants (STP's) within CSMIA area. Similarly, the sewage collection and treatment shall be carried out for proposed developments as well.

Based on updated proposed total BUA of Non-operational area development at CSMIA, due to reduction in water demand, the total estimated sewage generation is reduced to 9,497 CMD. Hence, there is an overall decrease of 271 CMD (2.27%) in estimated demand of waste water generation for overall development.

Table 2-17: Comparison of Waste Water Generation for Non-Operational Area Development 'as per EC 2011' and 'as per updated demand proposed for Amendment'

	Waste Water Generation as per EC 2011 (CMD)	Updated Waste Water Generation (proposed for Amendment) (CMD)	Decrease in Quantity (CMD)	Percent Decrease
Total	9,768	9,497	271	-2.27%

The approvals received from MCGM for proposed sewer networks of entire landside development at CSMIA are as follows.

- T1 forecourt Area- Dy Ch E/SP/41/KE/P&D dated 30 May 2016.
- North Sahar- Dy Ch E/SP/43/KE/P&D dated 28 March 2016
- North Village - Dy Ch E/SP/40/KE/P&D dated 27 Oct 2016
- South Sahar & T2 Forecourt- Dy Ch E/SP/45/KE/P&D dated 5 Feb 2018.
- West Gate- Dy Ch E/SP/42/KE/P&D dated 30 March 2016

Sewage Treatment Plant (STP): The Sewage collection and treatment for Landside Development shall be carried out at the 4 Sewage Treatment Plants (STPs) at various locations within the CSMIA area, out of which three STP's are already constructed and operational and one is proposed. The treatment at operational STP's is SBR Technology followed by ultra-filtration and RO, and treated water being reused for non-drinking purposes like flushing, HVAC and irrigation purposes. Dual plumbing network system is being implemented in phases for the purpose of distribution of potable requirement and treated water for flushing. Expected characteristics at Inlet and Outlet of STP's are as given below:

Table 2-18: Sewage Characteristics at Inlet and Outlet of STP

Sr. No.	Details	Units	Untreated	Treated
1	pH	----	6 -8	6 -8
2	Biochemical Oxygen Demand (BOD)	mg/lit	300	<10
3	Chemical Oxygen Demand (COD)	mg/lit	600	<50
4	Total Suspended Solids (TSS)	mg/lit	300	<10
5	Oil and grease	mg/lit	30	<10

Table 2-19: Details of the STPs

S.No	STPs	Capacity in MLDs (For Landside)	Remarks
1	STP-1 (near T1)	2.0	Constructed and Operational (Total capacity 4 MLD) (2 MLD for Airport Operation)
2	STP-3	1.5	Proposed
3	STP-4	4.0	Constructed
4	STP-5	0	Dropped
5	STP-6	0	Dropped
6	STP (T2)-8	2.0	Constructed and Operational (Total Capacity 10 MLD) (8 MLD for Airport Operation)
	Total Capacity for Landside Development	9.5	
7	STP-2 (near cargo)	0.5	Constructed and Operational, for Cargo Operations.

The total capacity of STP's proposed for Landside development is 9.5 MLD.

As there is overall reduction in estimated waste water generation quantity for overall Non-operational area development at CSMIA, 2 nos of STP's - STP no 5 and 6, as described in EC, 2011 are being dropped and sewage from collection wells from these areas is proposed to be pumped to STP No-8. Refer Fig. 3.6 below for Location of STPs & Fig 2.35 for updated proposed sewer network.

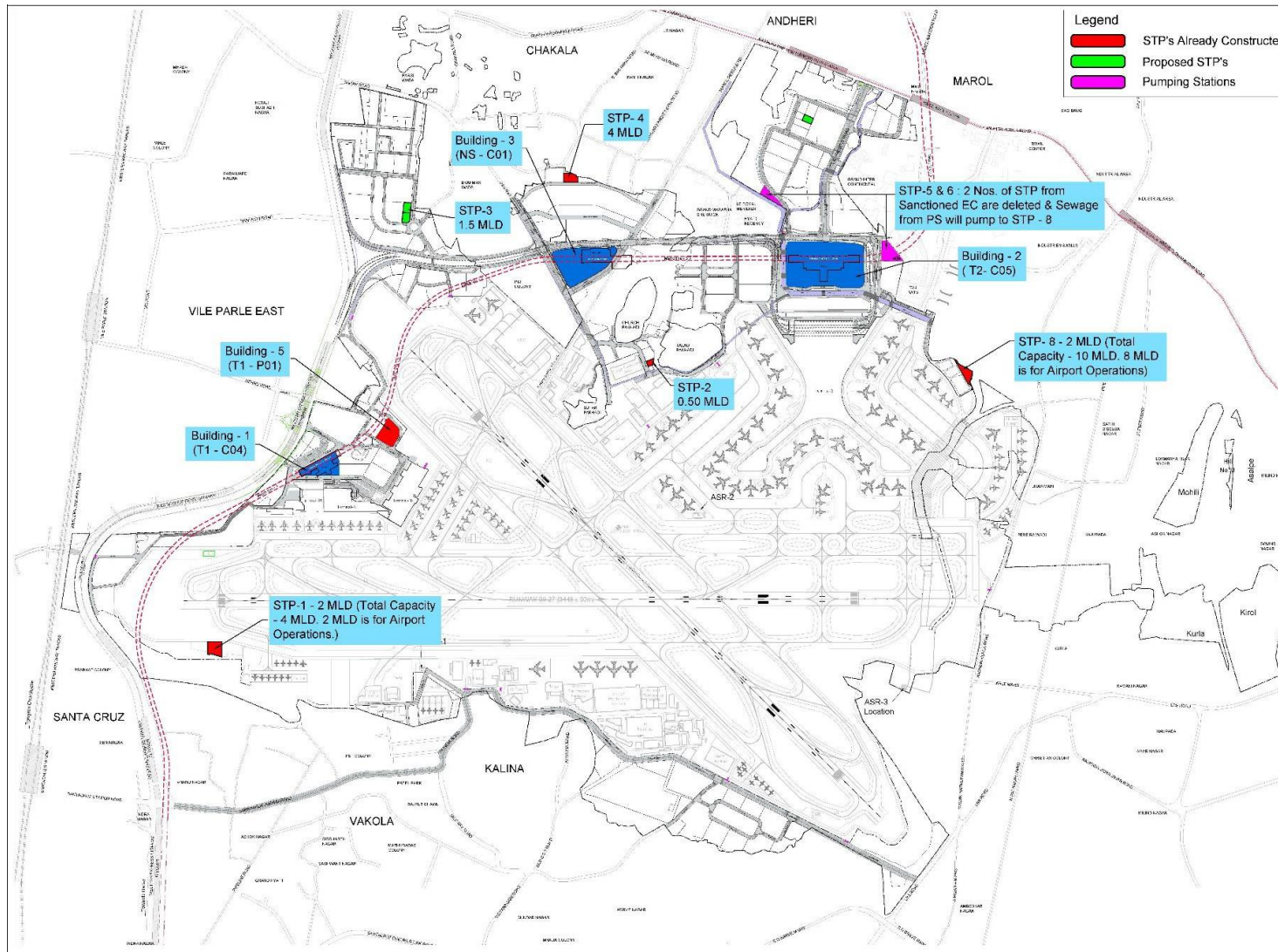


Figure 2-36: Locations of Sewage Treatment Plants (Updated 2019)

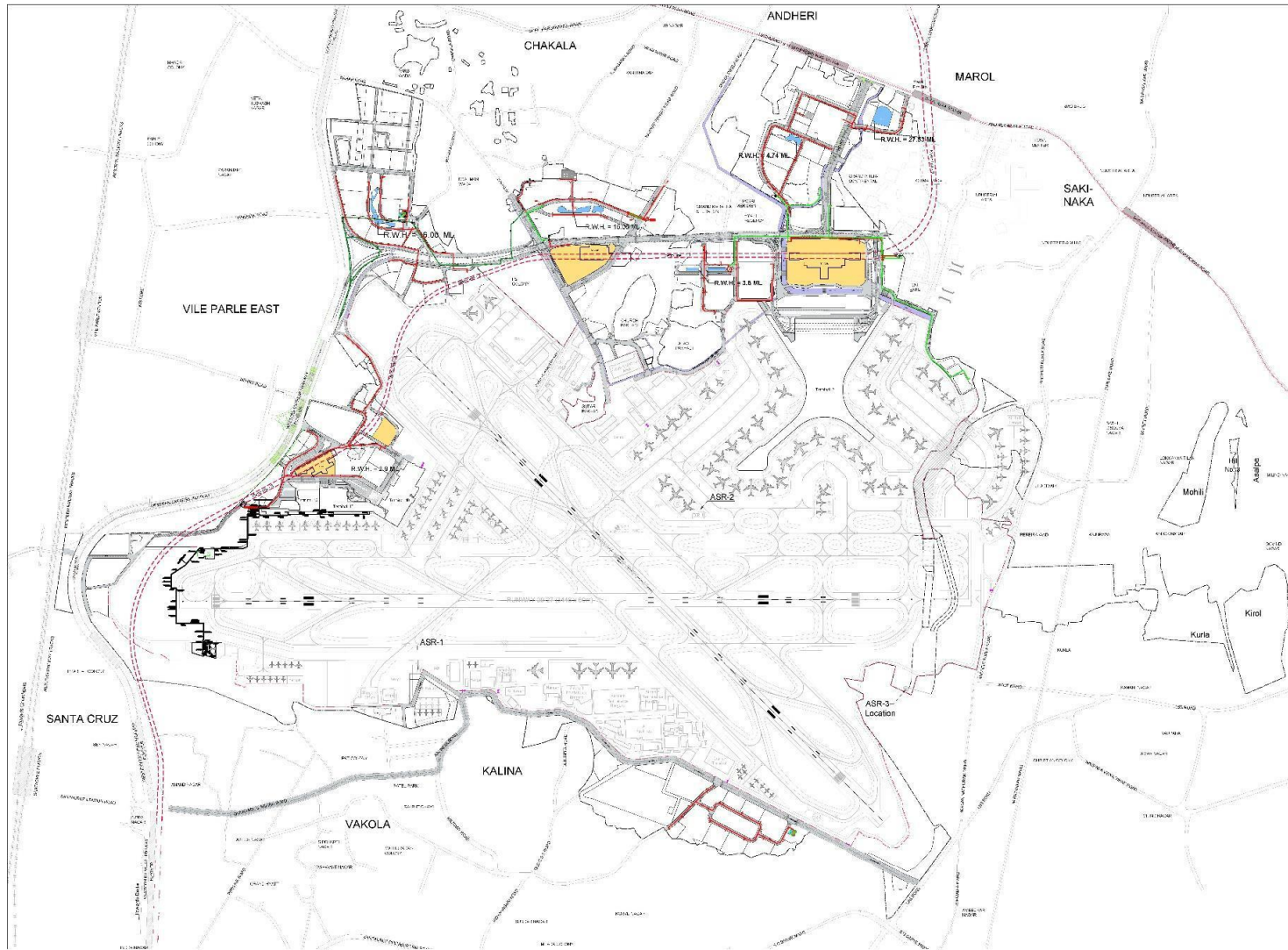


Figure 2-37: Plan Showing Sewage Network

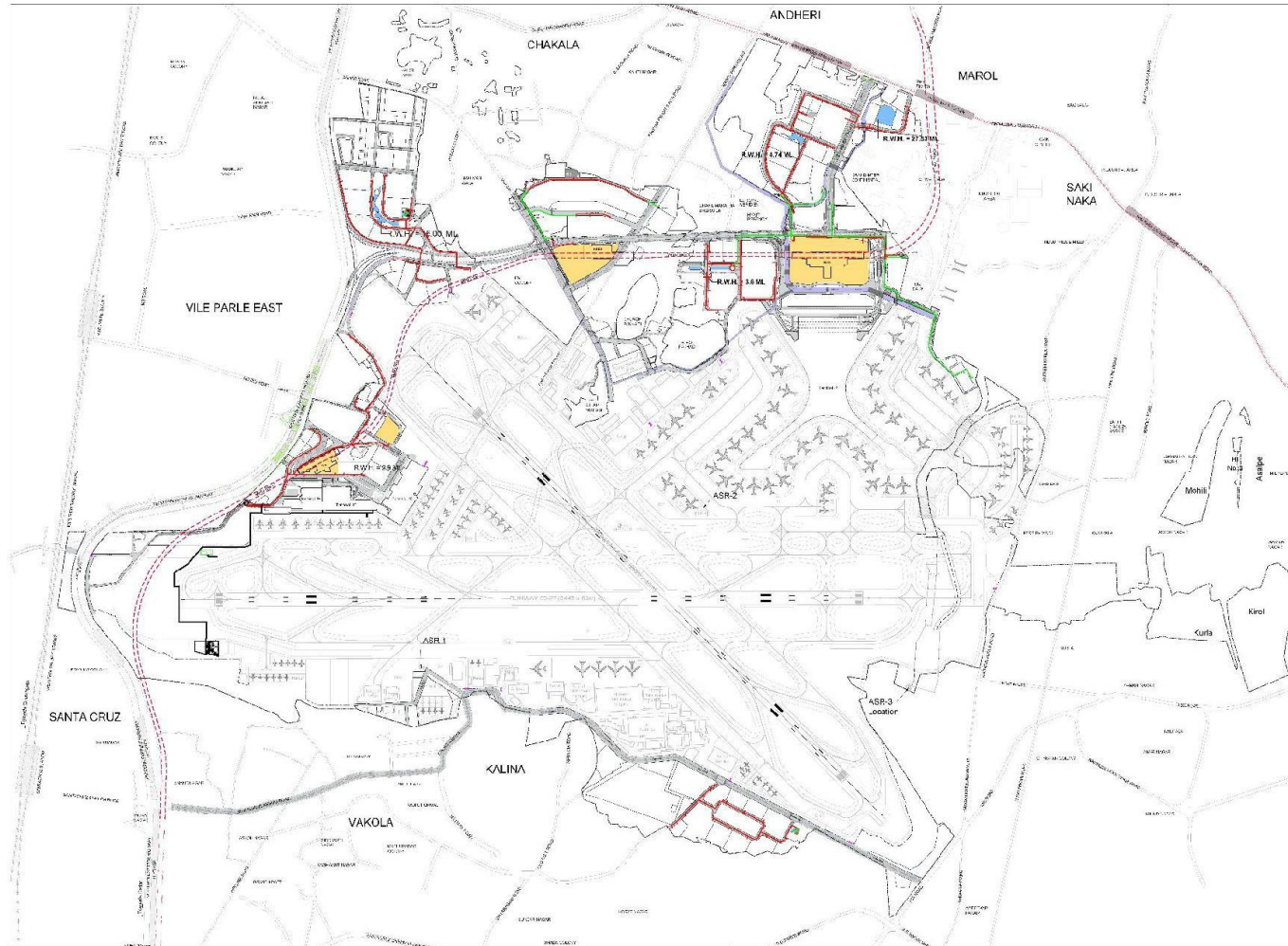


Figure 2-38: Plan Showing Sewage Network (Updated 2019)

Water Requirement for Proposed Four Buildings

The proposed developments consists of Retail, commercial/ offices areas, hotels& parking. Based on updated BUA following water requirements have been assessed. Fresh water requirement and sewage generation as per updated program proposed for amendment is given in the table below and water balance is as shown in the figure.

Table 2-20: Water Requirement and Water Reuse estimated during Operation Phase

	T1-C04	NS-C01	T2-C05	T1-P01	Total	Sewage Generation
Occupancy	5,621	16,490	31,296	555	53,408	-
Water Requirement (CMD)						
Domestic	169	455	700	15	1,338	1,205
Flushing	102	297	516	10	925	925
Irrigation	3	45	45		93	
HVAC					778	
Total					3,134	2,129

Total water demand as per EC 2011 was 2424 CMD, which is now being estimated to be 3,134 CMD, i.e. increased by 710 CMD, or approximately by 29.29%.

Though the total water requirement is increased, the fresh water requirement as per updated program proposed for amendment is reduced from 1,366 CMD as per EC 2011 to now 1,338 CMD i.e. by 28 CMD or approximately by 2%, and is well within the approved demand as per EC 2011. The additional requirement of treated water shall be met from existing STPs.

Waste Water Management during Construction Phase

For proposed construction of commercial buildings, the waste water during the construction phase is estimated to be 14.4 CMD (80% of domestic water supplied).

- Wastewater generated will be treated as per package treatment plant.
- Care shall be taken to ensure that the water used for construction purposes does not accumulate on the site to prevent breeding of mosquitoes.
- Measures shall be taken to divert run-off to storm water drainage and prevent pollution from construction run-off.
- Cleaning of drains on regular basis shall be done and monitored to avoid blockage.

Table 2-21: Water Requirement and Waste water generation during Construction Phase

Sr. No.	Purpose	Source	Quantity (CMD)	Waste Water Generation (CMD)
1.	Domestic use	MCGM	18	14.4 (@80%)
2.	Construction activity	Tanker/ MIAL STPs / RWH	80	
	Total		98	14.4

Waste Water Management during Operation Phase

For proposed commercial buildings, the total Sewage generation is estimated to be 2129 CMD. The Waste water generated shall be 90% of the water used for domestic purposes and

100% of water used for flushing. Total waste water generation is increased from previous 1058 CMD as per EC 2011 to now 2129 CMD i.e. by 1071 CMD@ by 88.66%.

The Sewage collection and treatment shall be carried out at STP-1 for Buildings T1-C04 & T1-P01, STP-8 for Building no T2-C05 & STP-4 for Building no NS-C01. The treatment proposed is SBR Technology followed by ultra-filtration and RO to reuse treated water for non-drinking purposes like flushing, HVAC and irrigation purposes. Dual plumbing network system is proposed for the purpose of distribution of potable requirement and treated water for flushing.

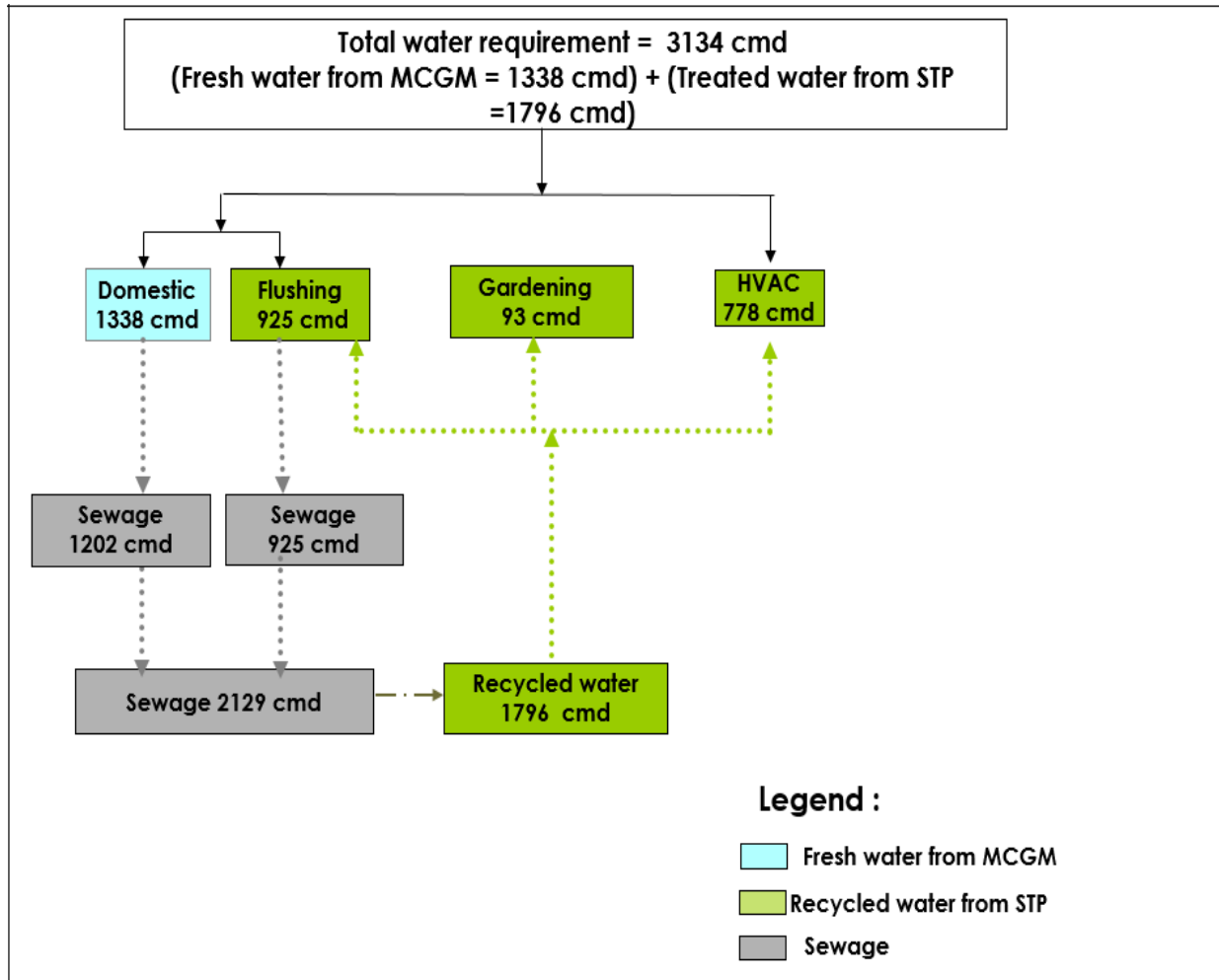


Figure 2-39: Water Balance for proposed commercial buildings (updated 2019)

2.4.9 Storm Water Drainage System

As described in EC, 2011 for proposed Non-operational area development at CSMIA, widening of existing major drains, in integration with MCGM's SWD proposals under BRIMSTOWAD have been developed in coordination with MCGM in phases.

Further, following measures have been taken as part of various developments within CSMIA landside area:

- Regular maintenance and cleaning of storm water drains
- Water harvesting to recharge ground water
- Planning and development of appropriate landscape design elements, within various lateral development works.

The approvals received from MCGM for the entire storm water drainage network as proposed for landside development at CSMIA are as follows.

- T1 forecourt Area-Letter no Dy Ch E/4264/SWD/WS dated 9 Nov 2012.
- North Sahar- Dy Ch E/4019/SWD/WS dated 8 Nov 2012.
- North Village, South sahar & T2 Forecourt area- Dy Ch E/4019/SWD/WS dated 8 Nov 2012.
- West Gate- Dy Ch E/1084/SWD/WS dated 25 March 2014.

The drainage network, capacity of drains and estimated discharge proposal remains unchanged as per sanctioned EC-2011 & as per updated 2019 assessment and proposal.

Please refer to Fig. 2.37 below for updated Storm Water Drainage system for Non-operational are development at CSMIA.

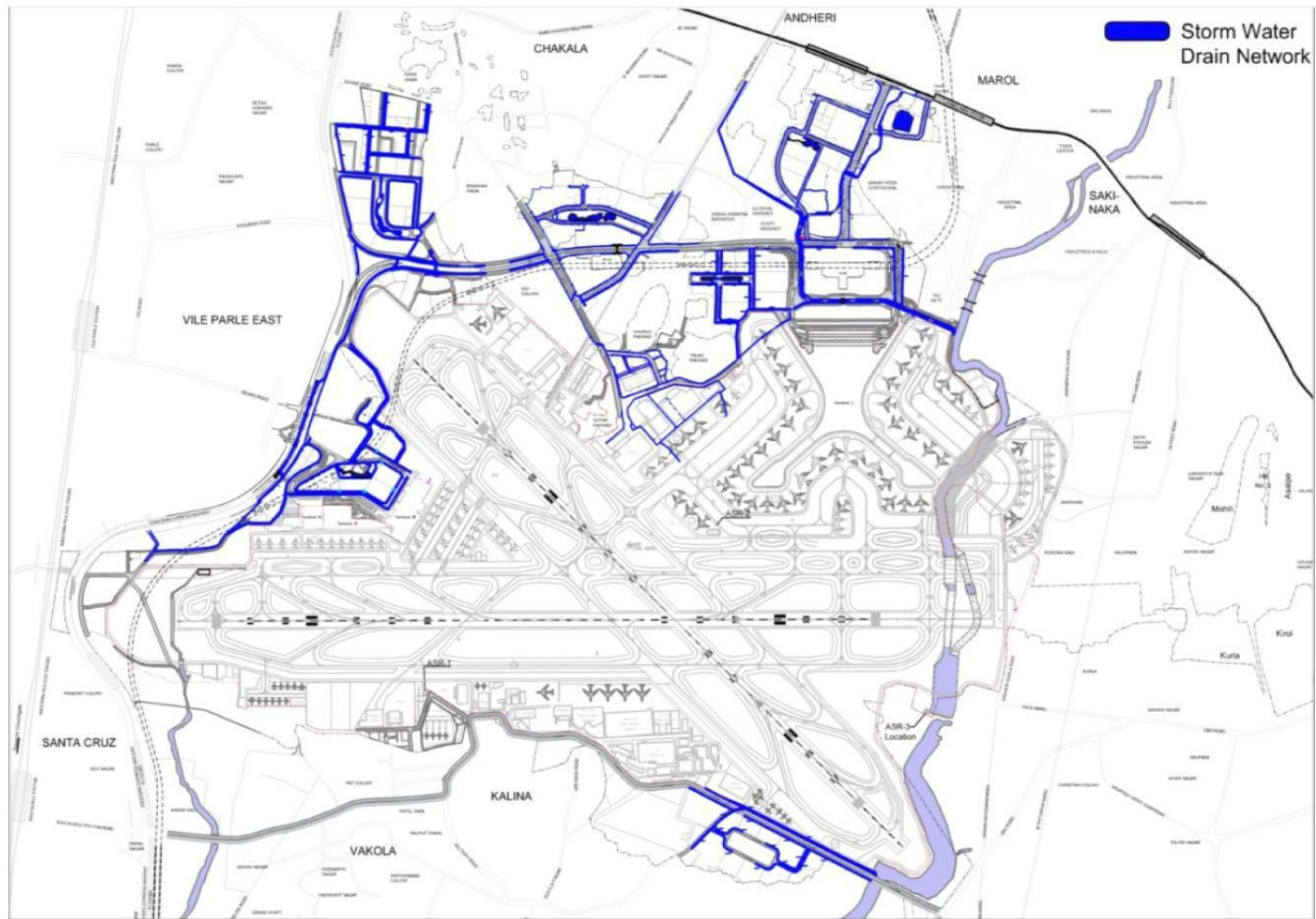


Figure 2-40: Storm Water Drainage & Rain water harvesting ponds

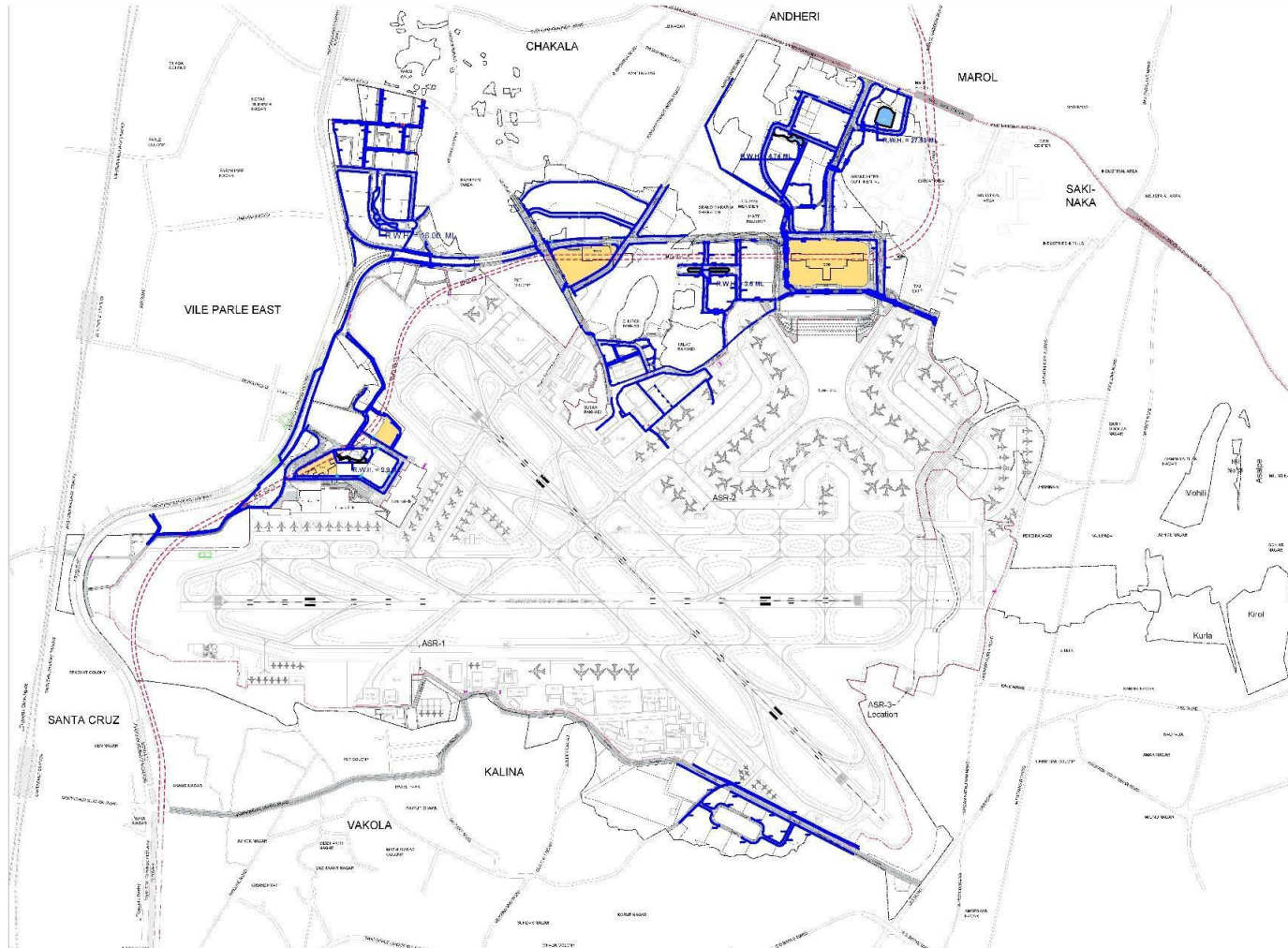


Figure 2-41: Storm Water Drainage & Rain water harvesting ponds (updated 2019)

2.4.10 Rain Water Harvesting System

As described in EC 2011, as part of CSMIA development, rainwater harvesting system is planned to collect rain water and use it for non-potable purposes. Rainwater harvesting system in the form of large water tanks are proposed and shall be developed in phases within all major green areas, parks and gardens. This is proposed to provide approx. 35 ML of harvested rain water in one year period. The said capacity shall be based on existing underground water table, drainage gradient and required overflow discharge levels. The said water shall be stored, aerated & used for non-potable purposes etc.

2.4.11 Solid Waste Management

For Entire Area Development

As described in EC 2011, during the construction stage, approximately 260 MT debris was estimated to be generated from demolition of abandoned structures and from buildings to be relocated and was planned to be segregated and reused to the extent possible for various redevelopment works. During operation phase at the end of all phases of development of the project, up to 30.18 MT/day of solid waste was estimated to be generated, from residential areas, hotels, and other commercial areas and was planned to be segregated into organic and non-organic solid waste for further treatment.

Various green development approaches, like reuse and recycle of waste generated have been adopted in all the development works at CSMIA for on-going construction activities and for operations management ensuring overall development to be environmentally sustainable.

Currently, within the landside development area, demolition of abandoned structures at IAD, CPWD and CISF colony areas are completed, along with respective relocation projects, wherein the excavated material from such sites has been mainly utilised within various CSMIA development projects, land development and road works etc. The damaged steel, glass, etc is being sold to scrap dealer approved by MPCB and balance debris has been disposed out of CSMIA area, with relevant permissions and approvals, as per MCGM approved dumping sites. For solid waste generated from various operational areas, organic and non-organic solid waste is being collected separately Food waste is being transferred to organic waste converter at CSMIA and compost from the same is being used for landscaping. Reusable and recyclable waste is disposed by selling to MPCB authorized vendors and balance inert and non-biodegradable waste are sent to the authorized MCGM sites.

Based on updated demand analysis and program requirements at Non-operational area development at CSMIA, at the end of all phases of the project, up to 21.35 MT/ day of solid waste is estimated to be generated. The solid waste generations is calculated based on Solid waste management rules 2016.

Table 2-22: Generation of Solid Waste for Non-Operational Area Development (updated 2019)

Description	Built up area (sq m)	Norms	Occupancy	Solid Waste Generation		
				Standard (gm/day)	(gm)	(MT)
Hotels	7,15,297	50 sqm	14,306	100	14,30,594	1.43
Entertainment, Retail, Leisure	3,78,527	30 sqm	12,618	100	12,61,757	1.26
Offices, Travel & Tourism, Banks	11,24,318	12 sqm	93,693	100	93,69,317	9.37
Hospital & Healthcare	32,765	50 sqm	655	100	65,530	0.07
Social Infrastructure	1,13,760	50 sqm	2,275	100	2,27,520	0.23
Sub Total (1-6)	-	-	1,23,547	-	1,23,54,717	12.35
Supporting Services	-	-	12,355	100	12,35,472	1.24
Total: Commercial Areas		-	1,35,902	-	1,35,90,189	13.59
Residential area	54,518	-	12,729	600	76,37,400	7.64
Visitors	-	-	1,273	100	1,27,290	0.13
Total: Residential Areas	-	-	14,002	-	77,64,690	7.76
Grand Total	24,19,186	-	1,49,904	-	2,13,54,879	21.35

Table 2-23: Comparison of solid waste generation for Non-Operational Area Development 'as per EC 2011' and 'as per updated proposal for amendment'

	Solid Waste Generation as per EC 2011 (in MT)	Updated Solid Waste Generation proposed for amendment (in MT)	Decrease in Quantity (MT)	Percent Decrease
Solid Waste Generation	30.18	21.35	8.83	29.25%

The total waste generation as estimated in EC 2011 was about 30.18 MT. Thus, there is a reduction of about 29.25% in the overall waste generation.

Solid Waste Management for proposed Four buildings

For proposed construction of commercial buildings, estimated Solid waste generation is given in the table below. The solid waste generation is calculated based on Solid Waste Management (SWM) Rules published by MOEF&CC in 2016.

Table 2-24: Generation of Solid Waste for proposed construction of buildings during Operation Phase

Building	Occupancy	Standard	Solid waste generation	
		600gm/capita for residential and 100gm/capita for commercial)	(gm)	(MT)
T1-CO4	5,621	100	5,62,111.6	0.56
NS-CO1	16,490	100	16,49,003	1.65
T2-CO5	31,296	100	31,29,640	3.13

T1-P01				0.16
				5.50

The solid waste generation from the four buildings has increased from EC 2011, from 4.17 MT to 5.5 MT i.e. by about 1.3 MT @ by 31.89%.

Collection and Disposal

Construction stage

Construction waste handling will be as follows:

- Various types of construction debris such as bricks, blocks, steel, formwork, finishing materials, etc. will be generated.
- Wastes will be used within the premises as filling material.
- Broken bricks, metal chips, cut tiles will be used for internal paving.
- The damaged/ cut pieces of steel, glass etc. will be sold to MPCB approved scrap dealer.
- The debris will be segregated and stored in separately earmarked area at a distance from construction site.
- Balance construction wastes, if any, will be sent for disposal by trucks to authorized sites.

Operation stage

Management of solid waste generated during the operation phase would include collection, transportation and disposal in a manner so as to cause minimal environment impact. For this, 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 retails, hotels and other commercial areas. Food waste would be transferred to organic waste converter at CSMIA treatment for compost and the same shall be used for landscaping. Reusable and recyclable waste will be disposed by selling to MPCB authorized vendors. Balance inert and non-biodegradable wastes will be sent to the authorized MCGM landfill site.

The following table gives the overall proposal for the management of solid waste within the proposed development.

Table 2-25: Proposed method for Solid Waste Management

Sr. No.	Waste Type	Collection and Storage	Method of Disposal
1.	Biodegradable waste	Manual collection & storage in storage yard.	Food waste would be transferred to organic waste converter at CSMIA and compost from the same will be used for

			landscaping.
2.	Reusable and recyclable waste	Manual collection & storage in closed rooms at ambient temperatures	To be taken away by MPCB authorized vendors.
3.	Non degradable and inert wastes	Manual collection & storage in closed rooms at ambient temperatures	To be transported to the authorized waste disposal site of MCGM

2.4.12 Power Requirement

For Non Operational Area Development

As described in EC 2011, the total power requirement for Non-operational uses was estimated to be 140 MVA. MIAL has signed a MoU, with TATA Power Co. Ltd. to provide power supply in phased manner. Electrical receiving and distribution sub-stations are constructed & operational as part of power supply & distribution network for the entire CSMIA development. The main 220KV Receiving sub-station (RSS) is constructed & operational on a site south of Hotel Leela off IA Road. The said RSS is GIS 220/110/33 KV substation with 2x250 MVA power transformer capacity and necessary switch gear.

During construction phase, the power will be & being sourced from TATA Power Co. Ltd. or alternative source. As backup, DG set power supply of 3.2 MVA for residential and 80 MVA for commercial areas (40% for all essential services in residential areas and 100% backup for commercial areas) is being made available as per phased development requirements for all essential services. During operation phase, power requirement will be about 120 MVA which will to be sourced from TATA Power Co.

Power requirement

The total power requirement for Non-operational uses as per present requirement is being estimated to be 120 MVA, which is about 20 MVA less than the estimated requirement of 140 MVA as per EC 2011. Thus, there is a decrease of about 14.28% in the current requirement.

Table 2-26: Comparison of power demand Non-Operational Area Development ‘as per EC 2011’ and ‘as per updated demand proposed for amendment’

	Power Demand (Original) (MVA)	Power Demand (Proposed EC Amendment) (MVA)	Change in Demand (MVA)	Percent Decrease
Power Demand	140	120	-20	-14.28%

Solar Power: At CSMIA landside area, there is a shortage of land. Hence, opportunities have been explored for installation of solar panels at available roof top spaces

CSMIA have installed a solar power system of 4.58 MW capacity on rooftop. As a result of our initiatives we have increased the solar power generation capacity using rooftop area and reduction in CO₂ emission

Within CSMIA land side area roof top solar power panel are installed at two locations T1 MCLP and at Kalina facility building that generates total 274 KW power.

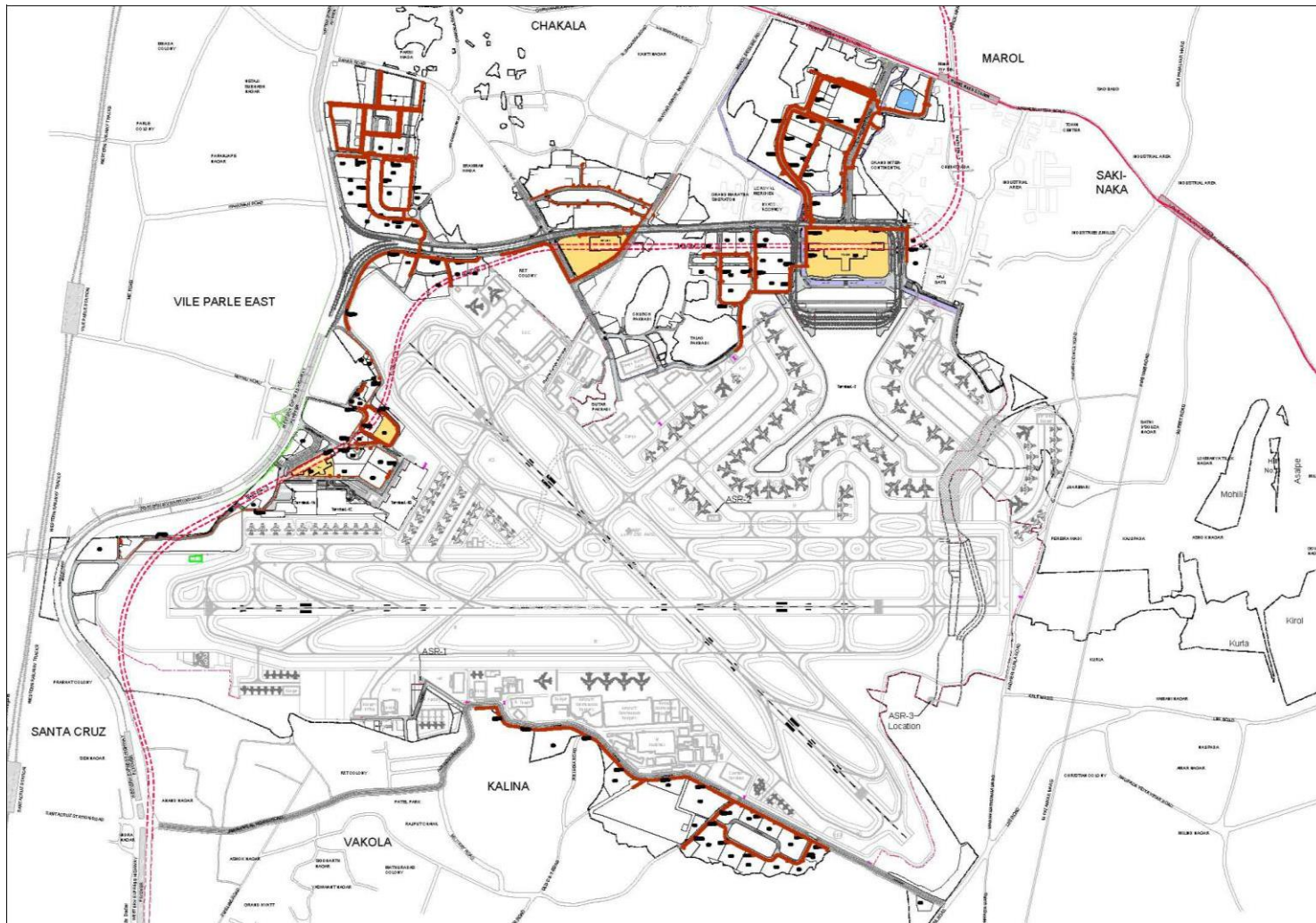


Figure 2-42: Plan Showing Power Supply Network

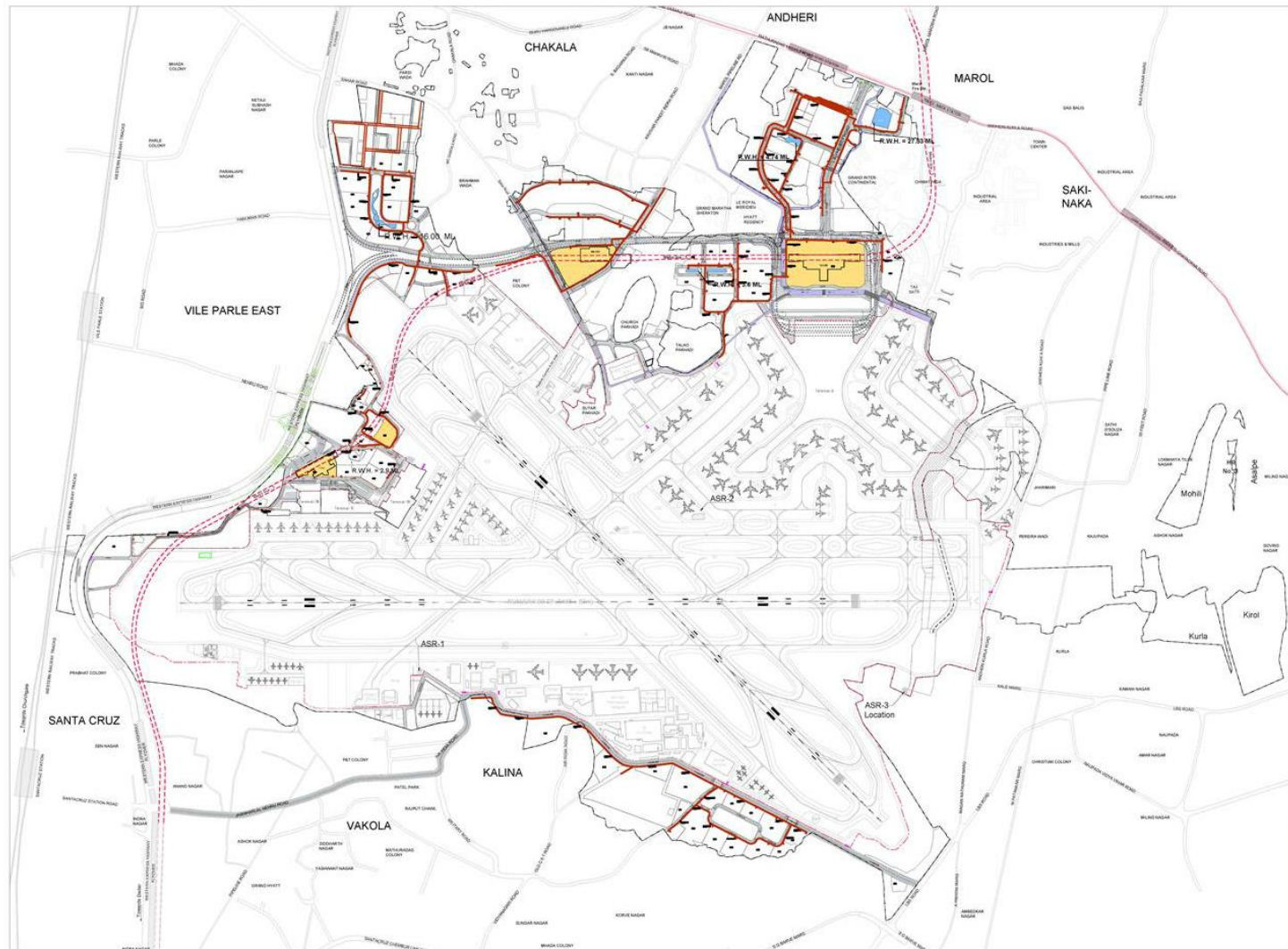


Figure 2-43: Plan Showing Power Supply Network (Updated 2019).

2.4.13 Energy Conservation Measures

Various energy conservation measures have been adopted in all the development works at CSMIA for on-going construction activities and for operations management through the usage of following energy efficient materials and systems ensuring overall development to be environmentally sustainable.

- Higher insulation levels in walls and roofs.
- High performance glazing.
- Efficient lighting design.
- Efficient packaged HVAC system
- Artificial lighting control via daylight sensor
- Adoption of high efficiency LED light fittings
- Use of photovoltaic panels to generate electricity

Power requirement for Proposed Four Buildings.

Power will be sourced from TATA Power Co. Ltd. to provide power supply as per requirement. During construction phase, the power will be sourced from TATA Power Co. Ltd. or alternative source. DG set will be provided as power back-up during construction phase. Estimated power demand for proposed four buildings is 35 MVA.

The total power demand for proposed commercial buildings has increased from sanctioned EC 2011, 22.5 MVA to 35MVA i.e. by about 12.5 MVA @ by 55.55%. However, the total power demand for the entire Non-operations area development is within the total estimated requirement as per EC 2011.

2.4.14 Air conditioning and Mechanical Ventilation System

Air conditioning and ventilation system designs being adopted for all development works are being ensured to comply ASHRAE, Ishrae and relevant other standards and Local Authorities Codes (NBC) whichever is more stringent.

To mitigate air pollutants from kitchen exhausts commercial grade grease filters and approved air cleaner / Activated carbon filter system are installed to treat all kitchen exhausts before discharging to the atmosphere. All non- air-conditioned rooms/plant rooms are provided with natural cross ventilation openings or mechanical ventilation system.

2.4.15 Fire Fighting

The fire-fighting arrangement being adopted for all development works are being ensured to comply to the requirement of local guidelines, NBC & engineering design standards.

All relevant latest fire-fighting and prevention measures and systems for Pumps, Hydrant systems, Sprinkler system, Fire alarm system, and Fire signage etc. are being implemented at various ongoing developments.

2.4.16 Green Area Development

As part of Non-operational area development at CSMIA, various existing vegetation including all major trees have been retained as far as possible along with transplantation of more than 80 trees at suitable locations. As per master plan proposal for the said development, the total proposed area for garden, lawns, outdoor recreation and other open areas is about 3,37,800 sq. m, wherein certain landscaped areas have been completed along Sahar Elevated road, landside of Terminal areas and along other infrastructure developments within landside area at CSMIA.

As per EC-2011, total of 16,890 trees were proposed for plantation, and till date approximately more than 12,000 new tree plantation is being carried out by MIAL at various locations and within developed site areas at CSMIA.

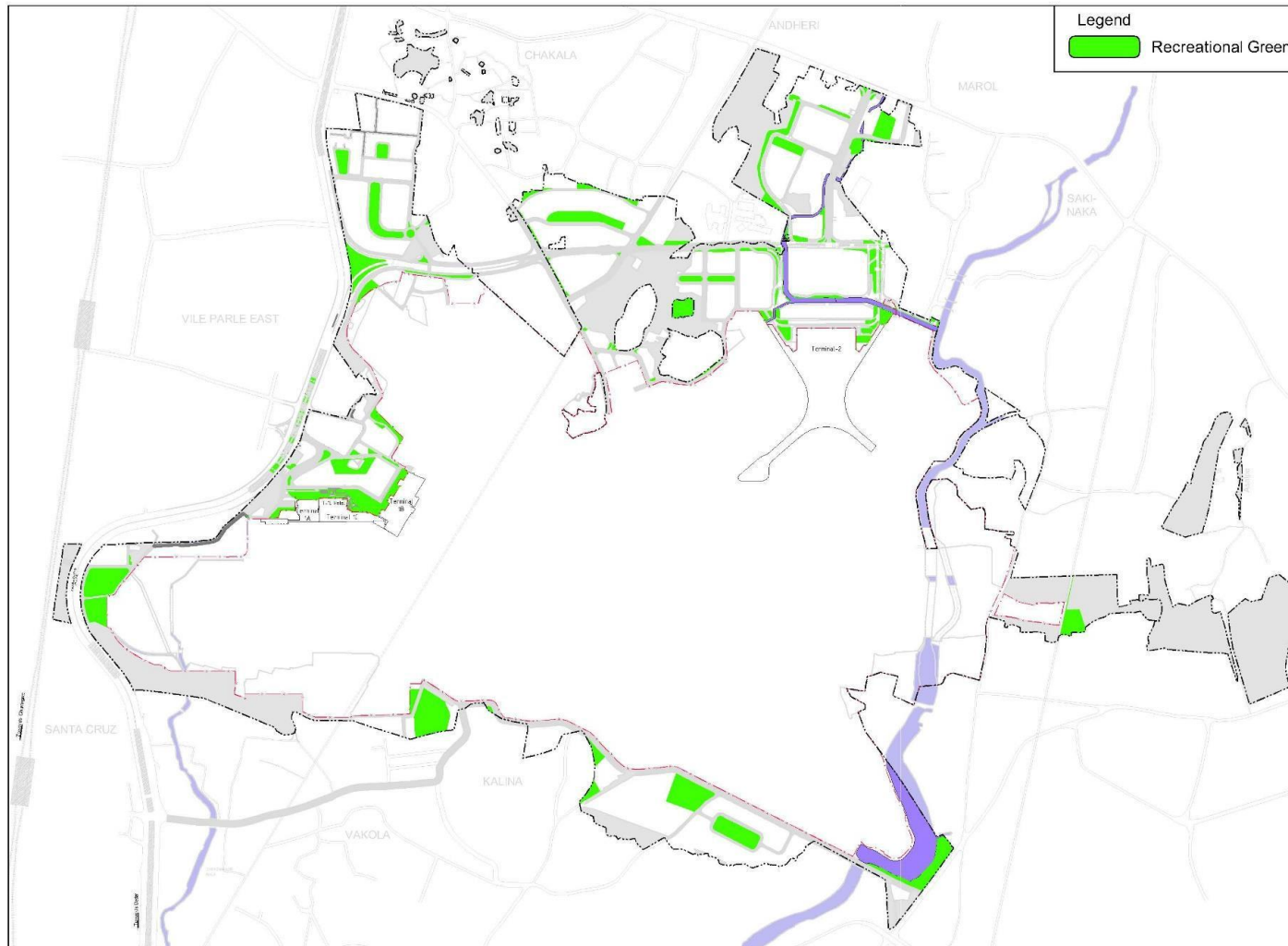


Figure 2-44: Proposed Landscape layout

CHAPTER 3. DESCRIPTION OF THE ENVIRONMENT

3.1 INTRODUCTION

A study of the baseline environment is conducted in order to assess the impacts of the project and the activities associated with it on the surrounding environment. The baseline data study consists of the status of the terrestrial environment covering land environment, air and noise environment, surface and ground water environment, biological environment (flora & fauna) and socio-economic environment.

Information in the study area was collected by undertaking primary surveys through field visits, monitoring and laboratory analysis of various samples of air, noise, water, soil etc. Secondary data was collected from relevant agencies. Reference to past studies and reports was also made. The baseline data collected and generated, together with the relevant project activities was considered for predicting the likely impacts of the project on the environment.

Subsequently, an appropriate environmental management plan (EMP) is presented to enable the project proponent to run the project within acceptable level of environmental impact and meet the compliance of the regulatory criteria. The EMP will be ultimately made to summarize the post project status of the terrestrial environment, with the project proponent incorporating the suggested EMP measures.

For the purpose of assessing the impacts, a study area of 10 km radius around the project site was identified for the EIA study. Each of these environmental features has been described in the following sections.

Table 3-1: Environmental Aspects for the EIA study

Sr. No.	Aspect	Mode of Collection	Parameters	Frequency of Collection	Source
1.	Land Environment				
	Land use	Primary	LULC classification as per NRSA, for an area of 10km and 500m surrounding area	One time	NRSA satellite imagery dtd. 12 th April, 2019
	Soil	Secondary	pH, Moisture, TOC, TKN, Conductivity, Calcium (Ca), Magnesium (Mg), Sulphate, Oil & Grease, Chlorides etc.	Summer 2019	Analysis reports from NABL accredited lab of 3 sampling stations located within study area
	Topography and drainage	Primary	DEM of 10km and 500m surrounding area	One time	DEM based on NRSA satellite imagery dtd. 12 th

Sr. No.	Aspect	Mode of Collection	Parameters	Frequency of Collection	Source
					April, 2019
2.	Air Environment				
	Ambient Air	Secondary	PM _{2.5} , PM ₁₀ , NO _x , SO _x , CO	Summer 2019	Analysis reports from NABL accredited lab of 4 sampling stations located within study area
3.	Noise Environment				
	Noise readings	Secondary	Leq [dB(A)]	Summer 2019	Analysis reports from NABL accredited lab of 4 sampling stations located within study area
4.	Water Environment				
	Surface Water	Secondary	Tolerance Limits for Inland Surface Waters as per MPCB classification	Summer 2019	Analysis reports from Mpcb website of 4 sampling stations located within study area
	Ground water	Secondary	Physico chemical and microbiological parameters as per IS 10500: 2012	Summer 2019	Analysis reports from NABL accredited lab of 2 sampling stations located within study area
5.	Biological Environment				
	Vegetation pattern	Primary/ Secondary	Flora fauna data, ecologically sensitive areas within 10 km	Field study	Field visit and secondary data
6.	Socio-Economic Environment				
	Socio-economy	Secondary	Population, sex ratio, literacy rate and occupation	--	Census of India, 2011

3.2 LAND ENVIRONMENT

3.2.1 Environmentally Sensitive Areas

The following table lists out the areas within 15 km of the project site which are environmentally sensitive.

Table 3-2: Environmentally Sensitive areas

Sr. No.	Areas	Name/ Identity	Aerial distance (within 15 km) from proposed project boundary
1	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value	Sanjay Gandhi National Park Thane Creek Flamingo Sanctuary	Nearest boundary is about 5 km from project site. Nearest boundary is about 5.41 Km from project site.
2	Areas which are important or sensitive for ecological reasons - Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests	Arabian Sea Mithi river	Approximately 2 km from the site towards west. Passes along the eastern boundary of the site
3	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration	No	Not applicable.
4	Inland, coastal, marine or underground waters	Mithi river	Passes along the eastern boundary of the site
5	State/ National boundaries	No	Not applicable.
6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas	Western Exp Highway Andheri - Kurla Road	Towards west of the site Towards north of the site
7	Defense installations	No	Not applicable.
8	Densely populated or built-up area	Yes	The site is located in Vile Parle and Andheri in the Western suburbs of Mumbai.
9	Areas occupied by sensitive man-made land uses (hospitals, schools, places of worship, community facilities)	Yes	Surrounding area is populated.
10	Areas containing important, high quality or scarce resources (ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)	No	Not applicable.
11	Areas already subjected to pollution or environmental damage. (Those where existing legal environmental standards are exceeded)	Yes	Mumbai
12	Areas susceptible to natural hazard which could cause the project to present environmental problems (earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions)	Mumbai lies in Zone-III of seismic region	Mumbai lies in Zone-III of seismic region and the designing and construction will be done accordingly. Plinth level for proposed structure is chosen such that incase of natural calamities such as floods, project

Sr. No.	Areas	Name/ Identity	Aerial distance (within 15 km) from proposed project boundary
			is not affected.

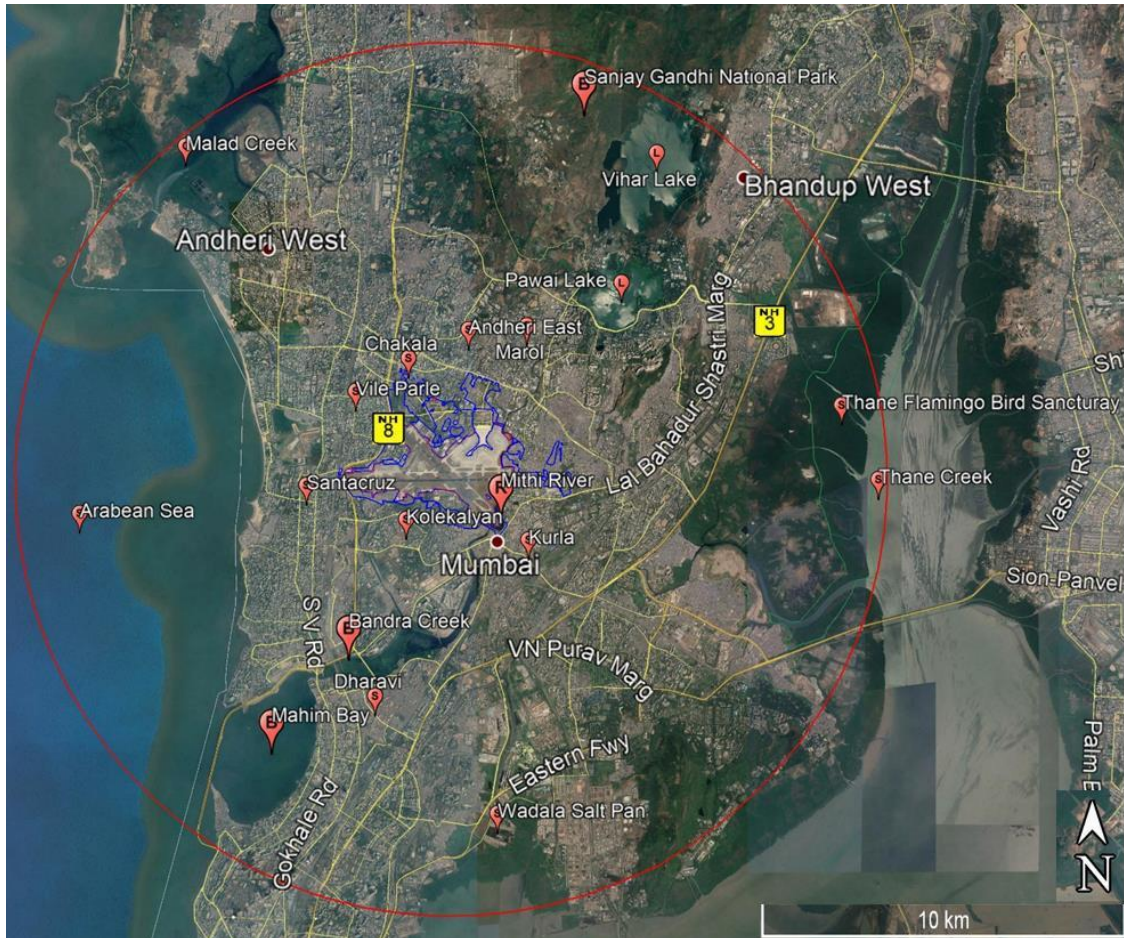


Figure 3-1: Map showing features within 10 km vicinity from the Site

3.2.2 Geology

The entire Greater Mumbai area is occupied by Deccan basalt flows and their acid and basic variants, poured out between the late Cretaceous and early Eocene times. The basaltic flows are horizontally bedded and are more or less uniform in character over wide areas. Certain extrusive and intrusive mafic types are associated with basalts and are found in the Mumbai Islands and its vicinity. This is contrast to the monotonous uniformity displayed by the Deccan basalt's in general. Furthermore, some fossiliferous sediments, mainly of tufaceous origin and partly of fresh water origin, rich in fauna, are also found in Mumbai area.

The stratigraphic succession of rocks in Greater Mumbai can be broadly categorized as Recent Alluvium, sand and recent Conglomerate, Cretaceous to Eocene Laterite, Trap dykes, Volcanic agglomerate and breccia, Basalt flows with interbedded ash beds and fossiliferous fresh water shakes.

The Deccan traps belongs to the plateau basalt and are so designated on account of their step-like or terraced appearance. The Deccan traps of Greater Mumbai belong to the Upper

traps. Besides the common dolerite and basalt, Deccan traps comprise other types like lamprophyre, limburgite, monchiquite, porphyrite, andesite, monzonite, nepheline, syenite, granophyre, rhyolite, obsidian and pitchstone.

However, no minerals of economic importance are found in the Mumbai area except pockets of bauxite in the laterite plateau, east of Kanheri caves. Large quantities of building stones required for construction work are supplied from quarries in the vicinity of Mumbai area. The main rock types quarried are basalt, andesite and granophyric trachyte, basalt being the most abundant.

3.2.3 Seismic Stability

The earthquake zoning map of India divides India into 4 seismic zones (Zone 2, 3, 4 and 5) based on available information. According to the present zoning map, Zone 5 expects the highest level of seismicity.

Mumbai lies in Zone III of the seismic region. This is referred to as moderate risk zone. Although there is no past record of any disaster in this region, earthquake of intensity between 5.0 and 6.9 on the Richter scale can occur in Zone III.

Earthquake disasters can be averted with the construction of seismic proof buildings. The construction will be carried out in such a way that it may withstand the severest quakes.



Source: http://en.wikipedia.org/wiki/Earthquake_hazard_zoning_of_India

Figure 3-2: Seismic zoning map of India

Table 3-3: Intensities of Seismic zones

Seismic Zone	Intensity on MMI scale	% of total area
II (Low intensity zone)	VI (or less)	43%
III (Moderate intensity zone)	VII	27%
IV (Severe intensity zone)	VIII	18%
V (Very severe intensity zone)	IX (and above)	12%

Source: Indian Meteorological Department (IMD)

3.2.4 Site Topography and Drainage

The site is mostly plain and covered with builtup area. The Airport area is well levelled and existing drainage channels are constructed as part of the development. Fig. 3.2 and 3.3

below is the Digital Elevation Model (DEM) of the site and study area around the site of 10km and 1km respectively showing existing topography. The river Mithi flows from the western part of the site. There is no other drainage of prominence close to the site. On a regional scale, the overall drainage pattern of this region is dendrite, wherein smaller drainage lines meet the larger ones.

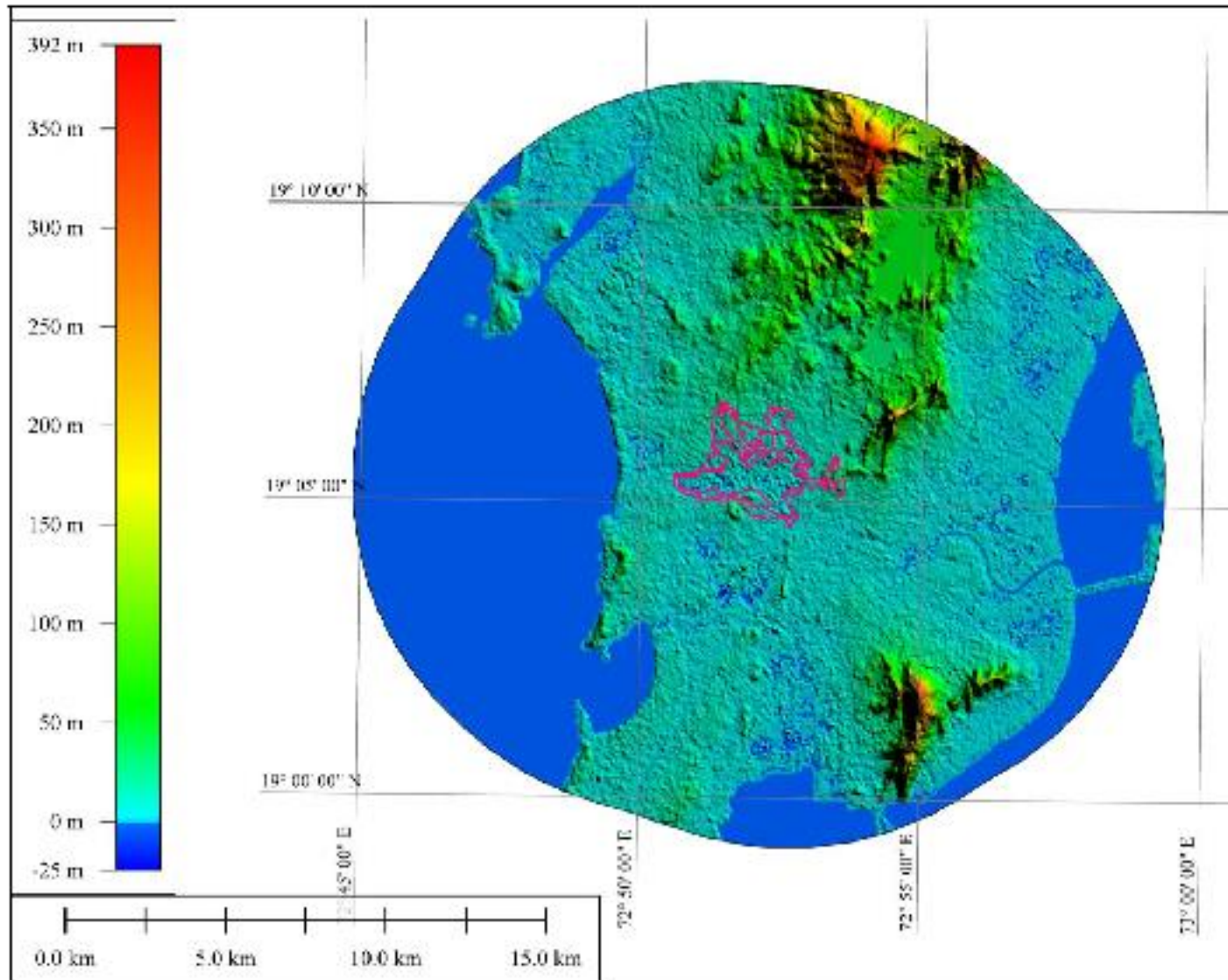


Figure 3-3: Digital Elevation Model (DEM) of the site and 10 km study area

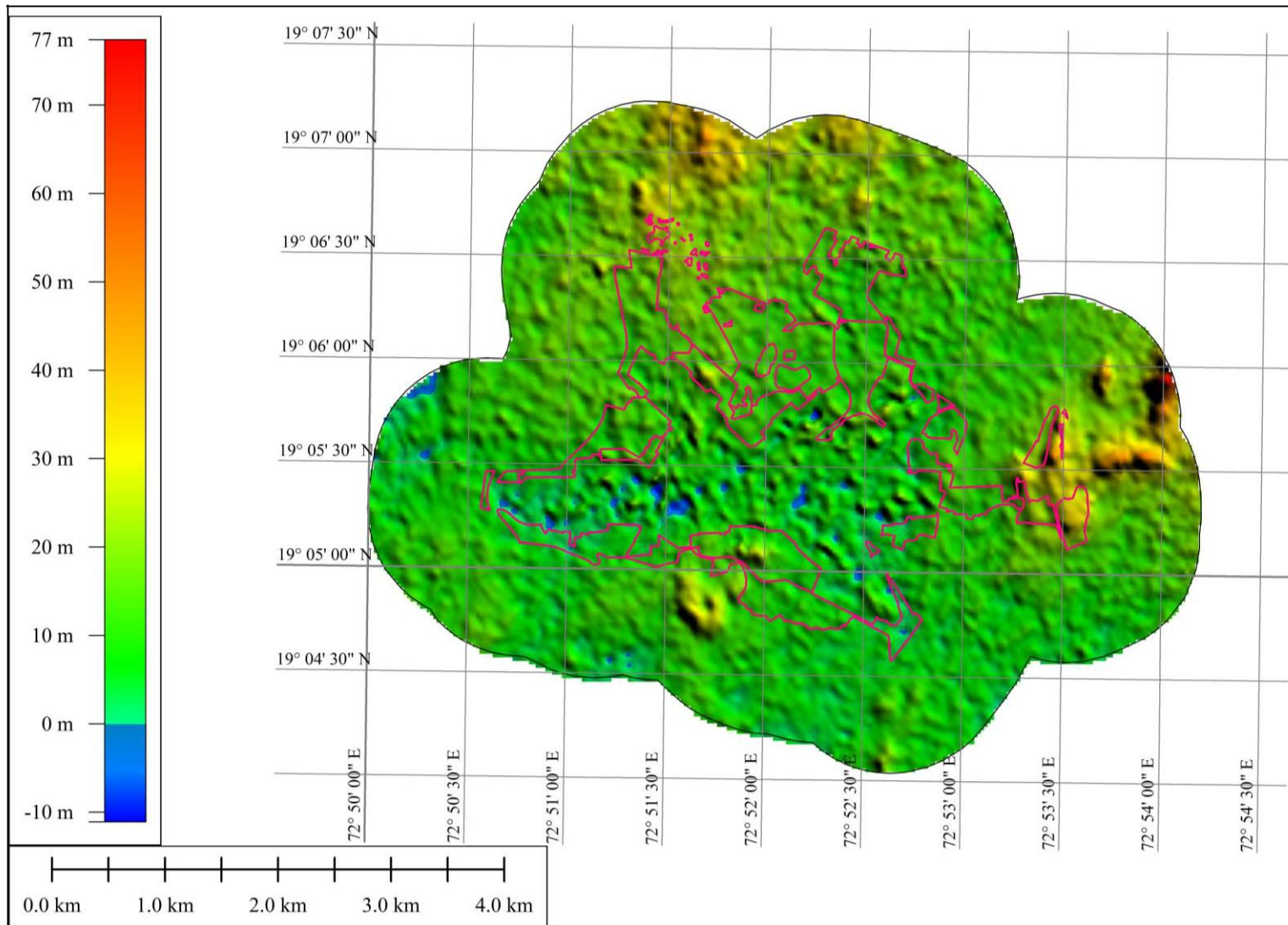


Figure 3-4: Digital Elevation Model (DEM) of the site and 500 m study area

3.2.5 Land Use Land Cover Study

The LULC study is based on LISS IV Satellite image of date of pass 12th April, 2019 which was purchased from National Remote Sensing Centre (NRSC), Hyderabad.

The digital classification technique is used for the extraction of the landuse/ landcover information from the imagery. A landuse land cover map of 10 km radius and 1 km radius around the project site is prepared and the same is described below.

*[Please refer **Annexure V** for detailed report on Landuse and Landcover study].*

Landuse Land Cover of an area of 10 km radius around the project site

The landuse map covering 10 km angular distance around the project site is prepared from the Geo-referenced FCC Resourcesat-2 satellite image shown in Fig. 3.5. A Landuse landcover map is shown as Fig. 3.6. As can be seen from the LULC map, most of the study area i.e. 41.90% falls under the class Built up Land. The existing Airport covers 1.08% area. The Sanjay Gandhi National Park is at about 5km from the site and the landuse Class Forest covers about 6.53% of the total study area. Barren/ Unculturable /Waste Lands cover 1.81%.

Arabian Sea being in close vicinity, the area under the class Water body and Wetlands comprise of approximately 25.76% and 10.10% of the total area, whereas area under mangroves is about 12.10% of the total area under 10 km. These are the mangroves located at Thane Creek and Malad creek which lie within 10km from the site.

The landuse class wise distribution of the different landuse/ landcover statistics found within the 10 km radius area around the project site is given in the table below. *(Please refer to the table 3.4 below. The graphical representation of the same is given in the Fig. 3.7.)*

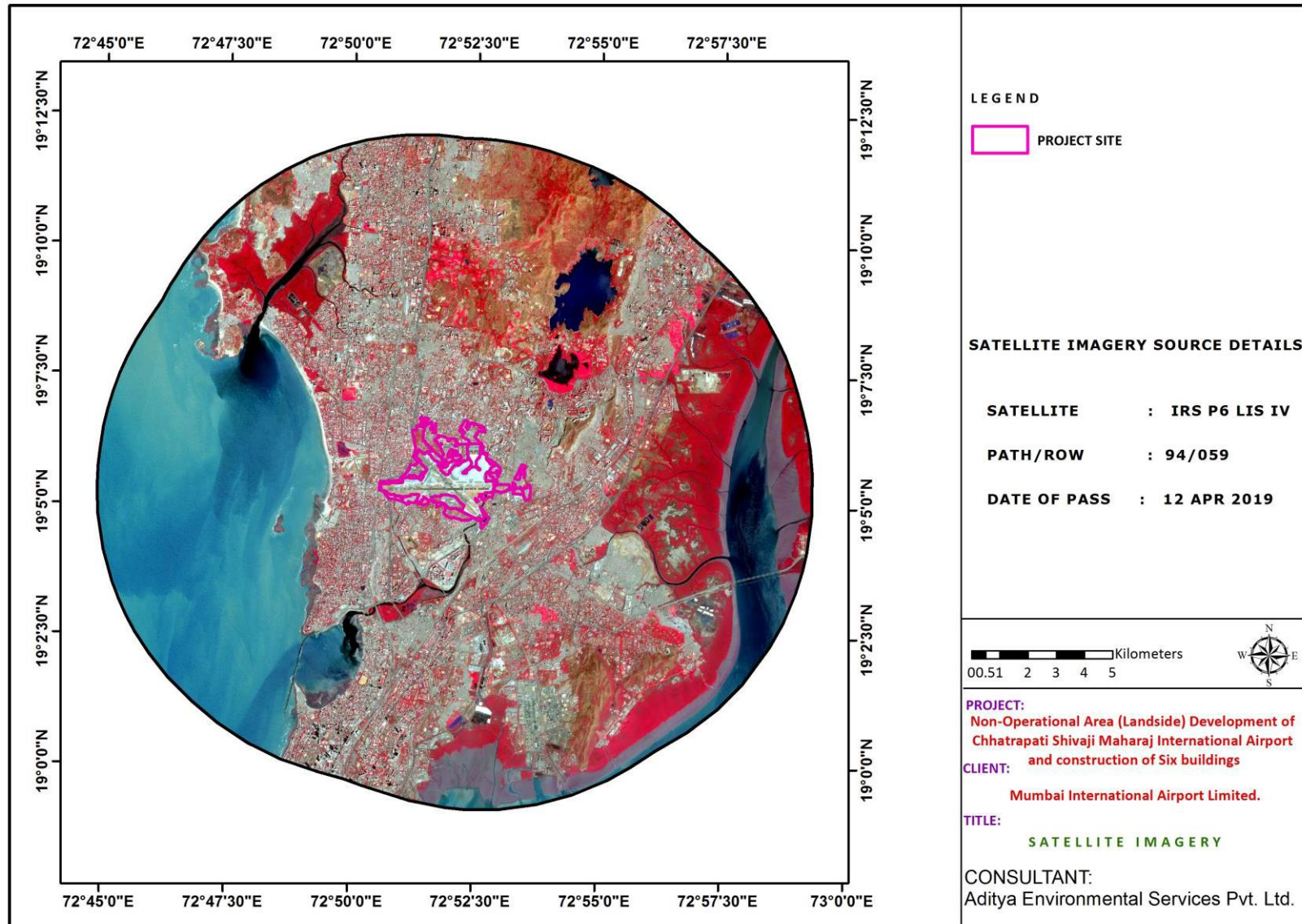


Figure 3-5: Geo-referenced False Color Composite (FCC) Resourcesat-2 satellite image

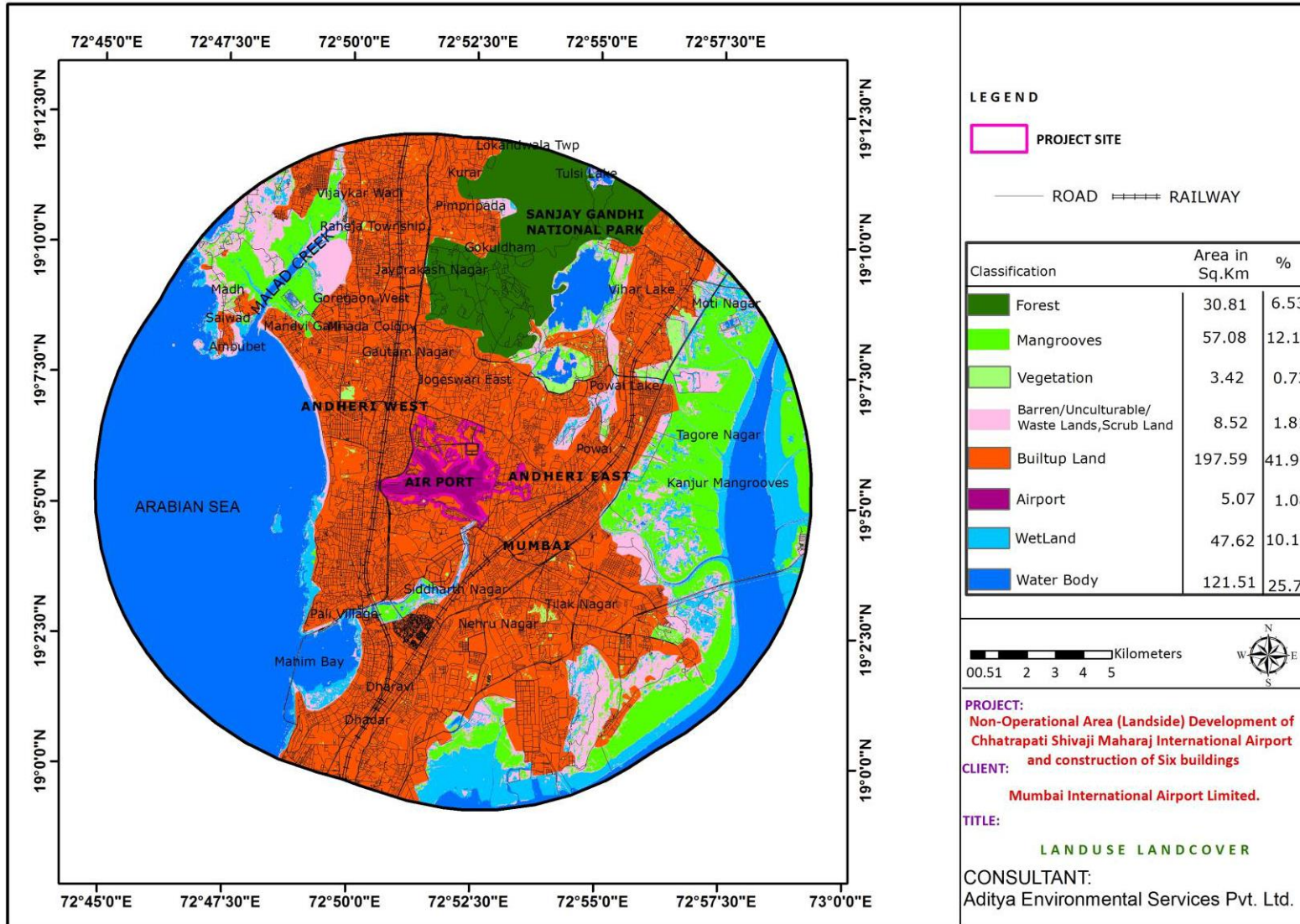


Figure 3-6: Landuse/ Land cover map of 10 km radius area around Project Site

**Table 3-4: Landuse classes and statistics of area under each class
(10 km radius area)**

Class Name	Area (sq.km)	Distribution (%)
Forest	30.81	6.53
Mangroves	57.08	12.10
Vegetation	3.42	0.73
Barren/ unculturable Waste land/ Scrub land	8.52	1.81
Built-up Land	197.59	41.90
Airport	5.07	1.08
Wetland	47.62	10.10
Waterbody	121.51	25.76
Total	471.62	100.00

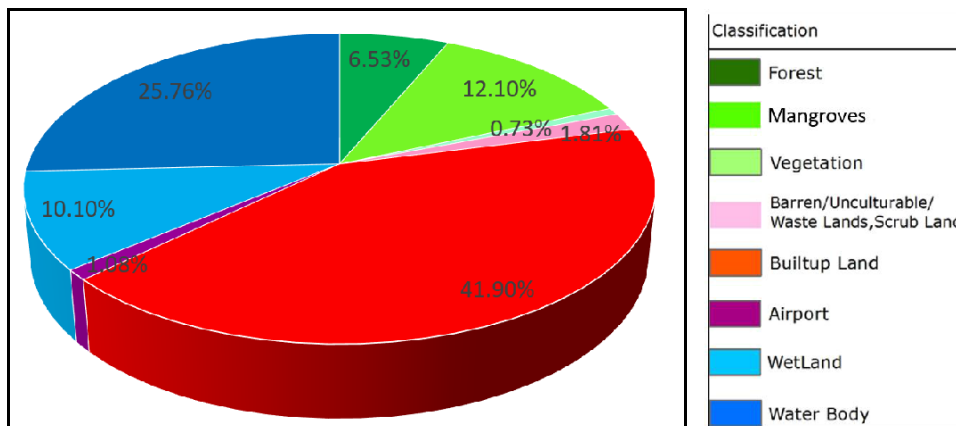


Figure 3-7: Graphical representation of area statistics under various Landuse classes (for 10 km study area)

Following is a description of the landuse land cover map of 1 km radius around the project site.

Landuse Land Cover of an area of 1 km radius around the project site

The Geo-referenced FCC Resourcesat-2 satellite image used to map the landuse classes within 1 km angular distance around the project site and the Landuse Landcover map is shown in Fig. 3.8.

As can be seen from the LULC map of 1 km study area, most of the land i.e. 65.95% falls under the class Built up Land. The existing Airport covers 16.73% area. Vegetation, mostly urban green pockets cover about 14.44% covers of the total study area. The Mithi river passes from within the site and the area under the class waterbody is 0.76%.

The landuse class wise distribution of the different landuse/ landcover statistics found within 1 km radius area around the project site is given in the table below. *(Please refer to the table 3.5 below. The graphical representation of the same is given in the Fig. 3.9)*

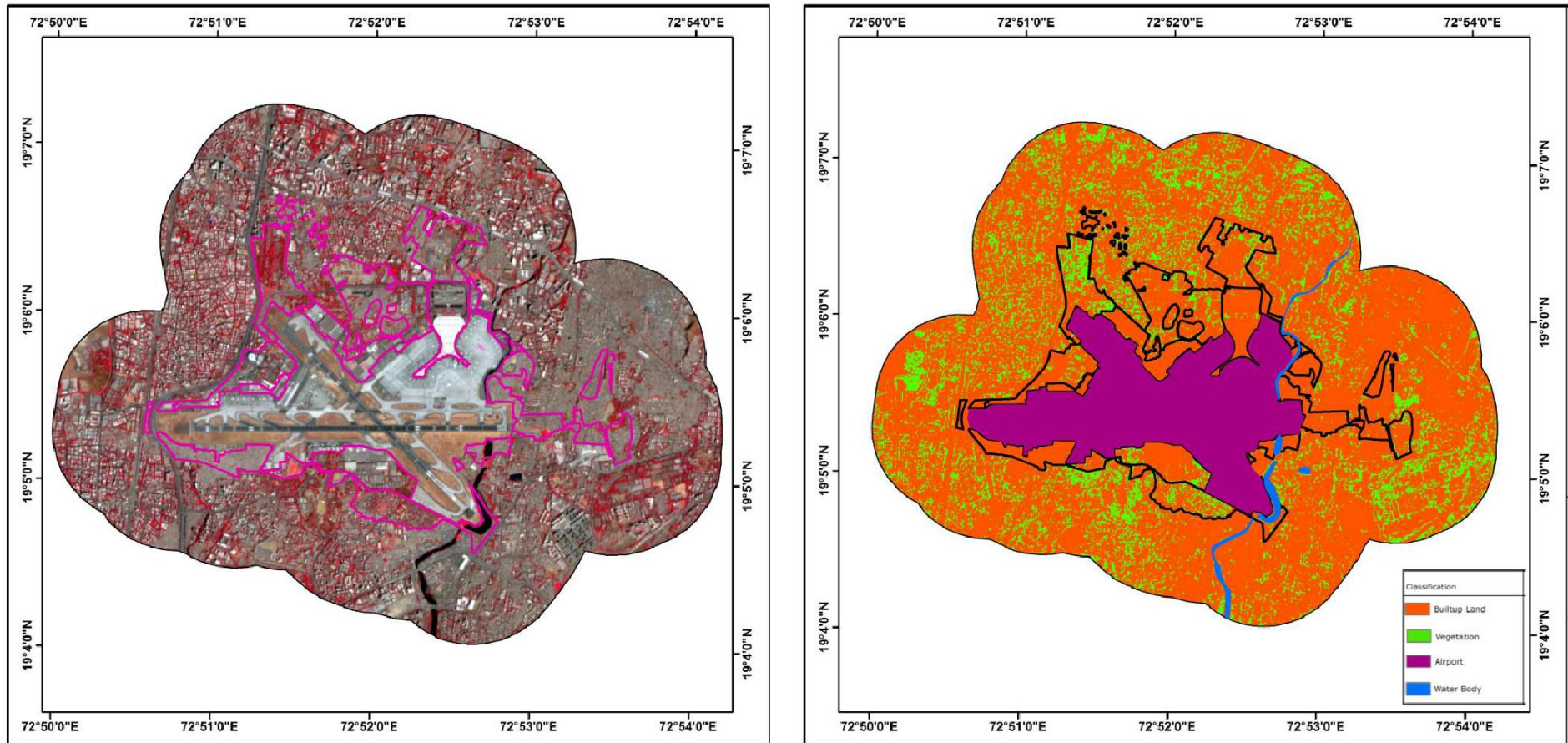


Figure 3-8: Geo-referenced FCC Resourcesat-2 satellite image and LULC map of 1 km radius area around Project Site

**Table 3-5: Landuse classes and statistics of area under each class
(1 km radius area)**

Class Name	Area (Sq.Km)	Distribution (%)
Built-up Land	20.59	67.95
Vegetation	4.41	14.55
Airport	5.07	16.73
Waterbody	0.23	0.76
Total	30.30	100.00

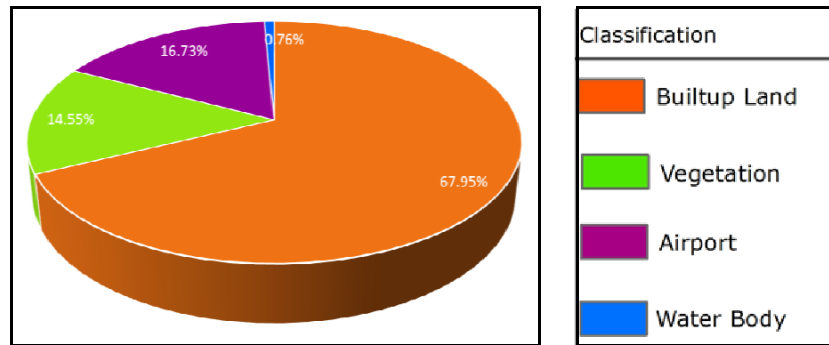


Figure 3-9: Graphical representation of area statistics under various Landuse classes (for 1 km study area)

3.2.6 Soil

In general, the predominant soil cover in Mumbai city is sandy whereas in the suburban district, the soil cover is alluvial and loamy.

3.2.7 Soil Monitoring

Monitoring of soil characteristics is one of the ways to determine certain aspects of land environment. Readings of 3 soil samples representing soils from the study area (10 km from the project boundary) were studied for important physical and chemical parameters determining the “fertility/ productivity” of soils for agriculture.

Locations of soil sampling are described in the following table and represented in the following figure (Fig. 3.10).

Table 3-6: Soil sampling locations

Sampling station	Location/ Name of the place	Distance from site (approx. km)	Direction from site
S1	Andheri Near Shrem Hotel	3.13	North
S2	Goregaon Near Skystar Buildcon	4.50	West
S3	Ghatkopar Near saroday Hospital	5.80	East



Figure 3-10: Soil sampling locations

Table 3-7: Soil monitoring results

Sr. No.	Parameter	Results						Unit
		S1		S2		S3		
1.	pH	6.89		6.82		8.25		
2.	Moisture	5.2		4.2		5.8		--
3.	Texture	Clay	81.76	Clay	78.3	Clay	77.9	%
		Silt	10.5	Silt	9.6	Silt	10.1	
		Fine sand	7.74	Fine sand	12.1	Fine sand	12.0	
4.	TOC	1.6		1.4		0.31		%
5.	TKN	0.0072		0.56		0.56		%
6.	Sulphate	48		48		34		mg/kg
7.	Ca	34		24		38		Meq/l
8.	Mg	12		04		08		Meq/l
9.	Na	80		10		40		Kg/ha
10.	K	80		28		50		Kg/ha
11.	Zn	BDL		BDL		BDL		mg/kg
12.	Ni	BDL		BDL		BDL		mg/kg
13.	Cr+6	BDL		BDL		BDL		mg/kg
14.	Fe	BDL		0.22		0.11		mg/kg
15.	Conductivity	284		232.6		237.4		µS/cm

Observations

It can be seen that the soil is mostly clay loam. Organic Carbon, Nitrogen and Potassium is low; this indicates poor fertility status and shows that nutrition supplement to grow crops and other vegetation is required.

3.3 AIR ENVIRONMENT

3.3.1 Meteorological Data

The climate of Mumbai is a tropical, wet and dry climate. Mumbai's climate can be best described as moderately hot with high level of humidity. Its coastal nature and tropical location ensures temperatures do not fluctuate much throughout the year.

The mean average is 27.2 °C and average precipitation is 242.2 cm (95.35 inches). The mean maximum average temperatures is about 32 °C (90 °F) in summer and 30 °C (86 °F) in winter, while the average minimums are 25 °C (77 °F) in summer and 18 °C (64 °F) in winter.

Mumbai experiences three distinct seasons:

1. Winter (Nov to Feb or mid March) winter temperature 15 to 20⁰ C Peak Winter Months - Dec to Mid Feb with temperature range 12-19⁰ C;
2. Summer (Feb/March to mid June and Sept to Nov) Avg temperature 30 to 27⁰ C; Peak Summer Months (Mid March to June 1 week), temperature shoots up to 30 - 40⁰ C with humidity being approx. 70-80%.
3. Monsoon: (June to August, at times until October). Peak monsoon months: July & August sometimes with winds and thunderstorms. Temperatures at 24-29⁰ C.

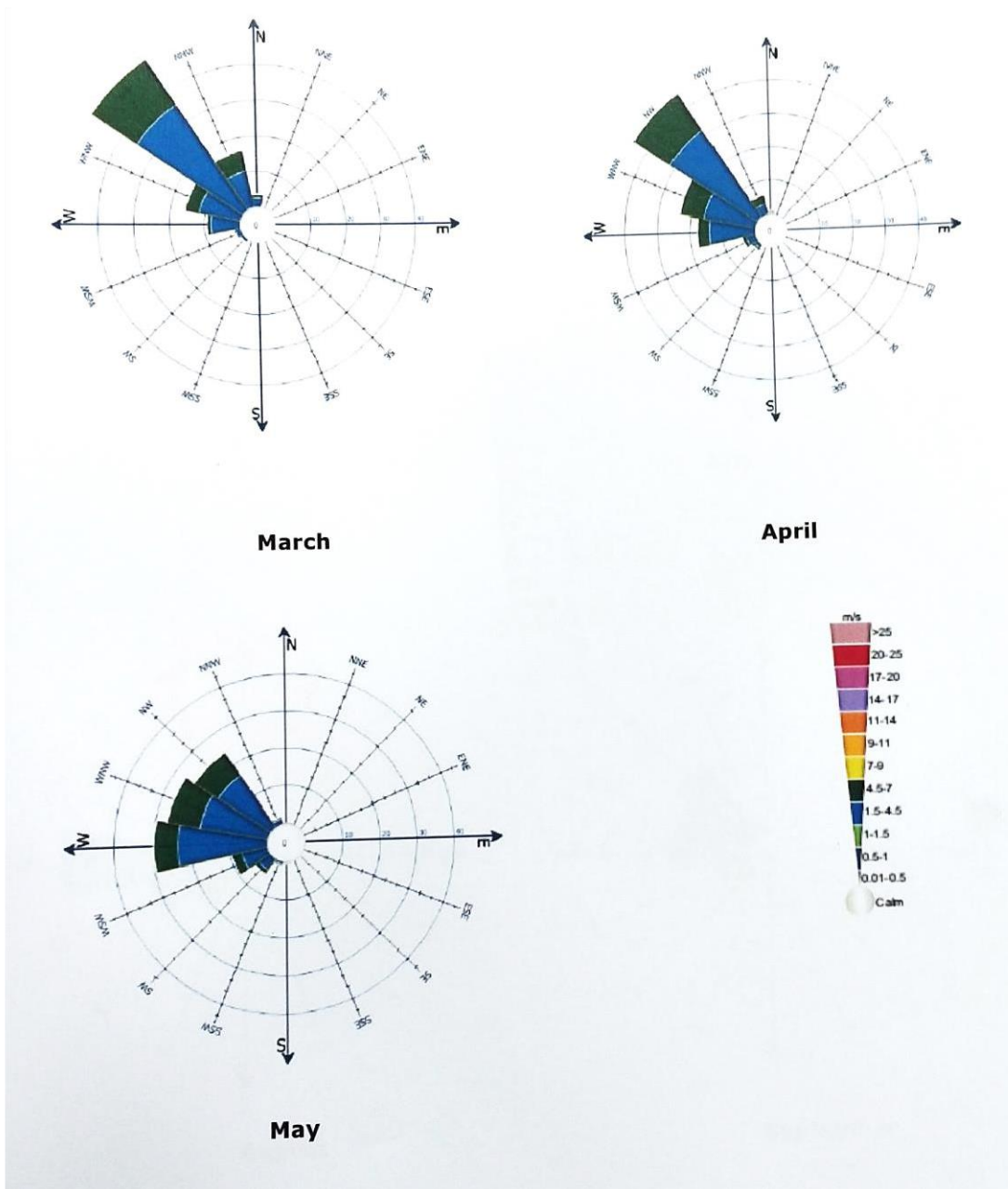


Figure 3-11: Wind rose diagram for Summer Season

(Source: EIA report of Proposed upgradation of Chhatrapati Shivaji Maharaj Airport)

3.3.2 Reconnaissance Survey for ambient air quality

A reconnaissance survey was conducted on the site to obtain an understanding of the existing ambient air quality. Study of land-use pattern and activity / development pattern within 7 km of site; indicate that there is very minor air pollution which may be due to vehicular movement along the adjoining roads.

3.3.3 Ambient Air Quality Monitoring

Ambient air quality was assessed to understand baseline status of air environment and to find the impact of surrounding activities on the air quality in the proposed project site. Ambient air quality in the area around the site was monitored for summer season for 24 hour average. Monitoring results of monitoring carried out at 4 locations within 10 km study area was studied. The table below (Table 3.8) gives a description of the locations of the monitoring stations and the fig. 3.11 gives the locations on a 10 km area map.

Ambient Air Quality data for CO, SO₂, NO₂, and PM_{2.5} and PM₁₀ was assessed at the monitoring stations selected (Table 3.9). Standards as per the National Ambient Air Quality Standards (NAAQS) published by CPCB have been considered.

Table 3-8: Description of Ambient Air Quality Monitoring Stations

Sampling station	Location/ Name of the place	Distance from site (approx. km)	Direction from site
A1	Near Shrem Hotel, Andheri	3.31	North
A2	Near Mahananda dairy, Goregaon	6.91	North
A3	Near BKC, Bandra	2.50	South
A4	Near Godrej Properties, Chembur	4.44	South East

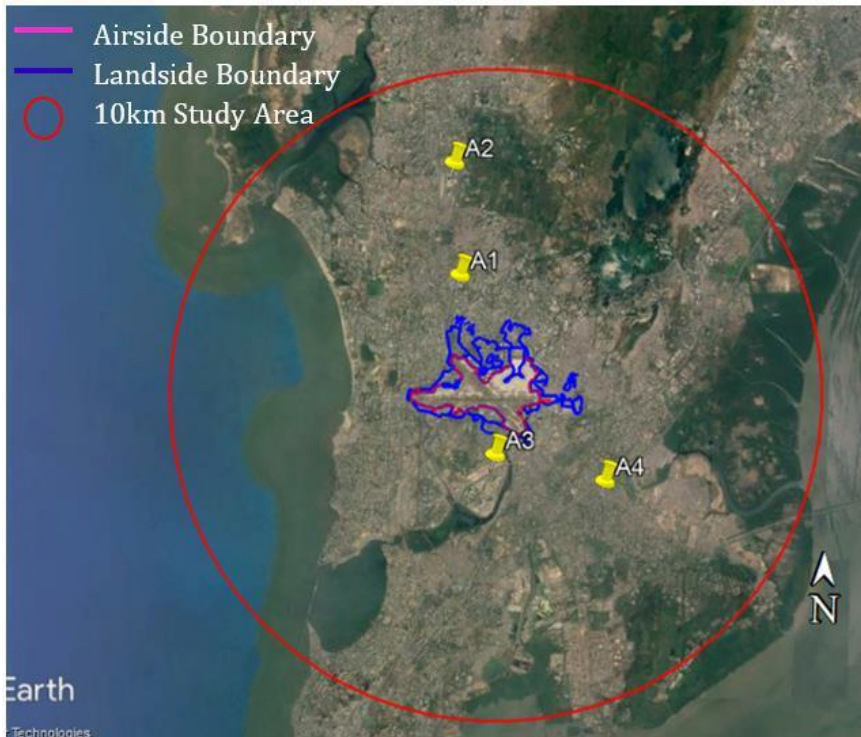


Figure 3-12: Locations of Air monitoring stations

Table 3-9: Results of Ambient Air Quality Monitoring

Sampling Station	Parameter				
	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)	CO (mg/m ³)
A1	64.2	21.5	13.0	16.9	0.23
A2	62.2	NA	13.8	17.6	0.23
A3	61.6	NA	12.7	16.1	0.22
A4	63.1	NA	13.8	21.4	0.25
CPCB Limits	100	60	80	80	04

Note: All readings are 24hr average

NA: Not Available

3.3.4 Results for Ambient Air Quality Monitoring

Results of AAQM survey indicate that the air quality in respect of the primary air pollutants viz. PM₁₀, PM_{2.5}, CO, SO₂ & NO_x are within standards. Levels do not exceed the standards.

3.4 NOISE ENVIRONMENT

3.4.1 Noise Monitoring

Major source of noise in the core zone are the traffic along the NH8 road and plying of railways along the Eastern Railway Line. Other sources of noise that exists in the area include commercial establishments and other activities associated with the same.

The noise monitoring readings of summer 2019 were studied for 4 locations within the study area (Table 3.10 and Fig. 3.12).

Table 3-10: Description of Noise Monitoring Stations

Noise Station	Location/ Name of the place	Distance from site (approx. km)	Direction from site
N1	Near Shrem Hotel, Andheri	3.31	North
N2	Near Mahananda dairy, Goregaon	6.91	North
N3	Near BKC, Bandra	2.50	South
N4	Near Godrej Properties, Chembur	4.44	South East

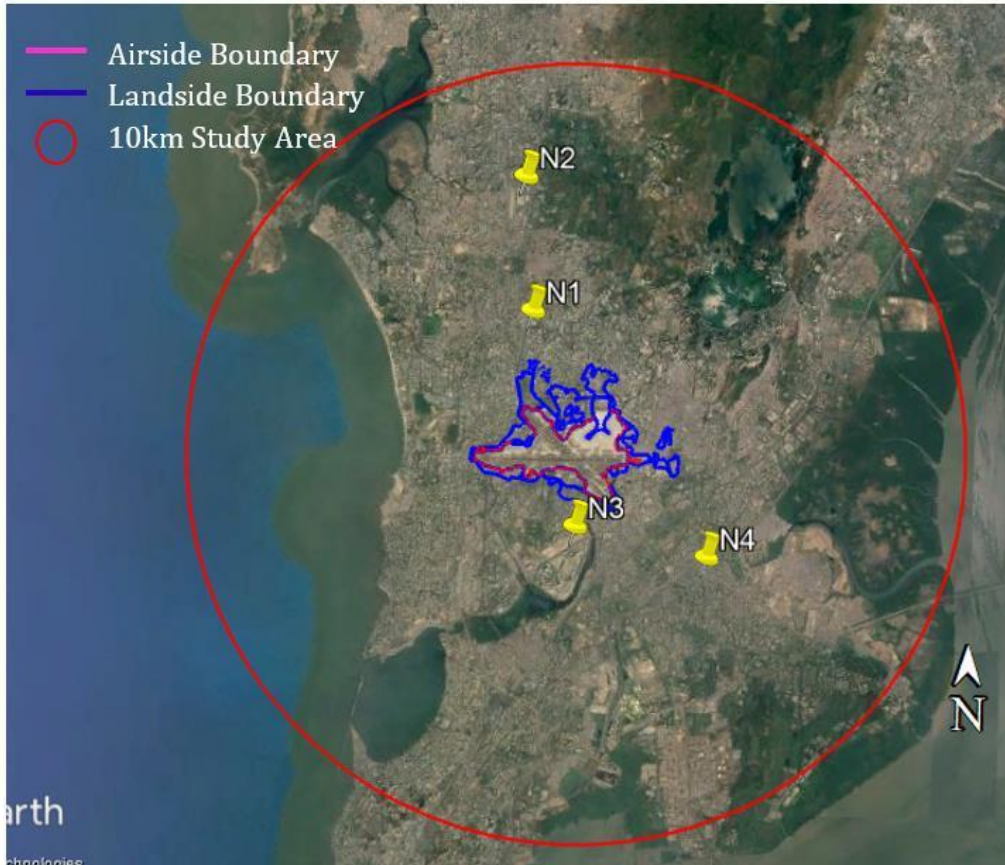


Figure 3-13: Noise Monitoring Locations

Noise monitoring results

The following table gives the results of noise quality monitoring results at the monitoring locations on site and within 10 km surrounding the site.

Table 3-11: Noise Level Readings

Sr. No.	Noise Monitoring Location	Day Time Leq [dB(A)]	Night Time Leq [dB(A)]
1	N1	64.1	54.6
2	N2	62.6	64.5
3	N3	63.1	NA
4	N4	69.9	NA
CPCB Standards for Residential Areas		55	45
CPCB Standards for Commercial Areas		65	55
CPCB Standards for Industrial Areas		75	70

NA: Not Available

Conclusions of Noise Monitoring

From the above, it can be concluded that the readings for day and night times are exceeding the day time as well as night time limits in residential and commercial areas. This may be due to the road traffic and the noise from nearby railway line.

3.5 WATER ENVIRONMENT

3.5.1 Surface Water

Surface Water Quality Monitoring

Water sample results carried out by MPCB were studied from 5 locations as part of the baseline studies during summer 2019 to analyze surface water quality. Sampling was carried out by MPCB at the following stations (Table 3.12 and Fig. 3.13):

Table 3-12: Description of Surface Water Monitoring Stations

Monitoring Location	Name of the place	Approx. distance from site	Direction from site
SW1	Mithi River	Adjacent	E
SW2	Mahim Creek	4.5 km	NW
SW3	Thane Creek	7.0 km	E
SW4	Juhu Beach	3.5 km	W

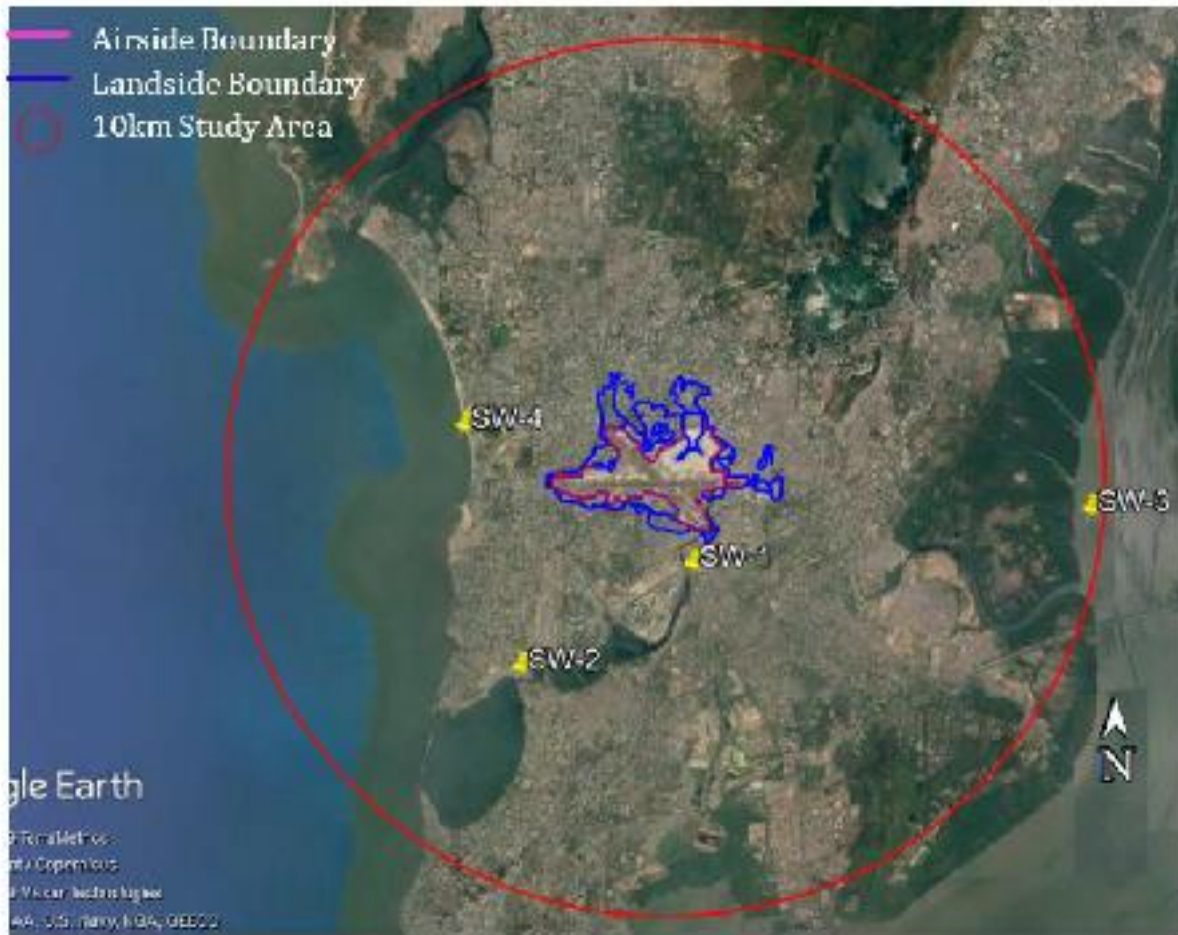


Figure 3-14: Sites for Surface Water Sampling

Table 3-13: Results of Surface Water Quality Monitoring

Sr. No.	Parameters	SW1	SW2	SW3	SW4
1	pH	6.7	7.3	7.4	7.7
2	Dissolved Oxygen, mg/l	3.1	3.7	3.4	4.1
3	BOD @20°C 5days, mg/l	39.0	15.0	16.3	12.7
4	COD mg/l	112.0	182.0	217.3	140.0
5	Nitrates as NO ₃ ⁻ , mg/l	1.4	1.6	1.4	1.2

Microbiological water quality report

Parameter	Result			
	SW1	SW2	SW3	SW4
Coliforms	1373	76	380	920

Analysis results of Surface Water Quality Monitoring

The results were checked against the Water Quality Standards for Best Designated Usage as categorized by MPCB. The results indicate that water quality broadly meets the requirements of Class C that is use of water permitted after Conventional Water Treatment.

3.5.2 Ground Water

Status of Ground Water

Ground water in the Greater Mumbai district is predominantly used for domestic, industrial and commercial purpose in the form tanker water supply to the hotel industry, construction purpose etc. The ground water development in the district is mostly through dugwells and borewells. The utilization of ground water through borewells is more in the Andheri, Malad, Goregaon, Kandivili, Bhandup, Kurla, Chembur and Ghatkoper areas.

Water Level Scenario: The depth to water levels during premonsoon (May 2011) occurred in 2.0 to 5.0 m depth range. The depth to water levels during postmonsoon (Nov. 2011) in major part of the district ranges between 2 and 5 m bgl. Shallow water levels of < 2 m bgl are observed in small area in southern part of the district. Seasonal water level fluctuation between premonsoon and postmonsoon of 2011 have been computed and observed that seasonal it ranges from 0- 2.0 m.

Suitability of ground water for drinking purpose: It was seen that the concentrations of all the parameters are the within the desirable limit of the BIS standards. It is also seen from the Table-5 that the potability of ground water in the wells is not much affected. Overall, it can be concluded that the ground water quality in the wells monitored in the district is within the BIS Standard condition.

(Source: Ground Water Information for Greater Mumbai District: Report by CGWA, 2013)

Ground Water Quality Monitoring

Ground water analysis results from 2 samples were studied as part of the baseline studies carried out during summer 2019 to analyse ground water quality.

Table 3-14: Description of Ground Water Monitoring Stations

Station Code	Location of Station	Approx. distance from site (km)	Direction from site
GW1	Andheri	3.31	North
GW2	Ghatkopar	5.80	East

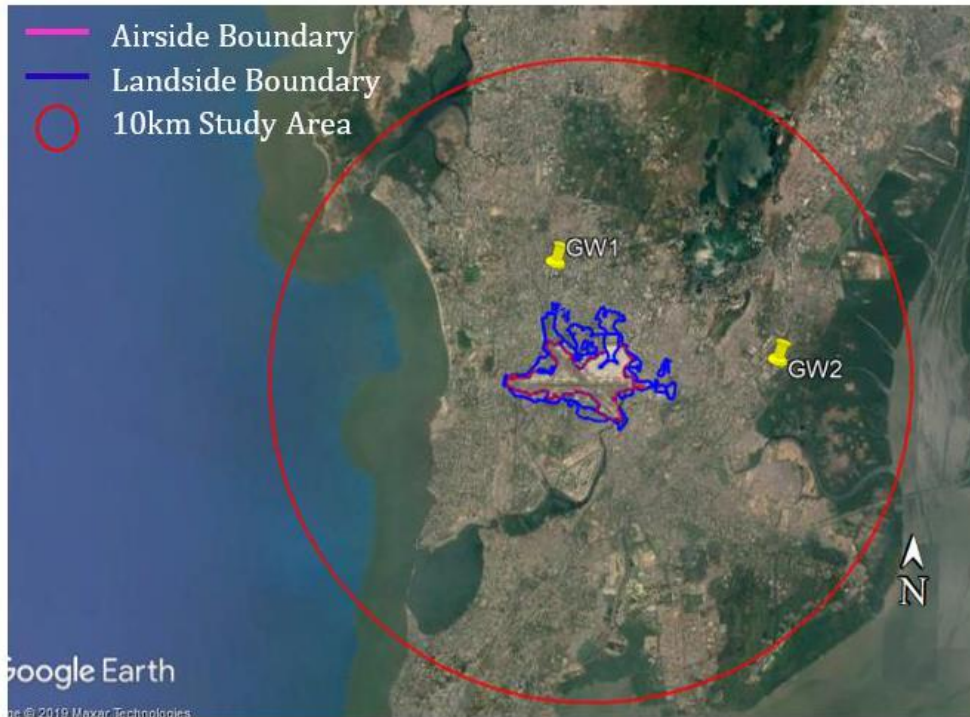


Figure 3-15: Location of wells for Ground Water Sampling

Table 3-15: Results of Ground Water Quality Monitoring

Sr. No.	Parameter	GW1	GW2	Limits (IS 10500: 2012)	
				Desirable	Permissible
1.	Colour, Hazen	BDL	<5	5 Max	15 Max
2.	Turbidity, NTU	BDL	BDL	1 Max	5 Max
3.	pH	7.85	8.08	6.5 – 8.5	No relaxation
4.	Residual Cl ₂ , mg/l	BDL	BDL	0.2 Min	1.0 Min
5.	Hardness, mg/l	82	480	200 Max	600 Max
6.	Iron, mg/l	0.02	0.06	1.0 Max	No relaxation
7.	Chlorides, mg/l	12	383	250 Max	1000 Max
8.	Fluoride, mg/l	BDL	0.35	1.0 Max	1.5 Max
9.	*Odour	Agreeable	Agreeable	Agreeable	Agreeable
10.	*Taste	Agreeable	Agreeable	Agreeable	Agreeable

Microbiological water quality report

Sr. No.	Parameter	Sample		Range of Detection	Limit As per 10500-2012	Method of analysis
		GW 1	GW 2			
1	Coliforms	Absent	Absent	Present / Absent	Absent	IS:1622 RA 2009
2	<i>E. coli</i>	Absent	Absent	Present / Absent	Absent	IS:1622 RA 2009

Analysis of Ground Water Quality Monitoring

The results were checked against the limits as per IS 10500-2012. The results show a higher level of chloride content at second location. Presence of coliforms and E. Coli was also not detected.

3.6 BIOLOGICAL ENVIRONMENT

Please refer to Annexure VI for detailed report on Ecology and Biodiversity study. Following is an extract of the same.

3.6.1 Reconnaissance

The site is surrounded by urbanized area, Arabian Sea is present to its west side and Thane Creek to east side. The Mithi River following nearby the site which meets into Mahim Creek where some greenery exists in form of remnant mangroves.

The present study was undertaken to assess the ecology of terrestrial habitat and the flora and fauna associated with them in the study area. Different habitats within study area are mentioned in the table below:

Table 3-16: Habitats within study area

Type of Habitats	Major ones in Study Area
Forest	Sanjay Gandhi National Park, Mahim Nature Park
Sanctuary	Thane Flamingo Bird Wildlife Sanctuary
Rivers	Mithi River
Lake	Vihar, Powai
Coastal Areas	Mangroves, Mudflats, Beaches, Rocky shores
Creek/Bay	Thane Creek, Malad Creek, Mahim Bay
Urban Parks	several small gardens and parks like Joggers etc.
Lakes/Ponds	Bandra Pond is present within the study area

3.6.2 Baseline Studies within study area

In the study area, the vegetation diversity can be divided into mostly urban and Plantation based. Common plants such as *Ficus sp.*, *Syzygium cumini*, *Roystonea regia* and *Peltoforum species* were observed mainly in the study area. *Terminalia catappa*, *Mangifera indica*, *Sarala asoca*, *Delonix regia* are common plants seen in residential complexes and industrial areas.

The avifaunal species were mostly prevalent in the forest and residential areas. Amphibians are mainly restricted to fresh water (lakes) and marshy areas. The presence of flora and fauna in study area can be referred to in the **Annexure VII**: Report on Ecology and Biodiversity study in Table 1.3 and 1.4.

Thane Creek, Mahim Creek and Malad Creek come under the study area, mangroves and other plant species associated with it are present around these creeks encompasses vast species composition. Some Part of Sanjay Gandhi National Park and some portion of Thane Flamingo Bird Sanctuary come under study area towards north and west of project site respectively. This ecosystem is surrounded by both urban populace and industrial Area.

Sanjay Gandhi National Park (SGNP)

Sanjay Gandhi National Park (SGNP) has an area of 103 sq. km as forest. In order to conserve and protect the habitat in and around the SGNP, MoEFCC has notified an Eco Sensitive Zone (ESZ) around the SGNP vide Notification S.O 3645 (E) dated 05.12.2016. The ESZ is spread over an area of 59.456 sq.km to an extent of 100 m to 4 km from the boundary of the SGNP.

SGNP has approx. 43 species of Mammals, 250 species of Migratory Birds, 150 varieties of butterflies, 5000 species of Insects, 38 species of reptiles and 9 species of amphibians, and more than 800 species of plants. Major floral species of SGNP are Kadamba, Teak, Karanj, Shisham, Accacia, ziziphus, Euphorbia, Red silk cotton, Karvi etc.

A wildlife habitat in Sanjay Gandhi National Park division supports a number of species of herbivores, carnivores and omnivores. Nearly 43 species of mammals belonging to 8 natural orders and 17 families are seen in the national park. The leopard is the main predator of SGNP (Forest Department).

SGNP is also home to the large number of resident and migrant birds belonging to 18 orders and 47 families as per record. The reptiles found in the park are covered under 3 orders and 14 families. In SGNP, there are 38 species of reptiles of which 7 are “endangered” and are included in Schedule-I and Part-II of Schedule-II of the Indian Wildlife (Protection) Act, 1972. Indian Rock Python- *Python mourns*, and Common monitor lizard – *Varanus benghalensis* are found in the park. Amphibian species Tree frogs, bull frogs and common toads are found in the park area. About 15 species of the freshwater fishes are seen within the national park, which are also common in the 10 km sq. km study area. The list of fauna/ avifauna of the Sanjay Gandhi National Park are mentioned in **Annexure VII**: Report on Ecology and Biodiversity study.

Chital (or spotted deer), rhesus macaque and bonnet macaque are some of the wild mammals that can easily be spotted roaming inside the park. Other large mammals found in the park are Indian hare, muntjac (barking deer), porcupine, Asian palm civet, chevrotain (mouse deer), Hanuman or grey langur, Indian flying-fox, sambar deer and leopard.

Crocodiles in the Tulsi Lake, pythons, cobras, monitor lizards, Russell's vipers, bamboo pit viper and Ceylonese cat snakes are reptiles found at SGNP.

Blue Mormon, blue oakleaf, the bright Jezebel and large yellow and white orange tip, tiger butterfly, eggflies and sailers are common butterflies spotted at SGNP.

Jungle owlets, golden orioles, racket-tailed drongos, minivets, magpies, robins, hornbills, bulbuls, sunbirds, peacock, and woodpeckers are Avian faunal species found at SGNP. Migratory and local birds such as paradise flycatcher and various species of kingfishers, mynas, drongos, swifts, gulls, egrets, and herons have also been spotted.

Thane Creek Flamingo Sanctuary

The flamingo Bird Sanctuary is situated about 4.5 km from project site, and the project activity is confined to land area in the vicinity of the CSMIA area. Hence, it will not affect this diverse bird ecosystem.

The major part of Thane Creek comes along the eastern boundary of study area. Dense mangrove vegetation is noted on the western boundary of Thane Creek which has been notified as Thane Flamingo Bird Sanctuary. The creek is influenced by high and low tide water due to which mudflats were formed along the bank of creek which support widespread growth of mangroves into dense, tall in several stretches. These areas are shelter to several birds and mammals, marine fishes, reptiles and several other organisms in this region.

A total of 200 bird species have been reported along the Thane Creek bird Sanctuary. Most of the birds are Winter Migrant majorly Flamingos, which is the keystone species in the region. List of birds reported from Thane Flamingo Bird Sanctuary is mentioned in **Annexure VII**.

Mangrove Forest

The mangrove forests are seen along various Creeks, such as Manori, Malad, Mahim, Bandra and Thane (**Fig. 3.15**). As stated in notification of the Office of Divisional Commissioner, Kokan Division, declare mangroves as notified forest in District Mumbai City dated 2nd September, 2013; in Mumbai Suburban District, Taluka Kurla and Andheri dated 17th September, 2013 respectively.

The total area (Ha) and Notified Mangrove Forest area within study area is mentioned in **Annexure VII**.



Figure 3-16: Mangroves observed within Study Area

Water bodies

The study area includes water bodies such as the Mithi River towards east passing through the site, Mahim Bay towards south, Arabian sea towards West and Thane Creek towards

East. Two lakes Vihar and Powai lake is present towards NE within the project site. Towards the NE end, the Malad Creek is present. A number of stream and nallah also flows joins Mithi River; Mahim Creek, Malad creek and Thane Creek which forms a wetland comprising mangroves and other wetland other vegetation depending upon the soil cover and supports vivid avifauna. Species of vegetation near Creek include *Avicennia sp.*, *Acanthus ilicifolius*, *Salvadora persica*, grasses like *Saccharum arundinaceum* etc. are dominant in the wetland.

The colonies of aquatic birds Little Egret, Cattle Egret were noted around the Creek. Cormorant, King Fisher etc. were noticed near the water bodies near creeks, ponds and lakes. Common aquatic Floral species like Mangroves were noted near creeks; freshwater aquatic plants like *Ipomea*, *Cyperus* were few common species noted throughout the study area.

Human Settlement

There is urbanized settlement in the study area around project site. The location of project sites are Vile Parle, Sahar, Brahamwada, Marol, Chakala, Koelkalyan and Kurla. The project is for commercial and residential development. The residential areas of Vile Parle is present towards West, Andheri is present towards North and Sakinaka towards East around the project site.

3.6.3 Baseline Studies within project site

The project site has small scattered vegetation in terms of trees. To collect data of such a landscape, multiple sampling locations in all directions were strategically undertaken to cover all major representative vegetation patterns, faunal diversity and habitat diversity.

The area around the actual project site is urbanized with some plantation and vegetation patches. Most of the Tree species observed were natural varieties interspersed with some non-indigenous species. In addition, shrub, herbs and grasses prevalent in the site.

Flora at Project site

The plants commonly occurring in the core area are, *Delonix Regia*, *Mangifera indica*, *Peltophorum pterocarpum*, *Terminalia catappa*, *Thespesia populnea* plants were commonly recorded at Project site. Shrubs like *Bogainvillea*, *Hibiscus rosa sinensis*, *Nerium indicum*, and *Lantana camera* were observed within study area. The list of observed plant species at project site are presented in table below.

Table 3-17: List of Flora present within Project site

Sr. No.	Scientific name	Common Name	Family
Tree			
1.	<i>Acacia auriculiformis</i>	Australian babhul	Mimosaceae
2.	<i>Acacia farnesiana</i>	Dev babhul	Fabaceae
3.	<i>Acacia nilotica</i>	Babhul	Fabaceae
4.	<i>Adenanthera pavonina</i>	Ratangunj	Fabaceae
5.	<i>Aegle marmelos</i>	Bel	Rutaceae
6.	<i>Ailanthus excelsa</i>	Maharukh	Simaroubaceae
7.	<i>Albizzia procera</i>	Kinai	Mimosaceae
8.	<i>Alstonia scholaris</i>	Saptarni	Apocynaceae

Sr. No.	Scientific name	Common Name	Family
9.	<i>Anacardium occidentale</i>	Kaju	Anacardiaceae
10.	<i>Annona reticulata</i>	Ramphal	Annonaceae
11.	<i>Annona squamosa</i>	Sitaphal	Annonaceae
12.	<i>Araucaria columnaris</i>	Christmas tree	Araucariaceae
13.	<i>Areca catechu</i>	Supari	Arecaceae
14.	<i>Artocarpus altilis</i>	Nirphanas	Moraceae
15.	<i>Artocarpus heterophyllus</i>	Phanas	Moraceae
16.	<i>Artocarpus lakoocha</i>	Otamb	Moraceae
17.	<i>Averrhoa bilimbi</i>	Bilambi	Oxalidaceae
18.	<i>Azadirachta indica</i>	Kaduneem	Meliaceae
19.	<i>Bauhinia purpurea</i>	Kanchan	Fabaceae
20.	<i>Bauhinia racemosa</i>	Apta	Caesalpiniaceae
21.	<i>Bombax ceiba</i>	Katesavar	Malvaceae
22.	<i>Borassus flabellifer</i>	Tad	Arecaceae
23.	<i>Bridelia retusa</i>	Asana	Phyllanthaceae
24.	<i>Caesalpinia pulcherima</i>	Shankasur	Caesalpiniaceae
25.	<i>Caesalpinia pulcherima</i>	Shankasur	Fabaceae
26.	<i>Callistemon viminalis</i>	Bottle brush	Myrtaceae
27.	<i>Caryota urens</i>	Bherli mad	Arecaceae
28.	<i>Cassia fistula</i>	Bahava	Caesalpiniaceae
29.	<i>Cassia grandis</i>	pink shower tree	Fabaceae
30.	<i>Cassia siamea</i>	Kashid	Fabaceae
31.	<i>Casuarina equisetifolia</i>	Suru	Casuarinaceae
32.	<i>Ceiba pentandra</i>	Savar	Malvaceae
33.	<i>Cicca acida</i>	Rai avla	Phyllanthaceae
34.	<i>Citrus aurantifolia</i>	Limbu	Rutaceae
35.	<i>Citrus grandis</i>	Papanas	Rutaceae
36.	<i>Cocos nucifera</i>	Naral	Arecaceae
37.	<i>Cordia dichotoma</i>	Bhokar	Boraginaceae
38.	<i>Couroupita guianensis</i>	Kailashpati	Lecythidaceae
39.	<i>Cycas revoluta</i>	Cycas	Cycadaceae
40.	<i>Dalbergia latifolia</i>	Sisvi	Fabaceae
41.	<i>Dellinia indica</i>	Karmal	Dilleniaceae
42.	<i>Delonix regia</i>	Gulmohar	Fabaceae
43.	<i>Dichrostachys cinerea</i>	Kunali	Fabaceae
44.	<i>Dombeya spectabilis</i>	Dombeya	Sterculiaceae
45.	<i>Drypetes roxburghii</i>	Putranjiva	Putranjivaceae
46.	<i>Erythrina variegata</i>	Pangara	Fabaceae
47.	<i>Eucalyptus globulus</i>	Nilgiri	Myrtaceae
48.	<i>Ficus benjamina</i>	F. benjamina	Moraceae
49.	<i>Ficus elastica</i>	Indian rubber tree	Moraceae
50.	<i>Ficus hispida</i>	Kala umber	Moraceae
51.	<i>Ficus infectoria</i>	Pipli	Moraceae
52.	<i>Ficus racemosa</i>	Umbur	Moraceae
53.	<i>Ficus religiosa</i>	Pimpal	Moraceae
54.	<i>Filicium decipiens</i>	Fern tree	Sapindaceae
55.	<i>Garcinia indica</i>	Kokam	Clusiaceae

Sr. No.	Scientific name	Common Name	Family
56.	<i>Gliricidia sepium</i>	Giripushpa	Fabaceae
57.	<i>Gmelina arborea</i>	Shivan	Lamiaceae
58.	<i>Grevillea robusta</i>	Silver oak	Proteaceae
59.	<i>Grewia tiliaefolia</i>	Dhaman	Tiliaceae
60.	<i>Holoptelea integrifolia</i>	Vavla	Ulmaceae
61.	<i>Kigelia africana</i>	Sausage tree	Bignoniaceae
62.	<i>Lagerstroemia speciosa</i>	Taman	Lythraceae
63.	<i>Lansea coromandelica</i>	Shemat	Anacardiaceae
64.	<i>Leucaena leucocephala</i>	Subabhul	Fabaceae
65.	<i>Livistona chinensis</i>	Fan palm	Arecaceae
66.	<i>Magnolia champaca</i>	Sonchapha	Magnoliaceae
67.	<i>Mangifera indica</i>	Amba	Anacardiaceae
68.	<i>Manilkara hexandra</i>	Khirni	Sapotaceae
69.	<i>Manilkara zapota</i>	Chiku	Sapotaceae
70.	<i>Manilkara zapota</i>	Ran chiku	Sapotaceae
71.	<i>Markhamia platycalyx</i>	Markhamia	Bignoniaceae
72.	<i>Melia azedarach</i>	Bakneem	Meliaceae
73.	<i>Mimusops elengi</i>	Bakul	Sapotaceae
74.	<i>Mitragyna parvifolia</i>	Kalamb	Rubiaceae
75.	<i>Morinda pubescens</i>	Bartondi (p)	Rubiaceae
76.	<i>Moringa pterigosperma</i>	Shevga	Arecaceae
77.	<i>Morus alba</i>	Tuti	Moraceae
78.	<i>Muntingia calabura</i>	Singapur cherry	Muntingiaceae
79.	<i>Murraya koenigii</i>	Kadipatta	Rutaceae
80.	<i>Murraya paniculata</i>	Kunti	Rutaceae
81.	<i>Neolamarckia cadamba</i>	Kadamb	Rubiaceae
82.	<i>Nyctanthus arbor-tristis</i>	Parijatak	Oleaceae
83.	<i>Peltophorum pterocarpum</i>	Sonmohar	Fabaceae
84.	<i>Phoenix sylvestris</i>	Shindi	Arecaceae
85.	<i>Pisonia alba</i>	Lettuce tree	Nyctaginaceae
86.	<i>Pithecellobium dulce</i>	Vilayati chinch	Fabaceae
87.	<i>Plumeria acuminata</i>	Chapha	Apocynaceae
88.	<i>Plumeria alba</i>	Champa	Apocynaceae
89.	<i>Polyalthia longifolia</i>	Asupalav	Annonaceae
90.	<i>Pongamia pinnata</i>	Karanj	Fabaceae
91.	<i>Prosopis juliflora</i>	Vilayati kikar	Fabaceae
92.	<i>Psidium guajava</i>	Peru	Myrtaceae
93.	<i>Punica granatum</i>	Dalimb	Lythraceae
94.	<i>Quassia indica</i>	Lokhandi	Simaroubaceae
95.	<i>Ravenella madagaskarensis</i>	Travellers palm	Strelitziaceae
96.	<i>Roystonea regia</i>	Bottle palm	Arecaceae
97.	<i>Samania saman</i>	Rain tree	Fabaceae
98.	<i>Sapindus mukorossi</i>	Ritha	Sapindaceae
99.	<i>Saraca asoka</i>	Ashok	Fabaceae
100.	<i>Scarlet cordia</i>	Scarlet cordia	Boraginaceae
101.	<i>Sesbania grandiflora</i>	Agasti	Fabaceae
102.	<i>Spathodia campanulata</i>	Pichkari	Bignoniaceae

Sr. No.	Scientific name	Common Name	Family
103.	<i>Sterculia foetida</i>	Jungli badam	Malvaceae
104.	<i>Streblus asper</i>	Kharoti	Moraceae
105.	<i>Syagrus romanzoffiana</i>	Queens palm	Aracaceae
106.	<i>Syzygium cuminii</i>	Jambhul	Myrtaceae
107.	<i>Syzygium samarangense</i>	Jamb	Myrtaceae
108.	<i>Tabebuia rosea</i>	T. rosea	Bignoniaceae
109.	<i>Tamarindus indica</i>	Chinch	Fabaceae
110.	<i>Tectona grandis</i>	Sag	Lamiaceae
111.	<i>Terminalia catappa</i>	Deshibadam	Combretaceae
112.	<i>Thespesia populnea</i>	Bhend	Malvaceae
113.	<i>Thevetia peruviana</i>	Pili Kanher	Apocynaceae
114.	<i>Trema orientalis</i>	Charcoal tree	Cannabaceae
115.	<i>Ziziphus mauritiana</i>	Bor	Rhamnaceae
Shrubs			
1.	<i>Bougainvillea spectabilis</i>	Bougainvillea	Nyctaginaceae
2.	<i>Calotropis gigantea</i>	Rui	Asclepiadaceae
3.	<i>Dracaena sp.</i>	Dracaena	Asparagaceae
4.	<i>Hibiscus rosa-sinensis</i>	Shoe flower	Malvaceae
5.	<i>Ixora parviflora</i>	Lokhandi	Rubiaceae
6.	<i>Nerium indicum</i>	Apocynaceae	Kanher
7.	<i>Lantana camara</i>	Ghaneri	Verbenaceae
Herbs			
1.	<i>Acalypha indica</i>	--	Euphorbiaceae
2.	<i>Ocimum sanctum</i>	Tulas	Labiataeae
3.	<i>Tridax procumbens</i>	Dagadi	Asteraceae
4.	<i>Euphorbia hirta</i>	-	Euphorbiaceae
5.	<i>Ageratum conyzoides</i>	Goat weed	Asteraceae
Grass			
1.	<i>Cynodon dactylon</i>	Harli/ Durva	Poaceae
2.	<i>Cyperus rotundus</i>	-	Cyperaceae
3.	<i>Andropogon sp.</i>	-	Poaceae
4.	<i>Dendrocalamus strictus</i>	-	Poaceae
Climbers			
1.	<i>Cuscuta reflexa</i>	Amarvel	Convolvulaceae

Fauna of the Project site

The list of faunal species observed within project site were of common occurrence, mostly common birds such as house sparrow, common crow, Jungle crow, and egrets. The commonly observed mammals were domestic animals, mongoose and squirrels. The list of animal species recorded in project site is presented in Table below.

Table 3-18: List of Fauna present within Project Site

Sr. No.	Scientific Name	Common Name	Family	Conservation Status as per Indian Wildlife Protection Act (1972)
Avian Fauna				
1	<i>Acridotheres tristis</i>	Common Myna	Sturnidae	Sch-IV
2	<i>Passer domesticus</i>	House Sparrow	Passeridae	Sch-IV
3	<i>Bubulcus ibis</i>	Cattle egret	Ardeidae	Sch-IV
4	<i>Egretta garzetta</i>	Little egret	Ardeidae	Sch-IV
5	<i>Corvus splendens</i>	House crow	Corvidae	Sch-IV
6	<i>Eudynamys scolopaceus</i>	Asian Koel	Cuculidae	Sch-IV
Mammals				
1	<i>Bandicota indica</i>	Greater Bandicoot	Muridae	Sch-V
2	<i>Funambulus palmarum</i>	Three Striped Palm Squirrel	Sciuridae	Sch-V
3	<i>Canis lupus familiaris</i>	Dog	Felidae	-
4	<i>Felis catus</i>	Cat	Felidae	-
Amphibians				
1	<i>Bufo melanostictus</i>	Common frog	Bufoidea	Sch-IV
Reptiles				
1	<i>Calotes versicolor</i>	Common garden lizard	Agamidae	Sch-IV
2	<i>Sphenomorphus indicus</i>	Indian Skink	Scincidae	Sch-IV

Highlights of the study

- The primary observations were compared with secondary sources (reports, research papers, literature survey). The status of vegetation was mix deciduous forest, littoral forest of mangroves, dense vegetation was noted at Hill near Powai and Trombay respectively.
- Sanjay Gandhi National Park is situated about 4.5 km from project site, which is protected area. Which is habitat for various mammals, reptiles, Birds, insects etc. the forest is of mix deciduous type to subtropical hill forests.
- The presence of Schedule I species includes *Panthera pardus fusca*, *Felius rubinginos* within study area, *Tetracerus quadricornis*, *Tragulus meminna*. Indian Flying Fox found in study area which comes under Schedule V Indian Wildlife (Protection) Act, 1972.
- There is no endangered species of Botanical flora as mentioned in Schedule VI of Indian Wildlife (Protection) Act, 1972.
- The species of mangroves were found near the creek within study area.
- During survey, a number of floral and faunal species were observed at the project site and in the study area. A summary of the same reflecting the diversity in the study area is given in the following tables for flora and fauna respectively:

Table 3-19: Summary of floral species observed at site and study area

Location	Trees	Shrubs	Herbs	Grasses	Climbers
Project site	115	7	5	4	1
Study area	103	12	9	6	5

Table 3-20: Summary of fauna species observed at site and study area

Location	Mammals	Birds	Reptiles	Amphibians	Insects
Project site	4	6	2	1	0
Study area	7	57	9	3	4

3.7 SOCIO ECONOMIC ENVIRONMENT

Following section gives the highlights of the Socio-Economic study for the project carried out within the study area which spans a radius of 10 km around the proposed project site. For the detailed report, please refer to Annexure VII: Socio Economic study report.

The project area belonging with Santacruz East area (ward no. 48) and Vile Parle East area (ward no. 49) which covered Municipal Corporation of Greater Mumbai (MCGM), Mumbai Suburban District.

The socio-economic data was collected and generated through secondary sources i.e. concerned office's documented records such as census records of 2011 CDs from Directorate of Census Office, district statistical abstracts etc.

3.7.1 Demographic Structure of the Study Area

The significant features of the demographic structure are given below:

Population, Households & Avg. Family Size: Total population of the study area is 84,44,857 out of which 45,64,556 (54.05%) are males and 38,80,301 (45.95%) are females. There are 18,68,464 households in the study area with average family size is 4.52 persons per household as per 2011 census.

Child Population of Age Group 0 – 6 Yrs.: In the study area children population within the age group of 0 – 6 yrs. is 8,48,909 (10.05%).

Sex Ratio: Sex Ratio in study area is very low i.e. 850 females per 1000 males. Reason behind that many males migrate from outside to employment.

Scheduled Cates & Scheduled Tribes Population: As per 2011 census, 7.17% of the population in the study area belonged to Scheduled Castes (SC) and 1.01% to Scheduled Tribes (ST). Thus, indicating that socially backward castes constitute about 8.18% of the population.

Literacy: Literacy rate of the study area is 80.42 percent. The male and female literacy rates are 83.59% and 76.68% respectively as per 2011 Census (Fig. 3.16).



Figure 3-17: Literacy rate of the study area

3.7.2 Infrastructural Facilities or Civic Amenities

The infrastructure resources in Mumbai Suburban District and Mumbai District which related project area like- education, medical facility, water supply, post and telegraph, transportation and communication facility and power supply etc. are adequate. These civic amenities are described below:

Educational Facilities: Mumbai Suburban District and Mumbai District area is a well developed urban area. This area has adequate educational facility. Many students come from neighbouring rural areas of Thane and Palghar District for getting education facility.

Medical Facilities: People have access to regular and sufficient medical facility in study area.

Drinking Water Facility: Mumbai controls several dams namely Modak Sagar/ Lower Vaitarna, Tansa Lake, Vihar Lake, Tulsi Lake, Upper Vaitarna, Bhatsa and Middle Vaitarna in Shahpur taluka (Thane District) that deliver water to the Mumbai Suburban & Mumbai City Area.

Sanitation Facilities: The project area falling under MCGM has covered approximate 100% toilet facility, supported with common toilet in public place and slum areas. There are separate sewage lines and drainage line. There is garbage collection system implemented by MCGM.

Communication, Transportation & Road Facility: Mobile phone is a main mode use for communication. Postal and telegraph facility is accessible. Project area is connected by government and private vehicle transportation with internal paved roads. The Eastern Express Highway No.8 is also parallel to project area. All over MCGM area, there is a strong network of Brihanmumbai Electric Supply and Transport (BEST) transportation. Project area connected with Vile Parle and Santacruz Railway Station on Western line of the Mumbai Suburban Railway network. The project area is also attached with major international airport in western India, domestic and international travellers connect to rest of western India through Mumbai.

Power Supply: Study area is covered with adequate power supply for domestic and commercial purpose. Power supply to Mumbai area is through three private distributors namely; Brihanmumbai Electric Supply and Transport (BEST), Adani Electricity and Tata Power. But in Bhandup and Mulund area, Power supply by Maharashtra State Electricity Distribution Corporation Limited (MSEDCL).

Banking Facilities: There is adequate Bank Facility in study area. All type of banks like- Nationalized Bank, Private Commercial Bank, Co-operative Bank, Agricultural Credit Society, Non-Agricultural Credit Society are available in the study area.

Recreation Centers: There is various sources of recreation in study area like- Govt. Stadium, Private Stadium, Govt. Cinema Theatre, Private Cinema Theatre, Govt. Auditorium/Community Hall, Private Auditorium/Community Hall, Govt. Public Library, Private Public Library, Govt. Public Reading Room, Private Public Reading Room etc

3.7.3 Occupational Structure of the Study Area

Information on Occupational Structure i.e. numbers of workers & non workers details & economic category wise distribution of workers in the study area is shown in the below table while its percentage is presented in the figure below (Fig. 3.17).

Table 3-21: Occupational Structure of the Study Area

Persons	Workers			Non Workers
	Main Workers	Marginal Workers	Total Workers	
Total	31,66,623	2,02,480	33,69,103	50,75,754
Male	25,50,084	1,25,257	26,75,341	18,89,215
Female	6,16,539	77,223	6,93,762	31,86,539

Source: Census CD 2011

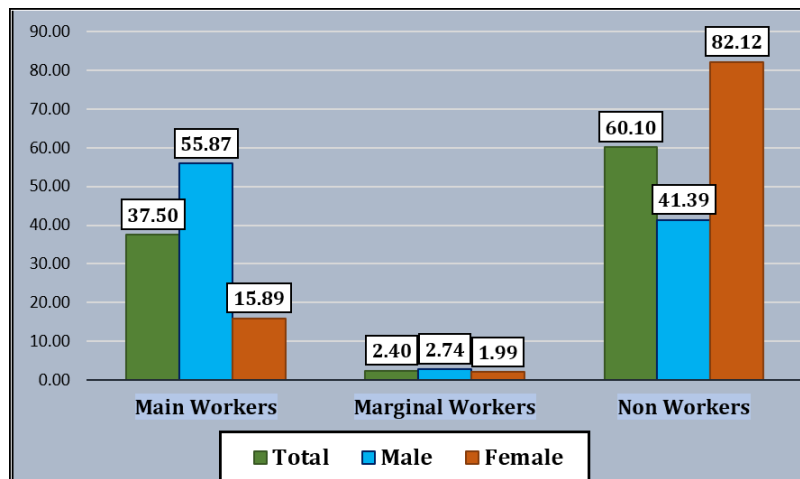


Figure 3-18: Ratio of Workers & Non Workers in the Study Area

Workers & Non-Workers: The total working population in the study area is 33,69,103 i.e. 58.61% of which 37.50% are main workers & 2.40% are marginal workers it means highest number of population is shared by non-workers i.e. 60.10% of the total population (Fig. 3.17).

Among the main workers, male participation rate is 55.87% while female participation rate is only 15.89%, it means proportion of main workers is higher in male population than in female population while in non-workers the percentage of female population is 82.12% shows higher than of male population i.e. 41.39% in the study area.

Table 3-22: Economic Category wise Distribution of Workers

Workers	Cultivators	Agricultural Labourer	Household Industry Workers	Other Workers
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Main Worker	9,592	15,800	98,845	30,42,386
Marginal Worker	5,415	2,503	13,047	1,81,515

Source: Census CD 2011

Economic Category Wise Distribution: Economic categorywise distribution of workers in the study area is as shown below:

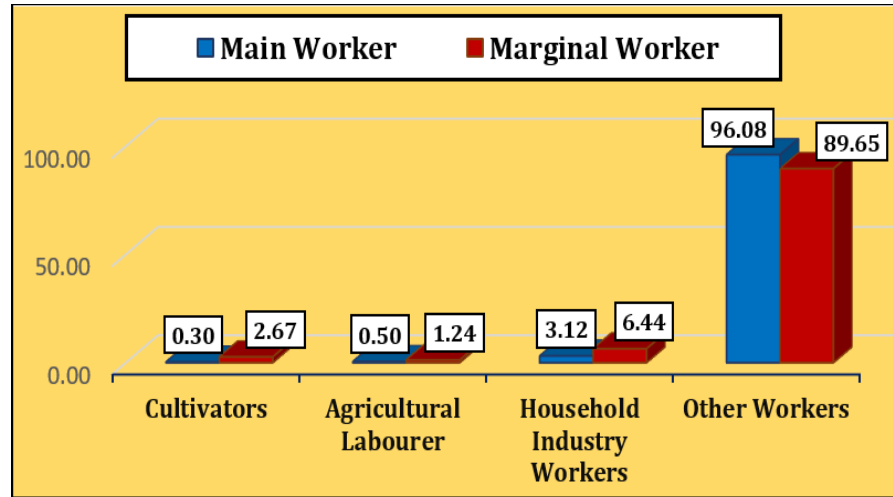


Figure 3-19: Economic Category Wise Distribution

Economic Category wise distribution of Workers: Study area is an urbanized and industrially developed area, people in the study area are mostly engaged in other activities i.e. 96.08% from main workers of the total main workers population and 89.65% from marginal workers of the total marginal workers population as per 2011 Census data (Fig. 3.18). Other workers include all private jobs/services, government employees, factory workers, those engaged in service, trade, commerce, business, transport, banking, schools, hospitals, construction etc.

3.7.4 Places of Religious/Archaeological and other Importance

There are some very famous tourist places within the study area. These include Archaeological Sites, Historical Places, Religious Places and Picnic Spots etc. These are mentioned in the table below:

Table 3-23: Places of Religious/Archaeological and other Importance

Sr.No.	Tourist Place	Approx. Distance	Approx. Direction
Archaeological Notified Heritage Sites			
1	Jogeswari Caves	5.45	North
2	Kondivate Caves or Mahakali Caves	4.50	North
3	Sion Fort	4.84	South
4	Monolithic of Shiva, Parel	9.92	South
Historical/Religious/Picnic Places			
5	Madh Fort	8.76	North West
6	Bandra Fort	7.30	South West
7	Mahim Fort	6.06	South West
8	Gilbert Hill, Andheri	4.28	North West
9	Juhu Chowpatty Beach	4.16	West
10	Versova Beach	6.22	North West

Sr.No.	Tourist Place	Approx. Distance	Approx. Direction
11	Band Stand, Bandra	6.40	South West
12	Bandra Waroli Sea Link Bridge	7.86	South West
13	Chota Kashmir Boat Club, Aarey Colony	7.80	North
14	Film City, Goregaon	8.14	North
15	Mahalaxmi Mandir, Mahalaxmi	8.33	South West
16	Shree Sidhhivinayak Ganpati Mandir, Prabhadevi	8.92	South West
17	Iskcon Temple, Juhu	4.78	North West
18	Mount Mary Church, Bandra	6.52	South West
19	St. Michael's Church, Mahim	5.86	South West

CHAPTER 4. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.1 INTRODUCTION

This chapter identifies the potential impacts on different environmental components due to the activities during the operation phase of the proposed project. The details of all potential impacts on the environmental components within the study area due to the ongoing project related activities have been presented.

Estimation of impacts is the most important component in the environmental impact assessment studies. Several qualitative and quantitative techniques and methodologies are used to conduct analysis of the impacts likely to arise as a result of the development activities on physical, ecological and socio-economic environments.

An assessment of the impacts is conducted to gauge the sufficiency of the adopted environmental protection measures taken by the project proponent and also to suggest suitable recommendations in order to minimize the adverse impacts and maximize the beneficial impacts on environmental quality due to the ongoing project activities.

4.2 ENVIRONMENTAL IMPACT STATEMENT

The environmental impact statement focuses on five basic environmental components, viz.

- Land Environment
- Air and Noise Environment
- Water Environment
- Biological Environment
- Socio-Economic Environment

4.2.1 LAND ENVIRONMENT

Impacts during Pre-Construction and Construction Phase

Construction Waste

During construction phase waste will be generated from discarded construction material, packaging and debris. Construction waste will consist of empty cement bags, concrete, steel/ other metals, bricks, pallets, packaging/ paper products, broken tiles, furnishings, discarded containers of paints, etc. Of these, discarded paint containers are hazardous waste.

Transportation of Construction materials

Roads leading to the site are means of transport for local traffic. Transportation of raw materials through trucks and workers to site may affect the traffic pattern and cause temporary traffic congestion in the vicinity of the site.

This may also cause localized short-term air pollution near the site during this period.

Mitigation measures during Pre-Construction and Construction Phase Site

Preparation

In dry weather conditions, dust nuisance may be created due to excavation, levelling and transportation activities. To control dust pollution, water sprinkling will be needed at regular intervals and excavated materials will be kept covered at all times.

Top Soil

- Top soil and substratum from excavated areas will be stored separately and reused, as the top cover, for landscaping
- Activities will be carried out during dry season and top soil will be covered with synthetic covers during rains
- Controlled entry and exit of machinery from site
- Excavated material will be used as back fill material as far as possible.

Management of Construction Waste

- Specific areas will be demarcated on the site for storage of topsoil and for temporary collection of construction debris, prior to its disposal.
- Adequate covered facilities such as sheds, will be provided for storing construction wastes.
- Debris generated in the form of sub-stratum removed during excavation for foundations may be used as back filling as far as possible so that its disposal out of the site is minimal.
- The solid waste like packaging of construction material will be sorted and sold for recycling and / or reuse.
- The construction debris will be utilized for internal paving and backfilling and non usable items will be disposed off through authorized vendors.

Roads and Traffic

- The raw materials required for construction will be sourced from the nearest available government approved contractors/suppliers, to prevent glut of traffic.
- Such vehicles shall be parked within site and not on public road leading to the site.
- The transport of materials will be arranged during non-peak hours.

Impacts during Commissioning Phase

Impacts during commissioning phase will be due to:

Use of water: Water requirement during operation phase is estimated as 16,498 cmd. 7,038 cmd will be fresh/ potable and will be sourced from MCGM and the rest (9,460) will be recycled water from STP.

Waste water generation during the operation will result in estimated 9,489 cmd.

Waste generation: About 21.35 MT solid waste will be generated during the operation phase of the project and there is need to store and dispose it safely so as not to cause land pollution.

Similarly, electricity required (120 MVA) will be sourced from TATA Power Co. During the commissioning stage, the water and energy demands will be fluctuating as one by one the equipment are commissioned.

Mitigation Measures during Commissioning Phase

- Proper training to employees in handling of waste effluent, solid waste, hazardous waste and other chemicals by hiring trained personnel well versed in handling chemicals required to operate ETP.
- Personal supervision by staff to ensure that there is no shock load to the STP. Active support from technology supplier and staff to ensure that the plant process is stabilized as soon as possible to ensure that loads to STP remain at the predicted levels.
- Have a designated procedure to ensure waste generated during commissioning is collected separately and sent to authorize waste disposal site.
- Proponent shall take membership of nearby municipal waste disposal facility & identify transporters for safe transport of waste.

Impacts during Operation Phase

Soil erosion

Possibility of soil erosion during operation phase is low as most of the land area will be developed/ paved.

Soil contamination

Contamination of soil by spilled fuel and lubricants from equipment such as DG sets, vehicles as well as due to improper storage and disposal of solid waste may occur during this phase.

Solid Waste Generation and Disposal

Solid waste from the development will consist of plastic, paper/paper products, glass, metal scrap and bio-degradable waste from kitchen and landscape maintenance works. Waste will be segregated scientifically and appropriate disposal techniques will be adopted as given below:

- Recyclable waste will be segregated and sold to scrap dealers
- Composting will be undertaken of bio-degradable waste
- Used cooking oil will need to be safely disposed off

The waste generation as per the already obtained environmental clearance is about 30.18 MT. Thus, there is a reduction of about 29.25% in the overall waste generation with the current proposal.

Impact on land due to solid waste generation in operation phase is seen to be negligible in view of the measures taken for its disposal. If not managed properly, waste will affect the health of residents, visitors, staff and employees of the proposed developments as well as population in the surrounding area and will also be aesthetically unpleasant.

Hazardous Waste Generation and Disposal

Disposal of hazardous waste as provided by the MPCB through authorized recyclers. There will be separate storage area for these type of wastes, which will be adequately covered and provided with impervious lining.

Similarly used oil/ waste oil generated from the maintenance of DG Sets will need to be disposed off through MPCB authorized recyclers.

Mitigation measures during Operation Phase

Measures for soil protection and pollution due to surface runoff

Erosion protection measures to prevent soil erosion will be adopted. Soil contamination through fuel/ lubricant will be prevented by avoiding runoff from affected areas into natural drains. Use of natural fertilizers and pesticides/ weedicides for gardening will be encouraged.

Solid Waste management and disposal

Management of solid waste generated during the operation phase comprises its collection, segregation, treatment and safe disposal so as to cause minimal impact on the environment. This involves mandatory manual segregation of the waste at the source, into biodegradable (wet) and non-biodegradable (dry) components. The latter will further be separated in to recyclable and inert waste. (Please refer to section 2.4.10).

Measures for storage and disposal of solid waste shall be as per studies previously conducted EIA study.

All components will be stored separately in labelled bins and designated covered sheds. Wet waste will be stored in refrigerated condition. Recyclable material will be sold to recognized recyclers and inert waste will be disposed off at MCGM designated landfill sites. The biodegradable waste and garden waste will be composted in mechanical composting unit of MIAL.

Other measures suggested:

- Dry STP sludge will be used as manure for gardening to the extent possible. The remaining will be mixed with wet waste and composted.
- Used/ waste oil generated during the maintenance of vehicles (separated at the oil separator) and from “DG sets/other machinery” will be disposed off through used oil recyclers recognized by the MPCB. Such waste needs to be stored in closed containers under covered roof and provided with impervious flooring.

- Used lead-acid batteries are classified as hazardous waste and should be stored in covered roof and impervious concrete flooring and disposed off through buy back arrangement with suppliers.
- The proposed OWC area will have adequate space for storage and segregation of various types of waste.
- Used cooking oil after certain cycles of frying as well as condensed oil from the kitchen exhaust will be stored and given away to animal feed manufacturers or oil cake/ soap manufacturers.

4.2.2 AIR AND NOISE ENVIRONMENT

Impacts during Pre-Construction Phase

Dust generation

Ambient air quality will be affected due to fugitive dust generation during excavation, construction of roads and laying of other essential infrastructure. This will be a major impact and proper precautionary and mitigative measures will need to be adopted till the road surfaces have been paved. There will be localized and temporary rise in air and noise pollution due to operation of heavy machinery such as excavators, bull dozers, tipper trucks etc.

Impacts during Construction Phase

Impacts due to Traffic

Increased traffic and transport to the site for bringing construction raw materials will lead to temporary rise in ambient air pollution levels in the vicinity (increase in levels of NO_x, PM₁₀, dust hazards). There will also be disruption of traffic on roads leading to the site due to the vehicles carrying raw material to the site.

Impacts due to Construction Activity

Construction activity will result in marginal and temporary impact in the neighbourhood areas as a result of the increased dust emissions. Activities such as road construction, raw material transportation to site, excavation for foundation and levelling etc. will be responsible for such impacts.

High noise levels are expected to be generated in the construction phase. Noise mainly will result from the work of heavy machinery such as excavators, bull dozers, dumpers etc, construction equipment like compressors, compactors, concrete plant, cranes etc. as well as heavy vehicles transporting construction materials to the site and transport vehicles.

Mitigation measures during Pre-Construction and Construction Phase

During the execution of earth works, mobile water spraying tankers should be made operational in strategic locations to mitigate the dust pollution caused by earth moving equipment.

To control dust pollution, measures given in the amendment dtd 25th Jan., 2018 in the EP Rules (1985), "Mandatory Implementation of Dust Mitigation Measures for Construction and Demolition Activities for projects requiring Environmental Clearance" to be scrupulously followed. Following is a summary of the same:

- Environmental Management Plan inclusive of dust mitigation measures to be approved before start of any work
- Roads leading to or at construction sites must be paved and blacktopped (i.e. metallic roads).
- No excavation of soil shall be carried out without adequate dust mitigation measures in place.
- No loose soil or sand or Construction & Demolition Waste or any other construction material that causes dust shall be left uncovered.
- Water sprinkling system shall be put in place.
- Dust mitigation measures shall be displayed prominently at the construction site for easy public viewing.
- Construction material and waste should be stored only within earmarked area and road side storage of construction material and waste shall be prohibited.
- No uncovered vehicles carrying construction material and waste shall be permitted.

Other measures depending on the type of source are as follows:

Emissions from mobile sources

- Idling of raw material delivery trucks or vehicles carrying other equipment will not be permitted, when not in active use.
- Dust covers will be provided on trucks used for transportation of materials prone to fugitive dust emissions.
- Cleaning of vehicles will be carried out periodically to reduce dust and vapour emissions.

Emissions from stationary sources

- Most of the machinery related to construction will be located close to construction area for ease of handling.
- Machinery such as mixers will be screened with sheets of suitable material to reduce the spread of suspended particulate matter and to reduce noise.
- All stationary construction equipment will be located as far away as possible from existing residential pockets.
- Areas of activities such as excavation/ grading and routes of delivery vehicles across patches of exposed earth will be frequently water sprinkled to prevent dust pollution till the road surfaces are asphalted.
- Appropriate containment arrangements around bulk storage tanks and material stores will be made to prevent spillages entering watercourses.
- Equipment/ machines and vehicles will always be kept in good state of repair to minimize emissions.

For mitigation of Noise and vibration impacts

- Construction related contracts will make it obligatory to ensure that the noise levels during the operation of construction machinery will be maintained below the limits prescribed under the EP Act noise standards.
- Noise generating sources will be regularly oiled/ greased and their support platforms maintained properly so as to prevent vibratory noises.
- Workers working near high noise machinery will be provided with earmuffs/ ear plugs.
- Workers to be provided with necessary safety equipment and protection measures
- 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 heavy machinery with ear muffs/ ear plugs

Impacts during Operation Phase

Traffic and Transportation

Impact on road traffic during operation phase will be due to the movement of vehicles of users/residents and visitors.

Exhaust from kitchen and other Utilities

During operation phase, exhaust from kitchens and DG set (emergency power back up arrangement) will be the only potential sources of air/ noise pollution. DG sets provided will meet latest norms as per EP Act and have silencers and enclosures so that the noise does not affect residents, guests and villagers as well as avifauna of the region. Kitchen exhausts will have activated carbon filters to reduce odour.

Mitigation measures during Operation Phase

Traffic and Transportation

A well-designed traffic management plan will be adopted to regulate vehicular traffic. Provision of adequate parking areas will be provided. "Entrance/ exit" to the site will be maintained so as to facilitate smooth traffic flow.

Pollution from Exhausts

- All hotel kitchens will be provided with proper ventilation and exhaust vents with grease and activated carbon traps to reduce odours.
- DG sets will conform to the norms specified by the Central Pollution Control Board under the Environment Protection Act and suitable acoustical enclosures will be provided. The project proponent will provide adequate preventive maintenance to ensure low emissions during operation of DG sets.

4.2.3 WATER ENVIRONMENT

Impacts during Pre-Construction and Construction Phase

During construction activity, pollution from construction run-off will affect surface water. There will be increase in turbidity and suspended solids due to soil erosion. Blocking of natural drains and existing nallahs due to deposition of construction materials is a likely impact. This problem will be more aggravated during the monsoon season.

Soil compaction caused by site development and the expanse of impervious surfaces, such as roads and parking lots, produce storm water runoff containing sediment and other contaminants (eg. nutrients, vehicle fluid leaks, and mechanical equipment waste).

Increased storm water runoff can overload pipes and sewers and spoil the water quality in the surrounding environment.

Impacts due to Construction Activity

During construction activity, waste pieces from construction run-off is likely blocking of storm water drains, nallas etc. due to deposition of construction materials is a likely impact unless regular cleaning of drains is carried out.

Mitigation measures during Pre-Construction and Construction

Phase Prevention of construction runoff

- Construction work to be carried out before monsoons
- Construction materials to be stored in enclosures
- Cleaning of drains on regular basis to avoid blockage
- Provision of storm water drains with silt traps
- No accumulation of stagnant water on site

Wastewater management

- Labour working on the site will be provided with adequate sanitation facilities like safe drinking water, toilets etc. Temporary arrangement of drinking water will be made for workers.
- Sanitation provisions such as washrooms, toilets, dustbins for waste and other packing material brought by workers will be made available during the period and capacity will be adequate for the workers.
- Construction area will be isolated and care will be taken to divert the run-off to storm water drainage, so as to prevent pollution. Also, subsurface work will be carried out only during non-monsoon period.
- A storm water management plan having limited impervious layer, will be implemented to promote infiltration.
- Precaution will be taken to ascertain that no waste materials such as cement, paint and solid material like iron rods and any other material are dumped into storm water system. No accumulation of stagnant water will be allowed within the construction area.

- Blocking of natural drains due to deposition of construction materials is a likely impact unless regular cleaning of drains is carried out. Regular maintenance of storm water drains
- Effective soil erosion measures

Impacts during Operation Phase

Impacts on natural drainage pattern and ground water

Increase in paved surfaces will reduce percolation of rain water into ground and increase surface runoff.

Impacts on water resources

During operation phase, water will be sourced from MCGM for domestic purpose. Since treated waste water will be reused for flushing, HVAC and green belt management, this will reduce the load on existing sources of water supply.

In the amendment proposal, the total Built-up area of Non-operational area has decreased due to the change in the development mix. There is an overall decrease of 19.09% in water demand. Thus there is no additional impact on the existing water resources.

Impacts due to wastewater generation

Wastewater generation is estimated from the proposed activity. In the amendment proposal, due to reduction in water demand, there is an overall decrease of 2.77% of wastewater generation for overall development.

This sewage if not managed may cause unhealthy conditions and may pollute surface and ground water within the area. Disposal of excess treated wastewater into existing municipal sewer lines must be carried out with due permissions from the authority.

Mitigation measures during Operation Phase

- Provision of storm water drains with erosion protection measures. Regular maintenance of the storm water drains.
- A rainwater harvesting system should be put in place as an integral part of the project work. This will also include the establishment of permeable pavements and other mechanisms to enhance the water infiltration capacity of the builtup land surface.
- Ground surface runoff should be collected into chambers covered with cast iron or RFP gratings. All the chambers will be networked and will drain into main header. The harvested "roof top/terrace" water (collected in underground storage tanks of 60.65 cum capacity) may also be partly used for gardening.
- Footpaths should be with perforated garden pavers at adequate intervals to assist rainwater seepage.
- Dual system of water supply for fresh and recycled water to be used for domestic purpose and to be reused for flushing respectively. Proper O&M of proposed STP to recycle domestic sewage to be reused for gardening, HVAC and flushing.

- Use of sanitary fixtures consuming low water, such as sensor operated taps and urinals.
- Use of drip-irrigation techniques to reduce water use

4.2.4 BIOLOGICAL ENVIRONMENT

Impacts during Construction Phase

Impacting activities during the construction phase like clearing of herbaceous vegetation, removal of trees if located within footprint of proposed structure (with prior permission from competent authority), transportation of construction material and work force, excavation for foundation, operation of ready mix plant, running of DG sets, fabrication etc. will affect the local biodiversity.

Air pollution due to the dust generated by earthwork leading to its deposition on surrounding plantations.

Project activities in construction phase due to air and noise generation and vibration impacts may cause direct, temporary, adverse impact on birds and other fauna. Illumination as well as the increase in traffic /noise also disturbs the day cycle of animals.

Local avifauna in the study area will get disturbed during construction phase and situation may compel them to leave this place temporarily.

Mitigation measures during Pre-Construction and Construction Phase

Protection of Existing Trees

Existing trees on the periphery shall be protected. Care shall be taken to not cause harm to faunal life present on them; it shall not cause domino effect with surrounding trees living creatures/ structures etc.

Green Belt Development

In order to keep a check on noise levels, particulate matter dispersion and concentration of polluting agents, a green belt shall be proposed as part of the landscaping and it shall be maintained. It shall be developed to provide better screening effect.

If necessary, the land shaping works shall be conducted in phases so that all the work started in October should be positively completed, including planting of a green belt along peripheral contours and saplings elsewhere, just before the onset of rains in June. This will ensure the full establishment of tree saplings by the monsoonal rains aided by occasional mobile tanker based supplemental irrigation.

To ensure maximum survival of trees, plantation will be started after 70% completion of construction just before the onset of monsoons. Well grown trees of 13-15 ft height and 3-4 inch girth will be planted. Dust adsorbing trees will be planted in appropriate green belt to reduce construction dust.

The green belt development should be based on the following principles:

- Green belt shall be composed of native species

- Species shall be suitable for agro-climatic zone and should be selected according to the soil type, climate, rain fall etc.
- Taller plants shall be planted towards outer periphery and shorter plants shall be planted towards inner periphery
- Evergreen species should be selected as far as possible to have least litter fall
- Plant shall be tolerant to air pollution. The green belt shall have indicator species with respect to air pollution
- Species may have quick growing ability

Care should be taken so that there is no disturbance to the micro level biodiversity.

Table 4-1: List of Trees suggested for plantation

S.No.	Tree Species	S.No.	Tree Species
1	Neem (<i>Azadirachta indica</i>)	22	Bael (<i>Aegle marmelos</i>)
2	Rain Tree (<i>Samanea Saman</i>)	23	Silk Cotton Tree (<i>Bombax ceiba</i>)
3	Pink Cassia (<i>Cassia roxburghii</i>)	24	Traveller's Palm (<i>Ravenala madagascariensis</i>)
4	Amaltus (<i>Cassia fistula</i>)	25	Red Champa (<i>Plumeria rubra</i>)
5	Jacaranda (<i>Jacaranda mimosaeifolia</i>)	26	Bullock's Heart (<i>Annona reticulata</i>)
6	Tamarind (<i>Tamarindus indica</i>)	27	Bitter Albizia (<i>Albizzia amara</i>)
7	White Champa (<i>Plumeria alba</i>)		
8	Banyan (<i>Ficus bengalensis</i>)		
9	Peepul (<i>Ficus religiosa</i>)		
10	Cluster Fig (<i>Ficus racemosa</i>)		
11	Mango (<i>Magnifera indica</i>)		
12	Ashoka (<i>Polyanthia longifolia</i>)		
13	Gulmohor (<i>Delonix regia</i>)		
14	Copper Pod (<i>Peltophorum pterocarpum</i>)		
15	Yellow Gulmohor (<i>Spathodia companulata</i>)		
16	Indian Coral (<i>Erythrina indica</i>)		
17	Champak (<i>Michelia champaka</i>)		
18	Bamboo (<i>Bambusa arundinacea</i>)		
19	Kanchan (<i>Bauhhinia purpurea</i>)		
20	Bottle Brush (<i>Callistemon citrinus</i>)		
21	Putranjiva (<i>Putranjiva roxburghii</i>)		

Impacts during Operational Phase

- Activities such as running DG sets during power failure/ emergency, vehicular movement and occasional excess noise generation etc. will be the major impacting activities. These activities will cause disturbance to local fauna.
- Particulate emissions from the traffic during operation phase of the road will have some impact on trees adjoining the road.

Mitigation measures during Operation Phase

- The development aims to preserve the ecology of the site. After completion of the project it will lead to a more organized open space and green cover of native species help conserve ecology and provide new habitat for fauna, there will be an overall long term beneficial impact.
- The site will have green cover as part of the proposed development in the form of garden, lawns, outdoor recreation and other open spaces.
- All open spaces will be covered with lawns, ornamental shrubs and flowering trees to provide good shade and an aesthetically rich as well as cool environment.

4.2.5 SOCIOECONOMIC ENVIRONMENT Impacts

during Pre-Construction and Construction Phase

Increase in population

There will be a minor influx of construction workers in the site who will be staying in temporary facilities during the course of the construction work.

Health of construction workers

Health problems may affect the workers due to continuous usage of construction equipment. The living conditions of workers also need to be hygienic; failing which, the health of people on site as well as in the surrounds will be affected. The construction site may pose unforeseen hazards like accidents to construction workers and local population.

Employment Opportunities

The construction activity will create temporary employment for construction labour for activities such as horticulture/ landscaping/ construction as well as for ancillary trades.

Mitigation measures during Pre-Construction and Construction

Phase Provisions at the construction site for labor

- Provision of potable water supply will be made along with sufficient number of taps.
- Adequate sanitation facility to maintain health and hygiene will be established at the camp by providing toilet blocks connected to existing MCGM sewer lines.
- All necessary precautions to avoid accumulation of water in the open will be taken. This will ensure that no breeding of mosquitoes will take place at the site. However, to control the mosquitoes and other flying insects regular spraying of biodegradable insecticides will be carried to supplement use of conventional ones.

- Other general cleanliness measures such as regular collection of waste and its systematic disposal at frequent intervals will be scrupulously enforced. Regular spraying of biodegradable insecticides and fogging will be carried out to control mosquito menace

Health and Safety

The safety of workers, supervisors and all those who visit or move on the site will be given utmost importance. Accidents affect the progress of work, and finally lead to escalation of costs. To avoid this situation, all safety precautions will be taken. Safety rules for all situations will be drawn and workers will be made to follow them.

Management training will be undertaken to ensure that design details take account of safety concerns. All safety equipment and measures required during construction to avoid accidents shall be followed.

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

- Safety training and weekly tool box meetings will be conducted as required.
- Depending upon the nature of work and expected risks, all necessary safety equipment will always be available. Medical aid in case of unlikely accidents will be made available quickly.
- Provision will be made for a stand by ambulance and paramedic at the site.
- Use of safety equipment like helmets, shoes, goggles, gloves, earmuffs/plugs etc. will be made compulsory. All workers will be provided raincoats during the rainy season.
- Depending upon the expected risks, all necessary safety equipment will always be available.
- Insurance cover & health cards will be provided to the workers.
- Periodic health check-up of labours.

Impacts during Operation Phase

Employment Opportunities

Locals may find employment in the activities associated with the proposed development, leading to improvement in their economic status. Thus, the project will improve the quality of life within the core zone and will have a long-term beneficial impact.

Impacts on Physical Infrastructure

In the amendment proposal, the total parking demand has decreased due to the change in the development mix. There is an overall decrease of 10.62% in parking demand. Thus there is no additional trip generation.

There may be a risk of accidents if traffic is not managed within the site as well as on the access roads. Development of access roads, improvement in connectivity, provision of amenity space and recreation ground will bring in better facilities into the area and an improvement in the standard of living as the residents will have easy access to commercial areas, easy mode of transport etc.

Mitigation measures during Operation Phase

During operation phase, precautions will be taken to ensure the health and safety of the local residents and the new users.

Some of the precautionary measures to be taken during emergencies are:

- Fire fighting system comprising of smoke detectors and well designed hydrants will be provided in each building as per local regulations. Fire water tanks with storage capacity as recommended will be provided. Maintenance and mock trial run of these 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.
- Safe evacuation route will be earmarked for the users and visitors to ensure safe and quick evacuation during emergency.
- Adequate provisions for parking, internal roads, smooth entry and exit of vehicles etc. are the key features of the proposed traffic management plan.

Impacts during Decommissioning Phase

- There will be a marginal and temporary impact on the air quality in the immediate vicinity due to dust emissions and noise generation.
- Decommissioning of the project will create temporary employment opportunities.
- Closure of the infrastructure facilities during commissioning of the project may an adverse impact on the local populace

Mitigation measures during Decommissioning Phase

- Mitigation measure for air and noise pollution as mentioned in section 4.2.2 may be followed.
- Proper procedure for safe decommissioning shall be established as part of project development with training to employees
- Wastes generated will have to be identified and disposed of safely
- Have a designated procedure to ensure that workers do not suffer in this eventuality.

4.3 ISSUES OF CONCERN

In order to prepare an Environment Impact Statement, environmental concerns and issues relevant to the operation phase has been identified on a broad level. The details of activities are presented in the following table.

Table 4-2: Issues of Concern

Phase	Environmental Concern				
	Land	Air	Water	Biological Environment	Socio Economy

Phase	Environmental Concern				
	Land	Air	Water	Biological Environment	Socio Economy
Pre construction and Construction	<input type="checkbox"/> Dust emissions during site preparation <input type="checkbox"/> Transportation of Construction materials <input type="checkbox"/> Construction waste management	<input type="checkbox"/> Fugitive dust generation and noise during site preparation <input type="checkbox"/> noise pollution from noise generating machinery/equipment <input type="checkbox"/> air emissions from DG sets <input type="checkbox"/> vehicles carrying raw material	<input type="checkbox"/> Pollution from construction run-off <input type="checkbox"/> Blocking of natural drainage by construction material	<input type="checkbox"/> Protection of the flora on site <input type="checkbox"/> Impact on local biodiversity	<input type="checkbox"/> Health and Safety of construction workers
Commissioning	<input type="checkbox"/> Use of water for construction labourers, power for construction, waste water generation <input type="checkbox"/> Soil contamination from use of DG sets	<input type="checkbox"/> dust generation due to construction works <input type="checkbox"/> dust generation due to movement of vehicles carrying raw material	<input type="checkbox"/> Contamination of surface water from wastewater from construction runoff		<input type="checkbox"/> Health and Safety of construction workers
Operation	<input type="checkbox"/> Soil erosion <input type="checkbox"/> Pollution due to surface runoff	<input type="checkbox"/> NOx & CO pollutants from vehicles plying on the road	<input type="checkbox"/> Disposal of excess treated water	<input type="checkbox"/> Maintenance of proposed landscaped areas	<input type="checkbox"/> Safety of habitable areas, pedestrians
Decommissioning	<input type="checkbox"/> Construction waste, debris generation	<input type="checkbox"/> Emissions & noise generation	--	--	<input type="checkbox"/> Closure of allied services

4.4 ENVIRONMENTAL IMPACT ASSESSMENT

The assessment of the impacts identified has been carried out in this section. The significance of environmental impacts has been evaluated in terms of:

- the spatial extent (geographic distribution),
- duration (short vs. long – term),
- magnitude (measured level of change in a parameter & whether thresholds are being exceeded),
- reversibility (reversible vs. irrevocable), and

- Special sensitivity (whether an impact affects a sensitive area e.g.: a nature reserve, within the impact zone).

The following matrix assesses the impacts based on these factors for identification of the most severe impact.

4.4.1 Environmental Impact Matrix

Table below presents the Impact Matrix for identified environmental parameters. The following rating scale has been devised to assess the severity of impacts:

- A- High Beneficial (positive) Impact
- B- Low Beneficial Impact
- C- Low Adverse Impact (localized nature)
- D- High Adverse (negative) Impact

(N): Indicates no conceivable (neutral) impact on the environment.

Table 4-3: Environmental Impact Matrix

Sr. No.	Environmental Parameter	Pre- Construction Phase	Construction Phase	Operation Phase
1.	Land Environment			
	Top soil loss	-	C	-
	Disposal of debris	C	C	-
	Landform	C	-	-
	Erosion	-	C	C
	Diposition	-	-	C
	Solid waste management	-	-	C
	Landuse	-	-	A
	Land value	-	-	A
2.	Air and Noise Environment			
	Suspended Particulates	C	C	C
	Sulfur Dioxide	-	-	-
	Nitrogen Dioxide	-	-	-
	Carbon Monoxide	-	-	-
	Ambient Noise Levels	-	C	-
3.	Water Environment			
	Receiving water body	-	-	-
	Drainage system	C	C	-
	Water availability	-	-	C
	Ground water availability	-	-	-
	Ground water quality	-	-	-
4.	Biological Environment			
	Trees	-	C	A
	Shrubs	C	-	A
	Grass	C	-	A
	Micro flora	C	-	B
	Wild Species/ Fauna	-	-	-

Sr. No.	Environmental Parameter	Pre- Construction Phase	Construction Phase	Operation Phase
5.	Socio Economy			
	Economic Output	A	-	A
	Employment Opportunity	A	A	A
	Occupational Health	C	C	-
	Population	-	C	B
	Infrastructure/ Utilities	C	C	A
	Scenic Views	-	-	-
	Aesthetics/ Skyline	-	C	A

4.4.2 Conclusions

Above table shows that no significant harmful impacts, on the surrounding environment, are anticipated due to the proposed project.

During pre-construction and construction phase, there are a few parameters that need to be considered for mitigation of adverse impacts (such as air pollution/ noise levels, health hazards for labour, ground water depletion and overloading of existing local infrastructure such as roads, water supply, etc. However, the impacts of this nature will be controllable and of a short duration, if proper mitigation measures are taken as recommended. The parameters which could be adversely affected during the operation phase are noise levels, ground water table and solid waste disposal.

It can also be observed from the above table, that there will be a positive long term impact on the socio-economic status of the area due to the proposed project. This will be in terms of direct employment generation for the local population, spin-off benefit of indirect entrepreneurship opportunities (shops selling local goods/ artefacts, plant nurseries, tour/ travel support, taxies etc.), improved infrastructure etc. Also, since the project will make use of locally available building materials, contemporary architectural design, etc., which will lead to an improved aesthetic ambience.

CHAPTER 5. ANALYSIS OF ALTERNATIVES

5 INTRODUCTION

Alternatives for mitigating the potentially negative project components which may have adverse impacts on the environmental conditions have been suggested here. A few activities having a negative impact are not avoidable and mitigative measures for such activities need to be adopted. Those activities which can be modified to reduce the impact will be considered.

The following three scenarios have been studied and the impacts under each have been assessed.

5.1 NO PROJECT SCENARIO

Without the development as proposed, the existing conditions of landuse, utilities, traffic and transport etc. would only deteriorate over time. Increase in traffic related noise and air pollution, mismanagement of land, under-developed utilities and infrastructure with continuous increase in users would all have a negative impact on the environment. The current state of the cityside facilities indicates urgent need to have appropriate roads and utility network, adequate built area for effective functioning, with contemporary planning & design, and optimization in plot area. Constraints of available land for development requires efficient planning for these facilities in the modern context.

From a socio-economic perspective, the “no action” alternative may not be the best alternative as the numerous benefits to be gained from the development both locally and nationally would not be realized and the resources in the area would continue to be under-utilized.

Most of the existing facilities and uses in Non-operational area of CSMIA were planned & developed in early stages of airport development in 1960's/ 70's, and are therefore in need for transformation and upgradation, also relocation is required in some cases due to incompatibility of their current locations. In view of severe scarcity of land for airport expansion along with urgent need to include contemporary airport uses, integration of scattered land parcels into a holistic contiguous integrated landuse plan has been proposed.

Restructuring of the Non-operational (cityside) land is important to guide the lateral development by defining the future development and land use patterns, areas of open spaces & social facilities, the layout and nature of infrastructure (including transportation links), and other key features.

5.1.1 Project Elements without Change

The project will accommodate contemporary Non-operational uses related to airport needs, make efficient use of land and integrate lateral development by way of comprehensive master planning of the Non-operational area.

The activities during the pre-construction, construction and operation stage which are likely to affect the environment have already been identified (ref table 4.5) and it can be seen that a few of these activities are likely to cause an impact on the environment unless they are modified or suitable mitigation measures are adopted.

5.1.2 Project Elements using Alternative Options

It is suggested to improvise on the impacts due to the proposed project by considering the latest available norms and standards and engineering technologies for conservation of natural resources, energy conservation, efficient use of materials etc. and overall reduced ecological footprint.

Following are some of the suggested measures for improving the impacts due to activities of the proposed project:

Labour Camp

Laborers to be housed within the premises of the area to be developed and facilities made available to them such that they do not obstruct the existing activities in the vicinity. It is suggested that the proposed labour camp be provided with adequate facilities for waste water and solid waste management.

Construction material

Materials used for construction may be those with minimum embodied energy, recycled or reusable. Efforts should be made to procure energy efficient materials for construction. Measures for conservation of energy through use of energy efficient materials as specified by ECBC norms may be adopted.

Conservation of top soil

Top soil removed from the site during site clearance/ excavation etc. should be stored so that it can be reused in areas where landscaping is proposed.

Construction Activity

Proposed project will generate job potential of both skilled and unskilled nature. Local labour may be employed for these jobs as far as possible.

Safety and health aspects of workers need to be addressed during construction and provision of hygienic conditions for labourers working on site need to be looked into. Waste management system for proposed labour camp needs to be provided.

The area to be developed should be properly enclosed with barriers in order to minimize the noise pollution effects on the surrounding vicinity. Raw materials should be procured from nearest available government contractor in order to reduce the distance traveled and minimum disturbance to ongoing road traffic. Construction work should be carried out during day time to reduce disturbance to activities in surrounding.

Green Belt/ Landscape Development

Green belt/ landscape development to attenuate air quality and noise impacts should be designed. Pollution absorbing species with specific reference to high traffic area in close proximity of site need to be made.

Proposal for landscape management may incorporate a plan for tree plantation of local species. Plantation of trees as per the prevailing norms for RG area development in reserved green areas may be adopted for sufficient green cover and to minimize heat island effect. It is also suggested to plant local species of trees having large canopy size as far as possible.

Management of Solid Waste

Effective measures for management of wastes generated during construction may be adopted. Waste can be segregated and reuse- recycling techniques adopted to minimize waste going out from the site to disposal sites.

Management of domestic waste generated during operation phase also needs to be looked into. Waste segregation at source, door to door collection and other techniques may be adopted to manage waste on site and reduce the quantum of waste to be transferred and disposed into designated site. Recyclable waste can be sold to recycling waste dealers.

Augmentation of Water Requirement

Design of a well engineered rain water harvesting systems needs to be adopted in order to collect and store maximum water on site. Water may be stored in RCC storage tanks or in retention ponds which can form part of the landscape features.

Rain water from roof tops may be harvested from constructed areas within the developable area. Storm water runoff from roads, paved areas and green areas may also be harvested. Excess storm water may be conveyed through well designed storm water drains into existing municipal drains in order to avoid flooding. Design of storm water to accommodate surplus water needs to be made. Rain water may also be harvested to recharge the ground water aquifer.

5.1.3 Analysis of Alternatives

The above alternatives for development show the following benefits that can be achieved with the development of the proposed development:

- Improvement in employment opportunity and overall economic condition within the area
- Improvement in overall infrastructure (water supply, sewerage, solid waste management, power etc.)

Benefits due to use of suggested alternatives include:

- Provision of well equipped labour camp considering health and hygiene aspects of the construction workers
- Reduction of construction wastes and probable air and noise pollution during construction phase
- Conservation of resources by incorporating the use of energy efficient materials
- Reduction in waste disposal at designated waste disposal site
- Rain water harvesting to conserve water

The following table gives a comparative analysis of the projects scenarios and the suggested alternatives for reducing negative impacts due to any of the project activities:

Table 5-1: Analysis of Alternatives

Project Elements/ Activities	Without Project	With Project	
		Project Elements without change	Project Elements with Alternative Options
Increase in paved and built up areas	--	Loss of top soil due to increase in paved and built up areas	Conservation of top soil for reuse in landscaped areas
Construction waste generation	--	Debris/ substratum generated if disposed unscientifically, will lead to environmental damage. Runoff from construction water may pollute surface water bodies.	Negative effects will be minimized with proper mitigation methods/ waste management techniques
Domestic solid waste management	--	--	Mechanism for waste disposal to be adopted
Air and noise pollution from construction activity and traffic	--	Air and noise pollution will cause disturbance to surrounding areas	Pollution effects will be reduced with management of traffic and measures to mitigate noise and dust
Water supply	Will remain as existing	Water supply infrastructure shall improve	Use of rain harvested water will reduce water requirement from the existing source
Ground water	--	--	Recharging of ground water will improve depth of ground water aquifer
Sewerage	Sewerage will remain absent	Provision of sewerage line will improve sanitation facilities in this area	--
Green Belt/ Landscape Development	Existing vegetation on proposed site at present	Landscape plan and green belt will improve aesthetics and act as public spaces and area for watershed collection	Sufficient green cover will minimize local heat island effect Pollution absorbing species and those requiring less maintenance and resources Healthy and sustainable green cover can be achieved through use of local species
Better construction material	--	--	Energy efficient materials suggested to reduce local heat island effect

From the above analysis, it can be seen that by modifying some of the project elements and by adopting suitable mitigation measures, majority of the negative impacts to environment can be reduced.

CHAPTER 6. ENVIRONMENTAL MONITORING PROGRAM

6.1 INTRODUCTION

This chapter provides the details of the monitoring program including organizational planning and post project monitoring schedule.

The monitoring plan enables evaluation of the success or failure of environmental management measures, and to carry out reorientation of the plan if found necessary.

6.1.1 Objectives of Environmental Monitoring Program

For tracking of the effectiveness of mitigation measures & EMP at specific interval, regular monitoring of the necessary environmental parameters is required. With this vision, an environment monitoring program is prepared with due consideration of the baseline status of the expansion project area, various components of the project and environmental attributes likely to be affected.

Major objectives of the Environmental Monitoring Program are as under:

- To comply with the statutory requirements of monitoring for compliance with conditions of EC (if applicable).
- Assessment of the changes in environmental conditions, if any, during the project operation/activities.
- Monitoring & tracking the effectiveness of Environment Management Plan and implementation of the mitigation measures planned.
- Identification of any significant adverse transformation in environmental condition to plan additional mitigation measures; if and as required.

The proponent will implement the environment monitoring programs in line with the planned schedule. They will ensure that the necessary requisite facilities are made available and budgetary provision is made as and when required to ensure regular and efficient environmental monitoring activities.

6.2 ENVIRONMENTAL MONITORING PROGRAM

Monitoring of environmental parameters like ambient air, noise, water (surface and ground), soil etc. is essential in the identification of areas in need of restoration and also the nature and magnitude of pollution control required. Monitoring also helps in prioritization of pollution control efforts and evaluating trends and effectiveness of such efforts.

Environmental monitoring parameters and frequencies of monitoring are given below in Table 6.1.

Table 6-1: Environmental Monitoring Plan during Construction Phase

Sr. No	Parameters	Monitoring		Standards
		Locations	Frequency	
1.	Ambient Air Quality			
	PM ₁₀ , PM _{2.5} , SO ₂ , NO _x , and CO	Monitoring stations are to be located based on dominating wind direction, habitations and terrain features in the study area. In nearby localities near to construction sites	On site and surrounding vicinity. 24 hourly continuous, once a month or as per MPCB directives	National Ambient Air Quality Standards, CPCB
3.	Source Noise Level (DG sets)			
	SO ₂ , NO ₂ , PM	DG set stack during construction work	Once a month or as per directives by MPCB	EP Act norms
4.	Ambient Noise Monitoring			
	Hourly equivalent noise levels	Locations of monitoring stations in the project area and surroundings considering any sensitive locations such as residential, hospitals, schools etc. Near closest settlement area and near DG set (1.5 metre from machinery)	24 hourly, once a month or as per directives by MPCB	IS:4954-1968 as adopted by CPCB
5.	Surface Water			
	Physico- chemical analysis, Bacteriological count	Grab samples during pre and post-monsoon for treated water / drinking water	Season wise or as per directives by MPCB	IS: 10500 Drinking Water Standards
6.	Ground Water			
	Physico- chemical analysis, heavy metal, Bacteriological count	Grab samples during pre and post-monsoon for ground water (existing well: open/ bore) to be taken within 2 km study area around site	Season wise or as per directives by MPCB	IS: 10500 Drinking Water Standards
7.	Soil			
	Soil Texture, Conductivity, pH, Oil and Grease, CaCO ₃ , Ca, Mg, Fe, SO ₄ , PO ₄ , TOC, Moisture, TKN	(soil samples to be collected as per BIS specifications) To be taken from area where there is topsoil, where top soil is to be removed and reused, existing agriculture fields (if any)	Season wise or as per directives by MPCB	Collected and analysed as per soil analysis reference book, M.I. Jackson and soil analysis

Sr. No	Parameters	Monitoring		Standards
		Locations	Frequency	
				reference book by C.A. Blacks

Table 6-2: Environmental Monitoring Plan during Operation Phase

Sr. No	Parameters	Monitoring		Standards
		Locations	Frequency	
1.	Ambient Air Quality			
	PM ₁₀ , PM _{2.5} , SO ₂ , NO _x , and CO	Monitoring stations are to be located based on dominating wind direction, habitations and terrain features in the study area.	On Site, 24 hourly continuous, once a month or as per MPCB directives	National Ambient Air Quality Standards, CPCB
2.	Source Noise Level (DG sets)			
	SO ₂ , NO ₂ , PM	DG set / boiler stack	Once in 6 months or as per directives by MPCB	EP Act norms
3.	Ambient Noise Monitoring			
	Hourly equivalent noise levels	Locations of monitoring stations on project site covering sensitive locations such as entry exit points, residential pockets etc.	24 hourly, once a month or as per directives by MPCB	IS:4954-1968 as adopted by CPCB
4.	Surface Water			
	Physico- chemical analysis, Bacteriological count	Samples on surface water bodies in surrounding to check soil erosion/ runoff from site during pre and post-monsoon to be taken within 2 km study area. Treated sewage quality at STP inlet and outlet. Water bodies in landscaped areas.	Season wise or as per directives by MPCB	IS: 10500 Drinking Water Standards
5.	Ground Water			
	Physico- chemical analysis, heavy metal, Bacteriological count	Grab samples during pre and post-monsoon for ground water (existing well: open/ bore) to be taken within 2 km study area where leachate/ contamination is predicted.	Season wise or as per directives by MPCB	IS: 10500 Drinking Water Standards

Sr. No	Parameters	Monitoring		Standards
		Locations	Frequency	
6.	Soil			
	Soil Texture, Conductivity, pH, Oil and Grease, CaCO ₃ , Ca, Mg, Fe, SO ₄ , PO ₄ , TOC, Moisture, TKN	(Soil samples to be collected as per BIS specifications) To be taken from area where soil contamination from DG set oil seepage etc is likely. And from landscaped areas to check fertility.	Season wise or as per directives by MPCB	Collected and analysed as per soil analysis reference book, M.I. Jackson and soil analysis reference book by C.A. Blacks

CHAPTER 7. ADDITIONAL STUDIES

7.1 DISASTER MANAGEMENT PLAN

Please refer **Annexure VIII** for detailed Disaster Management Plan. Following is a summary of the same.

Preliminary Hazard Analysis (PHA)

A preliminary hazard analysis has been carried out to identify major hazards associated with the functioning of the proposed project.

7.1.1 Vulnerability Analysis and Risk Assessment

The Vulnerability Analysis and Risk Assessment for the project is given in the following table:

Table 7-1: Vulnerability Analysis and Risk Assessment

Hazard Component	Potential Risk	Vulnerability/ Probability
D.G. Sets	Mechanical hazards and fire hazards in: Lube oil system Cable galleries Short circuits	Low: The DG sets are used only in case of power failures, which are rare. The lubrication oil and diesel are stored in small quantities.
Power Transformers	Fire and explosion	Low: Transformers are always kept in the open, with proper fencing, and isolated from buildings.
Electrical Control room	Fire in cable galleries and switches. Static electricity due to improper earthing and bonding. Fire, in earthing and bonding may result in Power failure.	Medium: The risk may arise from low quality of insulation material bad maintenance or alterations by untrained manpower. It may also arise from voltage fluctuations.
LPG Cylinders storage	Fire and explosion due to leakage	Low: Probability of cylinder related fire and explosion is low.
Natural Disasters	Earthquake and cyclones may damage the electrical system, lifts, and water/sewerage lines. It may also damage the external envelop of structures.	Low: Mumbai falls in Seismic Zone III which is one of the least vulnerable zones and does not have history of severe earthquakes. However, it lies on the West coast of India which is less prone to severe atmospheric changes resulting in cyclones, hurricanes, storms etc.
Topography and Drainage	Flooding/ Water logging may curtail access to daily needs and transports facilities.	Low: The risk may arise only in the rare event of choking of natural and manmade storm water drainage system coupled with high tide and storm surge.
Terrorist attack,	Forced acquisition of	Medium: The project is could be a high priority

Hazard Component	Potential Risk	Vulnerability/ Probability
blasts etc.	building and hostage situation may result from terrorist attacks.	target. The location is in a prime urban setting and in close proximity to the international airport.
Mob attack	Agitated mob attack will result in life and property damage.	Medium: The area is residential/ commercial and there may be instances when such disturbance is likely.
Biological Disaster	Disease outbreak, Epidemics causing deaths.	Medium: Mumbai is well connected by all means of transportation to the entire country and the outside, so the risk of biological disaster is considerable. However the State has well equipped machinery to deal with such occurrences and thus the overall risk is medium.
Others	Power failure, Water shortage, traffic congestion, communication failure, etc.	Low: Since it is the industrial capital of the country, such types of risks are rarely prevalent in Mumbai where the project is proposed. But response is very quick and services are immediate, no problems of difficult nature are likely. Power failure will not affect the project seriously as stand by DG sets are provided for all essential services. With water recycling, rain harvesting and sufficient storage capacity the project will have sufficient buffer for any short term water shortage in MCGM water supply. In case of prolonged problem the project can avail of private water tanker supply.

7.1.2 Precautionary Measures for Different emergency scenarios

Precautionary measures for any disaster are to be taken by all the users/ visitors of the proposed developments. Hence the measures mentioned below are to be meticulously followed by occupants/ users/ employees.

Earthquake

- BIS codes relevant to the project site shall be adopted for building standards
- Heavy items such as pictures and mirrors to be hanged away from beds, settees, and other sitting places.
- Overhead light and fixtures to be braced securely.
- Heavy/ large objects to be stored on lower shelves. All breakable items such as bottled foods, “glasses/ china ware”, etc. shall be stored in lower level closed cabinets with latches.
- Repair defective electrical wiring and leaky gas connections. These are potential fire hazards.
- Water heaters, LPG cylinders, etc., to be secured by strapping these to wall studs and bolting to the floor.

- Weed killers, pesticides, and flammable products will be stored securely in closed cabinets with latches, in bottom shelves.
- Safe places to be identified, indoors and outdoors, for safe occupation of the occupiers during tremors. Numbers (of doctors, hospitals, police, etc) to be displayed on each floor of individual buildings also, in other service areas. Emergency “telephone/cell”

Floods

- Sewerage and storm water systems to be checked at regular intervals for their proper functioning.

Cyclones

- Periodical checking of all buildings for structural faults, to secure loose tiles, and to carry out timely repairs, will be resorted to.
- Periodical removal of dead wood or dying trees close to the villas to be undertaken.
- Hurricane lanterns filled with kerosene, battery operated torches and enough dry cells will always be made available during emergencies.

Tsunamis

- An earthquake that lasts 20 seconds or longer in a coastal area, may cause tsunamis.
- When the shaking of the earth stops, people will be moved quickly to higher ground away from the coast. A tsunami may be coming within minutes.

Terror attack/ bomb blast

- The entry and exit points will be manned for 24 hours with specially trained security staff fully equipped with latest security gadgets including closed circuit electronic surveillance cameras/CCTVs monitoring all sensitive areas within the building complex. A log book will be maintained to record the identities of all “vehicles/residents/guests/visitors” entering and leaving the individual building premises.
- All “persons/vehicles” entering the premises will be fully checked for explosives and weapons.

Biological Disaster

Most of the precautions to prevent a biological disaster come under the domain of government authorities. However, at personal level, hygienic practices and proper sanitation are essential criteria to be followed to prevent the spread of both, induced or natural infections. The management will periodically be in touch with government health authorities to prevent any such eventuality.

Other Disasters

Other disasters are rare and have not occurred in the region or their occurrence can easily be mitigated with routine precautions. However, the following precautions will be taken:

- Sufficient water will be stored, in excess of actual requirement, as a buffer stock to tackle the eventuality of temporary water supply shortage.

- Multiple communication channels will be maintained to tide over the situation of failure of telephone link “and/or” malfunction of main server.
- “Alternate/renewable” energy sources will be used to illuminate garden, lobbies and corridors to supplement conventional power, as also to serve as emergency power source during unexpected electricity supply failures. Such alternate power sources shall include solar power.

7.1.3 Disaster Preparedness Onsite

The plan will include installation of alarms and other security related communication gadgets. Individual building security management will prepare a Disaster Management Plan and will constitute a dedicated Disaster Management Committee/ Team to implement the same when required.

Fire Alarms/Other Measures

Fire and smoke alarms will be installed in all covered places such as rooms, lobbies, banquet halls, kitchens, offices, etc. The functioning of these fire alarms will be checked every week by the security staff.

- To meet the requirements, the following measures will be taken:
- Access roads will be paved suitably to bear the load of fire engines.
- Electrical meter room will be sealed with non-combustible materials.
- The lighting in all fire escape routes will be based on independent circuits backed by DG sets.
- Underground and overhead water storage tanks having appropriate capacity will be provided for fire fighting.
- Automatic water sprinklers will be installed in all internal covered spaces.
- Fire Hydrants, Fire Hoses and Fire Extinguishers will be installed throughout the buildings as mandated by the Fire Department.
- Portable fire extinguishers of dry chemical powder will be provided in the electric meter rooms.

Emergency Response in the Event of Disaster

In case of emergency due to any type of disaster a quick and immediate response is essential. This response depends on the actions taken by individuals to avoid or mitigate the adverse effects of a disaster and to undertake search and rescue operations. Following are the actions which will be taken in various emergent situations.

Action in the event of Fire

Extinguishing fires: A small fire at the point of leakage will be extinguished by enveloping it with a water spray or a suitable smothering agent such as CO₂ or DCP (Dry Chemical Power).

Fire fighting personnel working close to un-ignited vapour clouds or close to fire, will be protected continuously by water sprays.

Response Sequence during Event of Fire

Any person noticing the fire will attempt to isolate and extinguish the fire with readily available equipment and inform or arrange to inform the Security Head in-charge regarding the:

- Location of fire
- Type of material burning
- Extent of fire
- Caller's name and phone number

Security Personnel will:

- Sound the siren as per the Siren Code.
- Will cordon off the area and call the local Fire Fighting Department.
- Will direct all occupiers/ guests to evacuate and assemble in designated fire shelter spaces

Actions in case of Flood/ Tsunami

As stated earlier, such eventualities are not expected, considering the past weather records. However, the management shall take all necessary precautions in consultation with the State weather and disaster management authorities.

Biological attacks

The individual building security management will take all necessary precautions as suggested by the state health and intelligence agencies, in the event of any such eventuality that comes to their notice.

7.1.4 Relief and Rehabilitation

Relief authorities at the site will:

- Encourage self-help in every activity of their day-to-day living.
- Provide assistance for identification/assessment of human and material loss.
- Provide assistance in maintenance of law and order.
- Provide assistance in maintaining sanitation standards and in disposal of waste.
- Promote cultural and recreational activities for mental health.

Measures during Earthquake

Relief authorities will:

- Conduct a week-long survey to locate quake related hazards/damages in the individual building premises.
- Work with local emergency services and officials to help affected people and those likely to be affected.
- Provide tips for conducting earthquake drills.

Actions to be taken to prevent impact of Cyclone

- Residents/visitors will be advised to stay tuned to weather advisories broadcast on radio or TV. Radios and TVs in building lobbies/restaurants etc. will also be activated for the benefit of employees/guests.
- All windows and external doors of the buildings will be shut and appropriately secured to withstand high wind speeds.
- Extra food, which can be eaten without cooking, and surplus drinking water will be stocked for the benefit of residents/guests to tide over long power failures and damage to F&B infrastructure.
- Hurricane lanterns, torches and other emergency lights will be made available.
- All loose and unsecured materials which can fly and cause damage due to strong winds, will be removed to safe locations and/or securely fastened.
- Electrical mains will be switched off except for emergency utilities.
- The management will be continuously in touch with the State Disaster Management Authority and scrupulously follow its instructions with respect to the need for evacuation of the buildings or any other eventuality.

7.1.5 Disaster Prevention

Following measures will be undertaken for prevention of disasters:

- Maintaining data base of agencies responsible for handling emergencies like Hospitals, Trauma care, State Disaster Management Agency, Police, Ambulance etc.

Maintaining constant liaison with agencies who can forewarn of likely disasters such as IMD (India Meteorological Department), National Tsunami Warning Centre etc.

- Train staff in handling firefighting equipment
- Defining an organ gram for handling emergency situations eg. Identification of a works main controller, incident controller etc. so as to have coordinated response to attend to emergencies. Conduct mock drills at regular intervals
- Identify an emergency control centre having maps, utility drawings such as electrical, fire fighting etc.

7.2 TRAFFIC MANAGEMENT PLAN

7.2.1 Transportation Network in CSIA Development

The adequacy of proposed transportation network in CSIA Development in view of additional 1.0 FSI for 'Other Commercial Uses' (Retail, Commercial & Entertainment) has been studied at different locations within CSIA, along with the overall airport development. The summary, results and the recommendations are given below.

Trip Generation

The traffic generated has been calculated based on the type, volume and quality of the developments proposed on city side area of CSIA as per benchmarks considered in Interim DP of CSIA. The traffic for the worst case scenario has been taken for determining the requirement of transport infrastructure considering that users of retail and certain percentage of office areas are assumed to be working in the conventional way for a fixed time of the day, where as it is expected that rest of commercial/offices /Terminal shall be working 24/7 reducing the traffic generated in the peak hour. In other words, the peak hour/period shall be staggered and there might be multiple peaking of traffic in CSIA area due to this staggered work pattern.

For assessment of capacity of proposed transport network, the total projected traffic of CSIA development has been split into road based and rail based modes depending on the likely preference for public/private mode of travel. This is based on existing benchmarks, and the same has been assigned on respective networks. The total projected traffic on the roads was then distributed on the proposed roads and planned improvements on existing DP roads with due consideration to surrounding anticipated developments and traffic increase due to the same. The daily trips from non-aeronautical development increase by 11% due to additional 1.0 FSI for Retail, Commercial, offices & Entertainment users. The daily work/user trips does increase to 2,74,500 from the Interim DP figure of 2,39,165. As the change in FSI at plot level does not affect the total proposed built up area, the increased daily trips are seen only on certain road stretches. It might be noted that this trip increase does not affect any roads as seen from the transport modelling exercise due to observed staggered work pattern and multiple peaking of traffic.

The overall peak hour road based trips generated / attracted by the landside development, as per above, are as follows:

Table 7-2: Peak Hour Trips generated

No.	Zone of Development	Projected Max Peak Hr trips of CSIA	Connecting Roads
		For additional 1.0 FSI	
1	West Sector (T1 Forecourt Area)	4800	T1 Entry/Exit road to WEH
2	North Sector (West Gate Area)	2300	WEH & At-grade links of SER
3	North Sector (North Sahar)	9325	Sahar Road, New Shadow Road, Marol Pipeline Road
4	North Sector (South Sahar)	2230	Sahar Road, AI Medicon Bhavan Road

5	North Sector (T2 Forecourt Area)	11200	SER for T2, IA Project Road, Sahar Road & Telecom Road
6	North Sector (North Village)	4910	IA Project Road, Marol Pipeline Road
7	South Sector (Kalina)	4770	Kalina Road, LBS Marg

The above road traffic is however distributed over several airport access roads around the proposed development sectors.

Modal Split

The modal split assumed for metro/Suburban trips in the Interim DP scenario was around 40% of the overall non-walk trips, which has been assumed similarly. This is due to the fact that, Metro line-3 and CSIA station proposals were not finalised and hence Interim DP only took a conservative assumption on modal share of Metro from CSIA. But now, since Metro Line 6 (BKC to Kanjurmarg) passing through the airport has been advanced and merged with Metro Line 3. (currently Metro Line 3 from Colaba to SEEPZ), this line provides a significant opportunity for people arriving at the airport from Line 3 catchment to shift to metro along with other metro transfer passengers from catchments of now operational Metro Line 1. Also, given the current patronage of the suburban system of the railways of 52% trips today, it can be safely assumed that the city residents are used to travelling in public transport and the proposed metro system being planned for the city will definitely get a similar or higher patronage over the years of its operations.

Metro Trips

The CSIA Development along with the nearby catchments outside CSIA, generates an average of 8,896, 9,921 & 13,888 peak hour passenger ridership for T1 Forecourt, Sahar Road and T2 Forecourt metro stations respectively based on the proposed alignment and system for Metro Line 3 passing through the airport.

Traffic on Key Roads

The traffic on the key surrounding roads connecting the airport is within range and can be accommodated within the road expansions & new road proposals of Interim DP.

Table 7-3: Projected Traffic on Key CSIA Roads (Peak hour 2 Way traffic in PCU)

Year	Sahar Elevated Road	Sahar Road (at Grade)	IA Road	T1 Entry/Exit Road	Marol Pipe Line Road
Interim DP	9879	5296	8179	4400	2947
Interim DP with additional 1.0 FSI for other commercial uses (2026)	9900	6210	9064	4480	3475

Lane Requirement

The above traffic translates into the following lane requirement for the surrounding roads connecting the airport:

Table 7-4: Lane requirement for Arterial Roads connecting CSIA

Sl. No	Road Name	DP ROW (m)	Present Lanes	Proposed Lanes in Interim DP	Required Lanes w.r.t Dev of additional 1.0 FSI
1	Sahar Road	27.45	4	6	6
2	AGLR / MV Road	27.45 - 45.7	6	8	8
3	Andheri Kurla Road	21.4	2	4	4
4	IA Project Road	27.45	4	8	8
5	Sahar Elevated Road (SER)	29.50	-	6	6
6	New At Grade below SER	29.50	-	6	6
7	Marol Pipe Line Road	27.45	1	4	4
8	T1 Entry/Exit Road	27.45	4	6	6

The resultant increase in Peak Hour PCUs on the roads as observed is already accommodated in the lane configuration proposed in road infrastructure of CSIA in Interim Development Plan.

Conclusion

The CSIA development has envisaged the airside and landside development to cater to the growing air passenger demand along with expected world class facilities around the CSIA. The resultant expected traffic from the envisaged landside developments especially the impact due to additional 1.0 FSI on 'Other Commercial Uses' has been reviewed in detail in the study. It can be concluded that the traffic due to landside development of CSIA on the key surrounding roads connecting the airport is within range and can be accommodated within the road expansions & new road proposals of Interim DP.

This is achieved due to the fact that the Interim Development Plan of CSIA has envisioned high capacity transport network such as Metro line 3, along with high speed, efficient circulation and dispersal system such as Sahar Elevated Road; transport facilities such as MLCPs, taxi staging etc. In addition, in order to cater to the peak hour flows additional capacity augmentation of important arterial roads is provided in the Interim Development Plan together with required new internal collector roads with adequate lane configuration.

In view of this it is observed that the provisioning of transport network made in the Interim development Plan of CSIA is sufficient and there shall be no traffic congestion with the envisaged 5.0 FSI landside developments.

7.2.2 Transportation Network for proposed Buildings

Adequacy of Proposed Transport Infrastructure for Building No-1 : T1-C04

Existing Transportation Infrastructure

Proposed building -1 on T1 – C04 land parcel site is located in T1 Forecourt area. The site is accessible by Terminal Loop Road on two sides of the site and shall be connected to the Terminal1 by skywalk for uninterrupted flow of pedestrians commuting to Terminal area & a pedestrian underpass is also proposed from T1 Metro station towards Western Express Highway for city commuters. Western Express Highway on the western side of Terminal 1 is the major access road for proposed development. All vehicular entry/ exit within Proposed

building -1 on T1 – C04 is planned from the (18.0 m wide) road on the North and from the (18.0 m wide) road on its South side. Thereafter, vehicular movement would get segregated within the plot depending on the requirement to access either Hotel, Retail, Office & respective Parking or Metro Station.

Travel Demand of Proposed Development

Travel demand for proposed development is calculated based on the land use planned for 5 FSI inclusive additional 15% for staircase and lift lobbies. ITE norms for trip generation 9th edition is used for generating trips and given in table below considering three major components planned as Hotel, Retail & Office.

Table 7-5: ITE Trip generating norms

ITE Norms, Trip Generation 9th Edition		
Land Use	Work force	Basis for visitor population
	(sq.m./worker)	
Hotels	2 per room	2 guests per room and 30% visitors
Office	20 sq.m./person	10% of work force
Retail	35 sq.m./person	5 sq.m./person

Proposed building -1 on T1 – C04 land parcel has Offices, Retail & Commercial as its major land uses. For assessing the impact of future traffic on all major roads in the vicinity, trips are generated for CSMIA Terminal 1 network including aeronautical & non-aeronautical components for the horizon year i.e. 75000 trips / day and the same is considered for Traffic Impact Assessment of proposed development. This zone also has a metro station (Terminal 1 Metro station) integrated with Retail, Commercial and Office activities. Following table provides details of trip generation from Aeronautical & Non – Aeronautical components for T1 Forecourt zone.

Table 7-6: Trip generating from Aeronautical component of T1

Trip Generation (Airport)	
Design Day Arrivals	11,940
Design Day Departures	12,630
Meeter- Greeter Trips	15,900
Terminal Employee Trips	8,800
Total Terminal Area Trips	49,270
Aeronautical trips corresponding to network Peak Hour (7PM to 8 PM)	4750

Table 7-7: Trip generating from Non - aeronautical component of T1

Trip Generation (Proposed Development)	
Employees	6,730
Visitors	19,000
Total	25,730
Peak Hour	7 PM – 8PM

Trip Generation (Proposed Development)	
Peak Hour Trips (7 PM to 8 PM)	8892

The combined daily profile of aeronautical and non-aeronautical trips of T1 Forecourt zone is presented in Figure 1. It may be observed that the peak traffic is observed in the evening hours. The combined highest volume of vehicles (from landside as well as Domestic Terminal 1) is 13642 Trips observed during 7 PM- 8 PM.

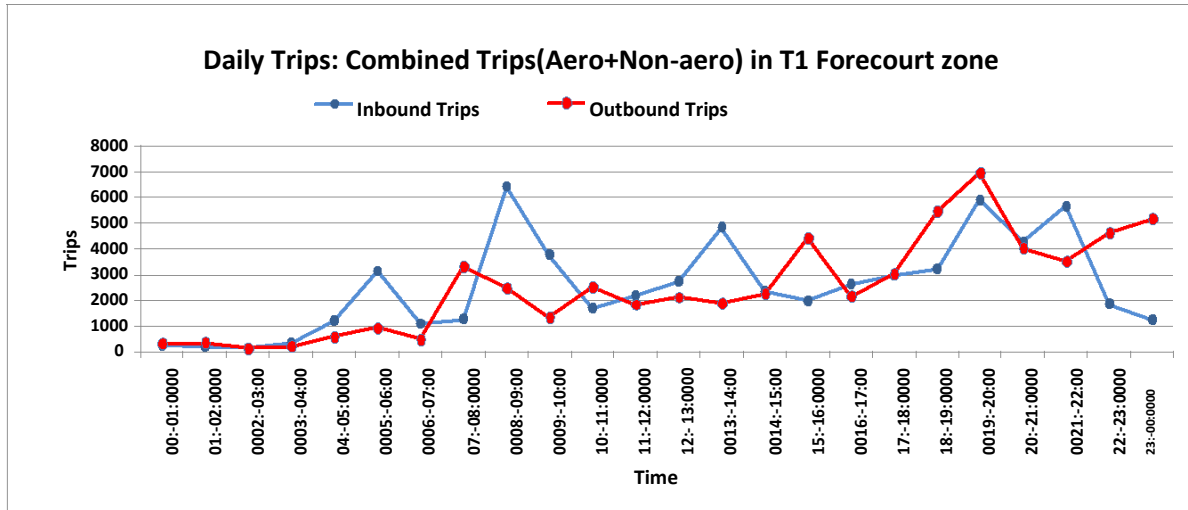


Figure 7-1: Aero+ Non Aero Trips Generation for Terminal 1

Traffic Impact of Proposed Development on Road Infrastructure

Travel Characteristics

Mode choice of a passenger and the occupancy of the vehicle depends on various characteristics like trip purpose, trip length, travel time, cost of travel etc. Based on these parameters, both mode choice and the occupancy for different users are assumed. Modal share vehicular occupancies are further factored with the trips generated from various components of Terminal 1 zone to calculate PCU in peak hours and finally the adequacy of different road sections. The aggregation of land uses near the metro station influences the mode choice for trips to this zone positively reducing the impact on the road network. Modal share and vehicle occupancy for Terminal 1 Aero + Non – Aero components is summarized in tables below.

Table 7-8: Modal Split for different users

Trip Component	Metro	Car	Taxi	Two Wheeler	Three Wheeler	Bus
Passengers and Meter-Greeter	30%	30%	15%	0%	24%	1%
Terminal Employees	50%	13%	2%	10%	15%	10%
Proposed Development	28%	17%	17%	13%	19%	6%

Table 7-9: Vehicle Occupancies for all vehicles of Terminal 1 Forecourt Zone

Vehicle Occupancy					
User Category	Car	Taxi	Two Wheeler	Three Wheeler	Bus
Air Passengers	1.75	1.8	1.1	1.61	30
Employees	1.2	1.2	1.1	2	30
Visitors to Hotels	2	2	1.1	2.3	30
Visitors to Offices	1	1	1.1	2.3	30
Retail Customers	2	2	1.5	2.3	30
Entertainment	2	2	1.8	2	30

Trips are converted into PCU using above travel characteristics and then assigned on various internal roads of T1 Forecourt area. Zonal Peak hour of assignment is observed from 7 PM to 8 PM. The total flows (PCU) entering/leaving the T1 zone is 6897 PCU. Out of this 44% is inbound and 56% is outbound. This traffic also consists of commuter traffic from T1 Metro Station to Non-CSMIA destination in the surrounding suburban area.

Table 7-10: Total Traffic generation inside T1 Forecourt Area

Traffic Generation	Peak Hour PCU(7 PM – 8 PM)
Airport Traffic (PCU)	1590
Proposed Development Traffic for T1 C01(PCU)	768
Proposed Development Traffic for other plots (PCU)	2980
Metro (PCU)	355
Total (Main Entry /Exit Road)	5697

Table 7-11: LOS of all road sections of Terminal 1 Forecourt Network area

Sr No	Road	Volume (PCU)	Ultimate Capacity (PCU)	V/C	LOS
1	T1 Entry/Exit Road	5697	6142	0.92	E
2	Proposed Development Approach road	1123	3142	0.36	B
3	Departure Approach Road	1701	4142	0.41	B
4	Arrival Kerb road	1469	4142	0.35	B
5	Departure / Arrival Exit Road	2532	4142	0.61	C
6	Road Behind Sahara Star	773	1285	0.60	C
7	Exit Road (South)	1270	2000	0.43	C

In above table, LOS A to LOS E represents vehicular operating conditions on the road where LOS A being the ideal condition for traffic Flow and LOS E represents utilizing maximum capacity of the road. Therefore considering effect of Metro ridership in peak hour, traffic volume carrying capacity of all the major roads of Terminal 1 network shall be adequate to cater traffic in horizon year. Also, traffic volume in peak period is high for domestic terminal and therefore proposed development traffic route is segregated with Terminal 1 traffic by providing approach road of width 18 m in front of the proposed development.

Impact of Metro Line 3 on Future Terminal 1 Forecourt Traffic Network

As per Mumbai Metro line 3 detailed project report, about 8567 riders (both directions) in peak hour will board and alight the underground Metro station planned below the proposed development of T1 forecourt (Plot T1 – C04). Domestic air passengers and escort shall be the major components amongst these riders. Therefore dedicated pedestrian facility is planned to cater the pedestrian demand from CSMIA Domestic Terminal T1 to Mumbai Metro Line 3 underground Metro station at Terminal 1. Based on Modal share and vehicle occupancy, about 355 PCU from Metro will be generated from and to proposed development in peak hour between 7 PM to 8 PM.

Proposed building -1 on T1 – C04 land parcel is a Transit Oriented Development as the metro is integrated with road and therefore will reduce the traffic on approach roads in future.

Traffic Management Scheme for Building -1 (T1-C04)

- 1 Metro line 3 will get operational by year 2021 and as per the travel characteristics of different landuses, substantial share of riders on Terminal-1 Forecourt zone road network will shift to this metro line.
- 2 Multiple Entry/Exit gates are provided for proposed building -1 on T1 – C04 land parcel resulting in reduction of vehicular queuing at entry gates.
- 3 One way circulation is planned at plot level to increase the capacity of driveways and remove the conflicts.

- 4 Minimum 6 m wide ramps are provided with required turning radius for smooth flow of vehicles at the basements of the Proposed building -1 on T1 – C04 land parcel.
- 5 Minimum width of 6 m is provided for two way driveway at ground and parking levels of proposed development.
- 6 All proposed developments consist of peripheral roads are planned for the access of Fire tender during emergency.
- 7 Multiple gates for each planned development will work as multiple exits during evacuation.

Traffic signals, Pelican signals, Skywalk etc. must be optimized to manage the traffic flow on approach roads.

Adequacy of Proposed Transport Infrastructure for building No-2: T2-C05

Existing Transportation Infrastructure

Proposed building -2 on T2 – C05 land parcel is located in the T2 Forecourt area. Proposed development is bounded by roads on all four sides - Extension of Sahar Road / I.A. Road (ROW of 31.0 m) on the North, 12 m wide Road on the South (in front of Terminal 2 Arrival), 24.0 m wide At-Grade Road on the East and 27.45 wide At-Grade Road on the West. Road hierarchy inside this development zone is planned to establish a clear separation of traffic types to ensure convenient and uncongested access to cityside developments of Proposed building -2 on T2 – C05 land parcel and Metro development within Plot T2 – C05. The main arterial road or primary addressing street of this zone is the six lane extension of Sahar Road with ROW of 31.00 m. Apart from this, there are three secondary roads on the East (of ROW 24.0 m), West (of ROW 27.45 m), and South sides (of ROW 12.0 m). Western Express Highway on the western side and Andheri Ghatkopar road on the northern side of Terminal 2 are the major access roads which connects proposed development to various parts of the city.

Travel Demand of Proposed Development

Travel demand for the proposed development is calculated based on the land use planned for 5 FSI inclusive additional 15% for staircase and lift lobbies. ITE norms for trip generation 9th edition is used for generating trips and given in table below considering three major components planned as Hotel, Retail & Office.

Table 7-12: ITE generating norms Trip

ITE Norms, Trip Generation 9th Edition		
Land Use	Work force	Basis for visitor population
	(sq.m./worker)	
Hotels	2 per room	2 guests per room and 30% visitors
Office	20 sq.m./person	10% of work force
Retail	35 sq.m./person	5 sq.m./person

Proposed building -2 on T2 – C05 land parcel has Offices, Retail & Commercial as its major landuses. For assessing the impact of future traffic on all major roads in the vicinity, trips are generated for CSMIA Terminal 2 network including aeronautical & non-aeronautical components for the horizon year i.e. 257846 trips/day and the same is considered for Traffic Impact Assessment. This zone also has a metro station (Terminal 2 Metro station) integrated with Retail, Commercial and Office activities. Following table details of trip generation for Aeronautical & Non – Aeronautical components for T1 Forecourt proposed development zone.

Table 7-13: Trip generating from Aeronautical component of T2

Trip Generation (Airport)	
Design Day Arrivals	43,240
Design Day Departures	45,360
Meeter- Greeter Trips	67,490
Terminal Employee Trips	31,200
Total Terminal Area Trips	1,87,290
Peak Hour Trips (9PM -10PM)	20,500

Table 7-14: Trip generating from Non - aeronautical component of T2

Trip Generation (Proposed Development)	
Daily Employees trips	11,991
Daily Visitors trips	58,565
Total Daily trips	70,556
Peak Hour	8PM – 9PM
Peak Hour Trips	18,720

The combined daily profile of Aeronautical and non-aeronautical trips of T2 Forecourt zone is presented in Figure 1. It may be observed that the peak traffic is observed in the evening hours. The combined highest volume of vehicles (Aero + Non Aero) is 35000 Trips observed during 8 PM- 9 PM.

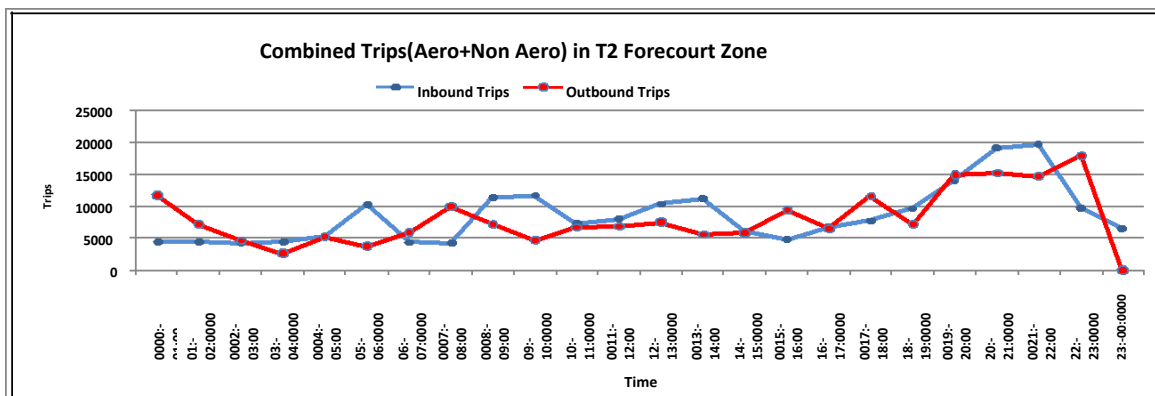


Figure 7-4: Aero+ Non Aero Trips Generation for Terminal 2

Traffic Impact of Proposed Development on Road Infrastructure

Travel Characteristics

Mode choice of a passenger and the occupancy of the vehicle depends upon various characteristics like trip purpose, trip length, travel time, cost of travel etc. Based on these choice and the occupancy for different users are assumed. These are further factored with the trips generated from various components of Terminal 2 zone to calculate PCU in peak hours and finally the adequacy of different road sections. The aggregation of land uses near the metro station influences the mode choice for trips to this zone positively reducing the impact on the parameters, both mode road network. Modal share and vehicle occupancy for Terminal 2 Aero + Non – Aero components is summarized in below.

Table 7-15: Modal Split for different users

Modal Split						
Trip Component	Metro	Car	Taxi	Two Wheeler	Three Wheeler	Bus
Domestic Passengers	30%	30%	15%	0%	24%	1%
International Passengers	20%	30%	45%	0%	5%	0%
T2 Proposed Development	35%	20%	18%	10%	12%	5%

Table 7-16: Vehicle Occupancies for all vehicles of Terminal 2 Forecourt Zone

Vehicle Occupancy					
User Category	Car	Taxi	Two Wheeler	Three Wheeler	Bus
Air Passengers	1.75	1.8	1.1	1.61	30
Employees	1.2	1.2	1.1	2	30
Visitors to Hotels	2	2	1.1	2.3	30
Visitors to Offices	1	1	1.1	2.3	30
Retail Customers	2	2	1.5	2.3	30
Entertainment	2	2	1.8	2	30

Trips are converted into PCU using above travel characteristics and then assigned on various internal roads of T2 Forecourt area. Zonal Peak hour of assignment is observed to be from 8 PM to 9 PM. The total flows (PCU) entering/leaving the T2 zone is 14582 PCU. Out of this 43% is inbound and 57% is outbound. This traffic also consists of commuter traffic from T2 Metro Station to non-CSIA destination in the surrounding suburban area.

Table 7-17: Total Traffic generation inside T1 Forecourt Area

Travel Direction	Peak Hour PCU (8 PM – 9 PM)
Airport Traffic	5862
Proposed Development	7810
Metro Trips	910
Total	14582

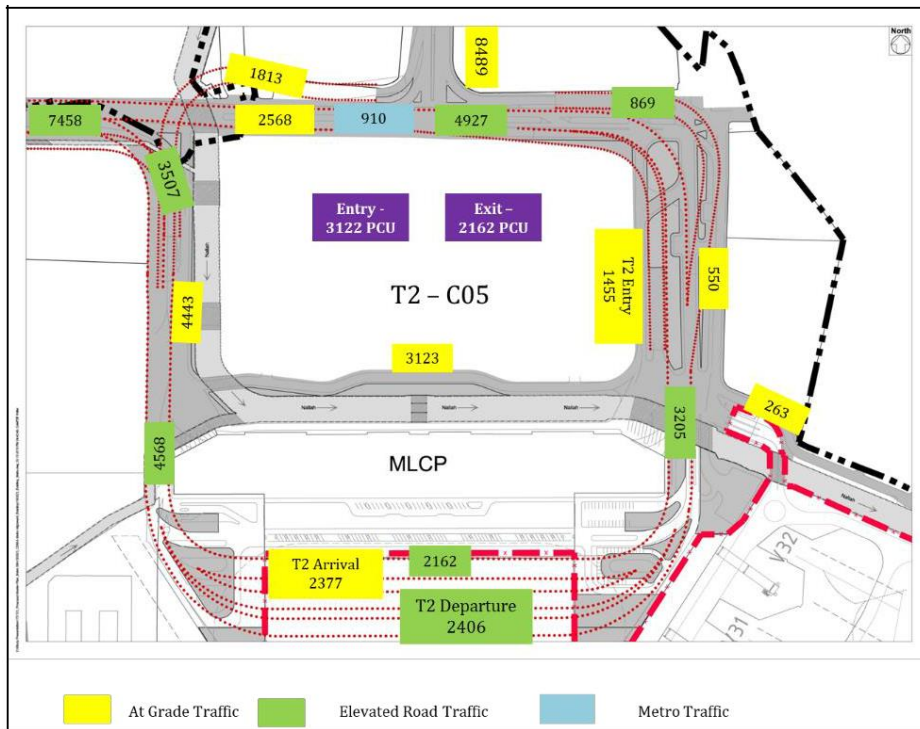


Figure 7-5: Traffic Volume at different nodes of Terminal 2 network

Adequacy of Terminal 2 Forecourt Network Roads

Adequacy of the road depends upon the vehicular volume plying on the road and the capacity of the road. Peak hour traffic volume in PCU is calculated based on the trip generation & their traffic characteristics and the capacity of each type of road in urban areas is given in IRC 106 – 1990. Further V/C ratio for all the roads in Terminal network is calculated and marked in the figure below.

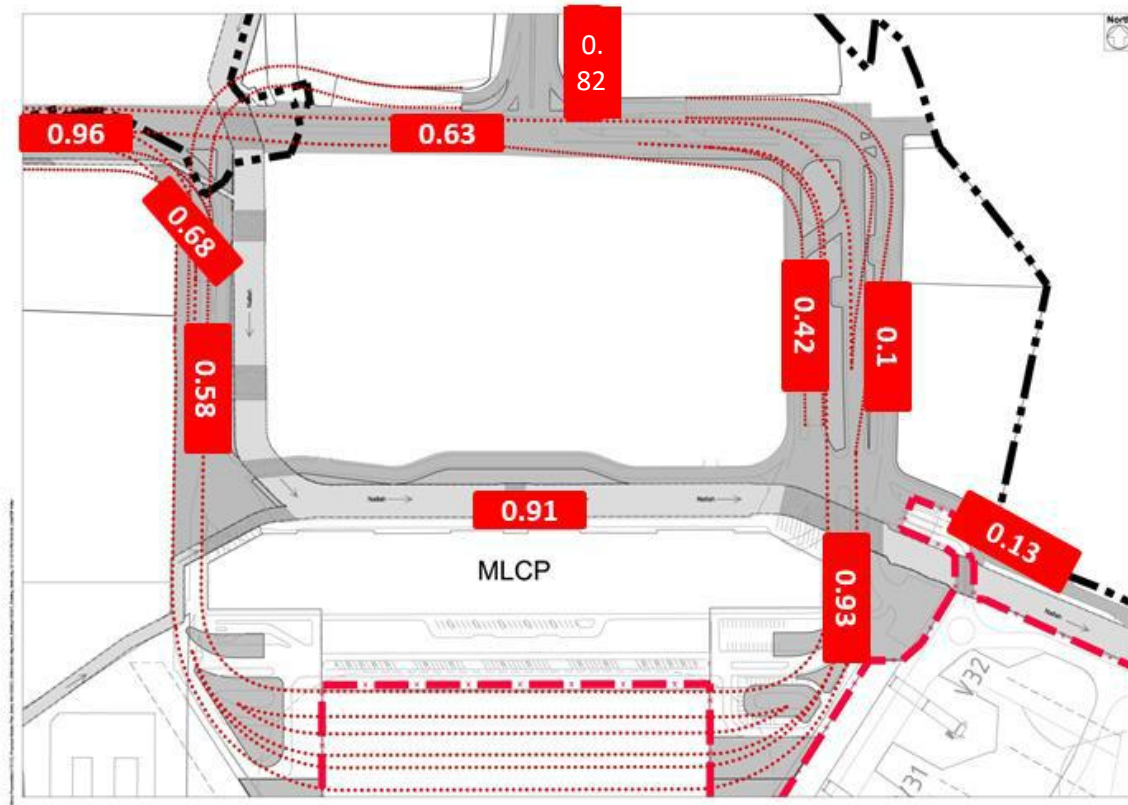


Figure 7-6: V/C ratio at different nodes of T2 Forecourt network area

Following table shows the calculation of V/C ratio and Level of Service of various internal road of Terminal 2 forecourt zone.

Table 7-18: LOS for all road sections of Terminal 2 Forecourt Network area

Sr No.	Road Name	Volume (PCU)	Ultimate Capacity	V/C	LOS
1	T2 Exit Road to Sahar Road	3507	5142	0.68	C
2	IA Road	8489	10285	0.82	E
3	Road Behind T2 MLCP	3123	3428	0.91	E
4	T2 Entrance Road	1455	3428	0.42	B
5	T2 Arrival Road	3205	3428	0.93	E
6	At Grade Exit Road	4443	7715	0.58	C
7	Sahar At Grade Road	4927	7715	0.64	C
8	Service Road in front of T2 Taxi MLCP	550	7714	0.10	A
9	Taj Sats Road	263	2142	0.13	A
10	Sahar Elevated Road	7458	7715	0.96	E

In above table, LOS A to LOS E represents vehicular operating conditions where A being the ideal condition for Flow and E represents utilizing maximum capacity of the road. Therefore considering effect of Metro ridership in peak hour, traffic volume carrying capacity of all the major roads of Terminal 2 network shall be adequate to cater traffic in horizon year.

Impact of Metro Line 3 on Future Terminal 2 Forecourt Traffic Network

The proposed underground Metro Stations at Terminal-2 Forecourt is planned and being implemented as part of Metro line 3 works to provide high-speed, high-volume connectivity linking Terminal-2 & T2 Forecourt commercial development with entire Mumbai, drawing domestic and international passengers, visitors, users & people of Mumbai. As per the assessment of metro ridership for metro line 3 at T2 metro station about 16778 riders (both directions) will board and alight the underground Metro station planned below the proposed development of T2 Forecourt in peak hour. Based on Modal share and vehicle occupancy, about 910 PCU from Metro will be generated from and to propose development T2 - C05 in peak hour between 7 PM to 8 PM. Proposed building -2 on T2 – C05 land parcel is a Transit Oriented Development as the metro is integrated with road and therefore will reduce the traffic on approach roads in future.

Traffic Management Scheme for Building - 2 (T2 -C05)

1. Metro line 3 will get operational by year 2021 and as per the travel characteristics of different land use users, substantial share of riders inside Terminal 2 road network will shift to this metro line.
2. Multiple Entry/Exit gates are provided on proposed building -2 on T2 – C05 land parcel resulting in reduction of vehicular queuing at entry gate.
3. One way circulation is planned at plot level and Terminal level zone to increase the capacity of roads and remove the conflicts.
4. Traffic signals, Pelican signals etc are planned to manage the traffic on approach roads.
5. Minimum 6 m wide ramps are provided at plot level with required turning radius for smooth flow of vehicles.
6. Minimum width of 6 m is provided for two way driveway at ground and parking levels of proposed development.
7. Proposed development consist of peripheral roads required for the access of Fire tender during emergency.
8. Multiple gates for proposed development will work as multiple exits during evacuation.

Adequacy of Proposed Transport Infrastructure for building No-3: NS-C01

Existing Transportation Infrastructure

Proposed Building-3 on NS-C01 land parcel is located in North Sahar Zone of CSMIA and is surrounded by three major roads i.e. 6 lane Sahar Shadow Road in the North, 6 lane Sahar Road in the West and 4 lane Marol Pipeline Road in the South-East. Sahar shadow road connects proposed development with Terminal 2 of CSMIA and WEH providing required arterial connectivity to other parts of the city. Metro line 1 and Andheri Ghatkopar road in the north of the plot can be accessed from proposed development through Marol Pipeline road.

Travel Demand of Proposed Development

Travel demand for the proposed development is calculated based on the land use planned for 5 FSI inclusive additional 15% for staircases & lift lobbies. ITE norms for trip generation 9th edition is used for generating trips and given in table below considering three major components planned as Hotel, Retail & Office.

Table 7-19: ITE Trip generating norms

ITE Norms, Trip Generation 9th Edition		
Land Use	Work force	Basis for visitor population
	(Sq.m./worker)	
Hotels	2 per room	2 guests per room and 30% visitors
Office	20 Sqm./person	10% of work force
Retail	35 Sqm./person	5 Sqm./person
Entertainment	50 Sqm./person	5 Sqm./person

North Sahar area has Hospitality, Office and Retail as the major landuses. For assessing the impact of future traffic on all major roads in the vicinity, trips are generated for whole North Sahar zone in the horizon i.e 72,924 trips/day and the same is considered for Traffic Impact Assessment. This zone also has a metro station (Sahar Road Metro station) integrated with Retail, Commercial and Office activities.

Following table shows details of trip generation for employee and visitors for North Sahar Zone.

Table 7-20: Trip generating from North Sahar Zone

Trip Generation (North Sahar Zone)	
Daily Employees trips	13,672
Daily Visitors trips	59,252
Total Daily trips	72, 924
Peak Hour	7 PM – 8PM
Peak Hour Trips	19,500

Following figure shows daily inbound and outbound trips generating from North Sahar Zone. The morning peak traffic corresponds to the inbound employees of the retail. Customer/Visitor profile is more dispersed in retail and the intensity is expected to be high in the evenings as reflected in the evening peak.

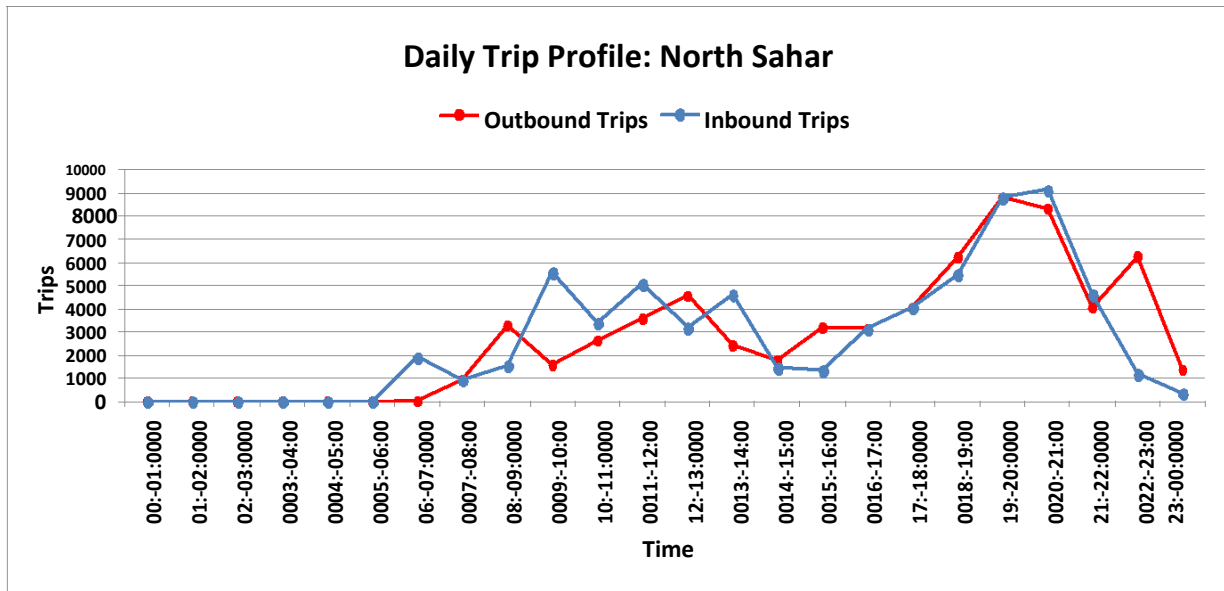


Figure 7-7: Daily Landside Trips Profile of North Sahar

Traffic Impact of Proposed Development on Road Infrastructure.

Travel Characteristics

Mode choice of a passenger and the occupancy of the vehicle depends upon various characteristics like trip purpose, trip length, travel time, cost of travel etc. Based on these parameters, both mode choice and the occupancy for different users are assumed. Mode share and Vehicular occupancies are further factored with the trips generated from various plots of North Sahar proposed development zone to calculate peak hours PCU in the network and finally the adequacy of different road sections. The aggregation of land uses near the metro station influences the mode choice for trips to this zone positively reducing the impact on the road network.

Modal share and vehicle occupancy for North Sahar Proposed Development is summarized in the figure below.

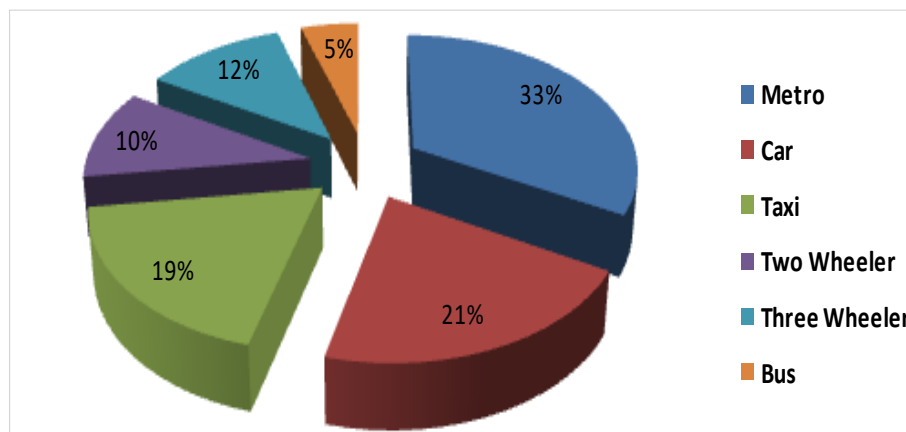


Figure 7-8: Model Share for North Sahar Zone

Table 7-21: Vehicle Occupancies for all vehicles of North Sahar Zone

Vehicle Occupancy					
User Category	Car	Taxi	Two Wheeler	Three Wheeler	Bus
Air Passengers	1.75	1.8		1.61	30
Employees	1.2	1.2	1.1	2	30
Visitors to Hotels	2	2	1.1	2.3	30
Visitors to Offices	1	1	1.1	2.3	30
Retail Customers	2	2	1.5	2.3	30

The traffic in North Sahar zone is generated by land use type - hospitality (mostly luxury hotels with associated retail). Peak hour of assignment is found between 7 PM-8 PM. The total flows (PCU) entering/leaving the North Sahar Zones is about 10,178 PCU (including external traffic for Sahar road metro station-701 PCU). Out of this total traffic, 47% is incoming and 53% is outgoing. Following figure shows different components of traffic plying on major roads inside north Sahar zone.

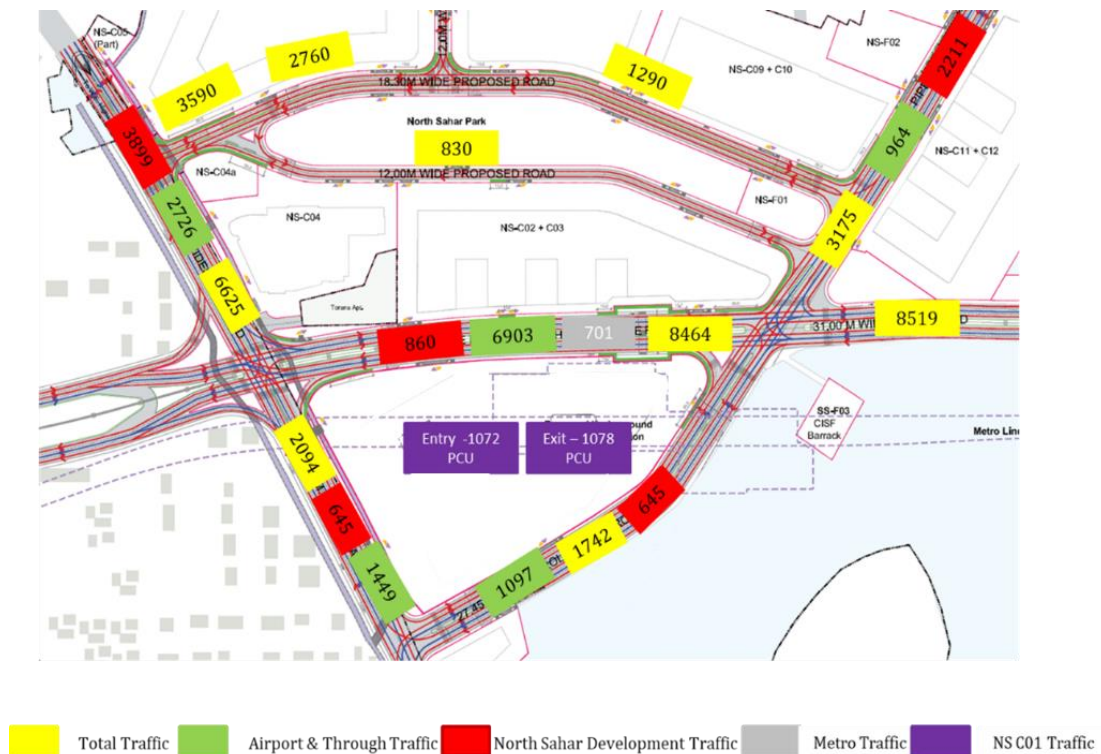


Figure 7-9: Traffic Volume at different nodes of North Sahar zone area

Adequacy of North Sahar Zone Roads

Adequacy of the road depends upon the vehicular volume plying on the road and the capacity of the road. Peak hour traffic volume in PCU is calculated based on the trip

generation and their traffic characteristics and the capacity is given in IRC 106 – 1990. Further V/C ratio for all the roads in Terminal network is calculated and marked on the figure below.

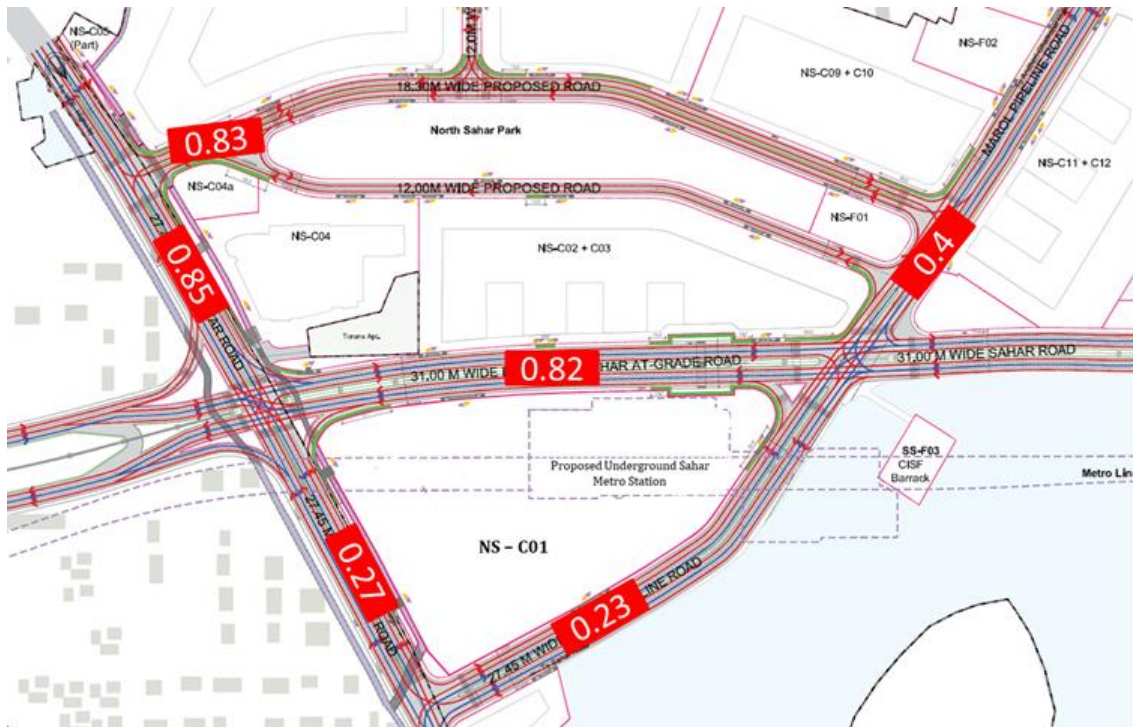


Figure 7-10: V/C ratio for all roads in North Sahar network

Following table shows the calculations of V/C ratio and Level of Service of various roads of North Sahar Zone.

Table 7-22: LOS for all road sections of North Sahar Zone

Sr No	Road	Lanes	Volume (PCU)	Ultimate Capacity (PCU)	V/C	LOS
1	Sahar Road	6 lane Divided 2 Way	6,625	7,715	0.85	D
2	Sahar At Grade (Shadow Road)	6 lane Divided 2 Way	6,350	7,715	0.82	D
3	Marol Pipeline Road	6 lane Divided 2 Way	3,175	7,715	0.4	B
4	NS Main Road North	4 lane Divided 2 Way	3,590	4,285	0.83	D

In above table, LOS A to LOS E represents vehicular operating conditions where A being the ideal condition for traffic Flow and E represents utilizing maximum capacity of the road. Therefore considering effect of Metro ridership in peak hour, traffic volume carrying capacity of all the major roads of North Sahar network shall be adequate to cater to future traffic in horizon year.

Impact of Metro Line 3 on Future Network Traffic

Access to under construction Metro Line 3 North Sahar Metro Station shall be through the proposed development on NS-C01 and therefore large share of employees and visitors of proposed and nearby development will use this metro line to commute daily. As per Mumbai Metro line 3 detailed project report, about 7015 riders (both directions) will board and alight the underground Metro station planned below the proposed development of North Sahar Zone (Plot NS – C01) in peak hour 7 PM to 8 PM. Work force of all landuse components along with retail and commercial visitors shall be the major trip generators amongst these commuters. Based on Modal share and vehicle occupancy, about 701 PCU from Metro will be generated on approach roads in peak hour between 7 PM to 8 PM. Proposed development of Building-3 on NS-C01 land parcel is a Transit Oriented Development as the metro station is integrated with proposed building and therefore will reduce the traffic on approach roads in future.

Traffic Management Scheme for Building - 3 (NS-C01)

1. Metro line-3 will get operational by year 2021 and as per the travel characteristics of different landuses, substantial share of riders on north Sahar road network will shift to this metro line and reduce the traffic on approach roads.
2. Multiple Entry/Exit gates are provided for every proposed plot development resulting in reduction of vehicular queuing at entry gate.
3. One way circulation is planned at plot level to increase the capacity of driveways and remove the conflicts.
4. Minimum 6 m wide ramps are provided with required turning radius for smooth flow of vehicles at the basements of the proposed development (Plot C-01)
5. Minimum width of 6 m is provided for two way driveway at ground and parking levels.
6. All proposed developments consist of peripheral roads are planned for the access of Fire tender during emergency.
7. Multiple gates for each planned development will work as multiple exits during evacuation.
8. Traffic signals, Pelican signals, Skywalk etc. must be optimized to manage the traffic flow on approach roads

CHAPTER 8. PROJECT BENEFITS

8.1 PROJECT HIGHLIGHTS

Lateral infrastructure development of non-operational (landside) area consists of:

Transport Infrastructure

- Roads (at grade, elevated) , underpass, METRO connectivity
- Utilities/ Services
- Drainage, Sewerage, Water Supply, recycled water supply network, STPs, Power

etc. Pedestrian Infrastructure

- Skywalks, underpass, Personal Rapid Transit (PRT) System

Sustainability measures

- Rainwater Harvesting, Green Cover & Landscaping, Water Recycling, SWM

8.2 IMPROVEMENTS IN INFRASTRUCTURE

Most of the existing facilities and uses in Non-operational area of CSMIA were planned and developed in the early stages of airport development in 1960's/ 70's, and are therefore in need for transformation and upgradation, also relocation in some cases due to incompatibility of their current locations. The current state of these cityside facilities indicates urgent need to have appropriate storm water drains, power, water supply, sewerage network, roads and other utility network adequate built area for effective functioning, with contemporary planning and design, and optimization in land utilization. Constraints of available land requires efficient planning for these facilities in the modern context.

Restructuring of the Non-operational (cityside) land is important to guide the lateral development or redevelopment by defining the future development and land use patterns, areas of open spaces & social facilities, the layout and nature of infrastructure (including transportation links), and other key features. It will help to accommodate contemporary Nonoperational uses related to airport needs, efficient use of land and integrated lateral development by way of comprehensive master planning of Non-operational area.

The proposed landside/ Non Operational development in CSMIA is the land area outside the aeronautical area and will be independent, separate and distinct from aeronautical/ airside development. Proposed landuse plan of Non Operational Area defines proposed cityside development approach with special emphasis on adequate land allocation for Non-operational (cityside) uses. Existing activities also are accommodated in the site to serve the airport as well as surrounding area/ localities.

The envisaged mixed-use development as part of the Non Operational Area shall have the primary aim of becoming a true attraction point in Mumbai, a vibrant world class mixed-use

commercial, recreational, hospitality centre for the passengers as well for the people of Mumbai.

Strategically located outside the existing airport, the landside development is intended to become a unique destination, an Urban Activity Centre for a wide range of compatible hospitality, commercial, recreational, entertainment, cultural and business functions. It will have a world class architectural and urban design character and shall involve relocation of few existing functions, review of existing on-site traffic and road-network and planning of new road network and utility infrastructure.

8.3 EMPLOYMENT POTENTIAL

The project will have the following positive repercussions on socio economic and community welfare:

- Will create jobs that match the “skills/ talent”, available locally
- Will lead to spin-off businesses
- Will provide community service facilities, better infrastructure and employment in the proposed commercial, recreational, hospitality businesses.

CHAPTER 9. ENVIRONMENTAL COST BENEFIT ANALYSIS

Environmental cost benefit studies have not been conducted for this project.

However, all the required environmental protection measures will be implemented by the project proponent as part of the proposed development to ensure compliance with the local and national norms.

CHAPTER 10. ENVIRONMENTAL MANAGEMENT PLAN

10.1 INTRODUCTION

This chapter states the administrative aspects of implementation of mitigation measures along with the budgetary requirements for environmental protection.

It is emphasized that many of the protective and enhancement measures be implemented by adopting suitable planning and engineering solutions for the project. The stage wise mitigation measures outlined in this section have been suggested after discussion with project proponent.

Further, it is suggested that the resources required for the mitigation/ protection, enhancement measures and monitoring are provided for in the cost estimates of the project, to ensure proper implementation.

10.2 OBJECTIVE & SCOPE OF EMP

Environmental Management Plan is prepared with the main objective of enlisting all the requirements to ensure effective mitigation of adverse impacts for all the components of the proposed project. The objectives taken into account in preparation of EMP are summarized here as follows:

- The prevention, control and abatement of pollution, i.e. air pollution, water pollution, hazardous/ non-hazardous wastes and noise pollution,
- To comply with the stipulated enviro-legal requirements and standards,
- To direct the steps to be followed, for effective maintenance and regulation of environmental management system,
- To ensure the better and safe work environment through pre-meditated planning of prevention and control of hazards,
- To direct the investments towards sustainable development by considering the cost of emission control, waste disposal, social development, green belt development and health & safety in the planning and construction stages,
- To account for recycling and reusing measures, proposed or required to be adopted for minimization of consumption of resources and generation of pollutants.

10.3 RESPONSIBILITIES FOR ENVIRONMENT MANAGEMENT

Environmental pollution during construction phase will be considerably more than that when the project will be fully developed. Hence, as a good practice, it is suggested to develop procedures for control of pollution for the entire phasing of the project. This section covers the care proposed to be taken during the ongoing construction and operation phases of the project for environmental management.

10.3.1 Environmental Management during Construction Phase

During the construction phase, an Environmental Management Committee will be set up by proponent and dedicated Environmental Officers will be appointed to look after tasks such as labour health and sanitation facilities, management of construction waste, monitoring of environmental parameters, and other mandatory regulatory compliances. The Contractor/s assigned for the work will assist the Officers.

A high-level committee consisting of top level officials will be set up as listed below. This body will oversee, inspect, co-ordinate and implement the entire environmental management plan.

The Committee comprises of the following:

- The Manager at the site
- General Manager (Environment)
- Environmental Officer
- Administrative Head
- Visitors/ Staff Manager
- Head of Security

This Committee will meet at least once in a month and consider all issues affecting the environment. It will inspect the works frequently and take quick decisions to correct any anomaly. The Committee will meet and act as per the following schedule:

Table 10-1 Environmental Inspection Schedule during Construction Phase

Facility	Normal Inspection	Committee Inspection	Action to be taken
Health & Safety of Workers	Fortnightly	Quarterly	Suggest improvements
Water Supply	Daily	Monthly	Leakages, quality, etc.
Mobile Toilets	Daily	Fortnightly	Cleaning, choke up removal
DG sets	Daily	Monthly	Exhaust, cleanliness
Landscaped areas	Fortnightly	Quarterly	Initiate plantation, suggest improvements
Construction Waste	Weekly	Monthly	Proper collection and disposal
Hazardous Waste	Weekly	Monthly	Proper collection and disposal

The Committee will address the short-comings in all the above instances and take action to take immediate remedial measures. A 'Minutes' Book' will be maintained wherein, the minutes of meetings and action taken reports will be entered and endorsed by all members of the Committee. The entries in the 'Minutes' Book' will be reviewed periodically. Monitoring of environmental parameters will be carried out through an NABL accredited/ MoEFCC recognized laboratory. The results will be observed and immediate corrective steps taken to meet the prescribed standards.

The Environmental Management Plan during the construction phase is given in the following table and it lists the mitigation measures to be undertaken during the construction phase and the entity responsible for implementation.

Following are the mitigation measures to be undertaken during construction phase with the agency responsible for implementation.

Table 10-2: Mitigation Measures during Construction Phase

Sr. No.	Affected Environmental Parameters	Likely adverse impacts in absence of mitigation measures	Nature of impact	Proposed Mitigation Measures	
				Action to be taken	Implementing Agency
1.	Land Environment	<ul style="list-style-type: none"> ▪ Generation of excavated waste and debris ▪ Soil erosion and construction runoff ▪ Aesthetically unpleasant ▪ Health problems of laborers 	Temporary	<ul style="list-style-type: none"> ▪ Debris disposal in identified locations with prior permission. ▪ Work to be carried out in non-monsoon season ▪ Provision of storm water drains with silt traps ▪ Segregation of construction waste materials to facilitate reuse/ recycling ▪ Adequate facilities for the storage of waste materials on site 	EMC, various Contractors
2.	Air Quality	<ul style="list-style-type: none"> ▪ Fugitive dust generation (Increase in levels of NO_x, SPM, Dust hazards) ▪ Noise impacts ▪ Traffic congestion ▪ Risks of accidents 	Significant but Temporary	<ul style="list-style-type: none"> ▪ Raw materials will be procured from the nearest material supplier and material will be brought in batches to avoid increase of traffic volume. ▪ Material transport during non-peak hours ▪ Idling of the trucks and dumpers on the access roads will not be allowed ▪ Dust mitigation measures to be scrupulously followed. ▪ Use of dust covers during transportation ▪ Keeping all stationary equipment downwind ▪ Stabilization of dust prone areas by sprinkling water 	Project manager & Contractor
3.	Noise Quality	<ul style="list-style-type: none"> ▪ Increase in noise levels causing nuisance to surroundings. 	Significant but temporary	<ul style="list-style-type: none"> ▪ 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 heavy machinery with ear muffs/ ear plugs ▪ Provision of temporary barricading around site 	Contractor
4.	Water Environment	<ul style="list-style-type: none"> ▪ Increase in turbidity and suspended solids due to soil 	Significant and temporary	<ul style="list-style-type: none"> ▪ Construction work to be carried out before monsoons ▪ Construction materials to be stored in enclosures 	Contractor

Sr. No.	Affected Environmental Parameters	Likely adverse impacts in absence of mitigation measures	Nature of impact	Proposed Mitigation Measures	
				Action to be taken	Implementing Agency
		<ul style="list-style-type: none"> ▪ erosion ▪ sedimentation of surrounding water bodies with deposition of construction materials ▪ Unhealthily conditions due to waste water from labor camps 		<ul style="list-style-type: none"> ▪ Cleaning of drains on regular basis to avoid blockage ▪ Provision of storm water drains with silt traps ▪ No accumulation of stagnant water 	
5.	Biological Environment	<ul style="list-style-type: none"> ▪ Deposition of dust on existing surrounding flora 	Significant and temporary	<ul style="list-style-type: none"> ▪ Temporary enclosures to be provided to existing trees for protection ▪ Measures for prevention of fugitive dust to be followed 	Contractor
6.	Socio Economic Environment	<ul style="list-style-type: none"> ▪ Health and safety issues of labor ▪ Operation of heavy equipment 	Temporary	<ul style="list-style-type: none"> ▪ Provision of basic facilities at labor camp ▪ labor will be guided about the measures to be taken during emergency and accident ▪ instructions about personnel safety will be given ▪ Safety equipment will be made mandatory 	Contractor

10.3.2 Responsibilities for Environment Management during Operation Phase

During the operation phase also, an Environmental Management Committee will be set up by proponent and dedicated Environmental Officers will be appointed to look after tasks such as complete disposal of construction waste, maintaining the landscaping of borrow areas, monitoring of environmental parameters, and other mandatory regulatory compliances.

A high level committee consisting of top level officials will be set up as listed below. This body will oversee, inspect, co-ordinate and implement the entire environmental management plan.

The Committee comprises of the following:

- The Manager at the site
- General Manager (Environment)
- Environmental Officer
- Administrative Head
- Visitors/ Staff Manager
- Head of Security

This Committee will meet at least once in a month and consider all issues affecting the environment. It will inspect the works frequently and take quick decisions to correct any anomaly. The Committee will meet and act as per the following schedule:

Table 10-3 Environmental Inspection Schedule during Operation Phase

Facility	Normal Inspection	Committee Inspection	Particulars to be inspected
Water Supply	Daily	Monthly	Leakages, quality of fresh water/ recycled water
Sewerage	Weekly	Monthly	Cleaning, choke up removal, recycled water supply line
STP	Daily	Fortnightly	Pumps, sewage inlet/ outlet characteristics, sludge disposal mechanism
DG set	Daily	Monthly	Exhaust, chimney cleanliness
Gardens	Daily	Monthly	Suggest improvement, recycled water supply line
Swimming Pool/ water bodies	Weekly	Monthly	Ozonation, filtration
Solid Waste	Fortnightly	Quarterly	Proper segregation, collection and disposal
Environmental Permits/ Licenses	Monthly	6 Monthly	Consents from MPCB, environmental monitoring as per regulatory requirements

The Committee will address the short-comings in all the above instances and take action to take immediate remedial measures. A 'Minutes' Book' will be maintained wherein, the minutes of meetings and action taken reports will be entered and endorsed by all members of the Committee. The entries in the 'Minutes' Book' will be reviewed periodically.

Monitoring of environmental parameters will be carried out through an NABL accredited/ MoEFCC recognized laboratory. The results will be observed and immediate corrective steps taken to meet the prescribed standards.

The Environmental Management Plan during the operation phase is given in the following table and it lists the mitigation measures to be undertaken during the operation phase and the entity responsible for implementation.

Table 10-4: Mitigation Measures during Operation Phase

Sr. No.	Affected Environmental Parameters	Likely adverse impacts in absence of mitigation measures	Nature of Impact	Proposed Mitigation Measures	
				Action to be taken	Implementing agency
1.	Land Environment	<ul style="list-style-type: none"> ▪ Soil erosion from unpaved areas ▪ Increase in solid waste generation 	Significant and Temporary	<ul style="list-style-type: none"> ▪ Waste management practices like waste segregation of solid waste at source, recycling and reuse, composting etc. to be adopted ▪ Provision of common mechanical composting unit (OWC) ▪ Provision of waste transfer facilities ▪ Regular collection of segregated Biodegradable and Non-biodegradable solid wastes 	Project proponent
2.	Air Environment	<ul style="list-style-type: none"> ▪ Air and noise impacts due to vehicular emissions and re-suspension of particulate matter / dust ▪ Emissions due to DG set 	Significant and permanent	<ul style="list-style-type: none"> ▪ Sign boards on approach roads and at parking areas will be installed. ▪ Adequate parking spaces to be provided. ▪ Adequate stack height for DG sets as per CPCB norms will be provided to reduce impact from emissions. 	Project proponent
3.	Water Environment	<ul style="list-style-type: none"> ▪ Increase in turbidity of water ▪ Reduced percolation due to increased paved areas ▪ Unhealthily condition in case of inadequate waste water management facilities ▪ Disposal of excess treated wastewater 	Significant and permanent	<ul style="list-style-type: none"> ▪ Regular maintenance of storm water drains which will be provided with erosion protection measures ▪ Footpath should be with perforated garden pavers at adequate interval ▪ Dual system of water supply for fresh and recycled water to be used for domestic purpose and to be reused for flushing, gardening and HVAC ▪ Proper O&M of proposed STP to recycle domestic sewage to be reused for gardening and flushing. ▪ Rain water harvesting through provision of storage tanks as far as possible 	Project proponent

Sr. No.	Affected Environmental Parameters	Likely adverse impacts in absence of mitigation measures	Nature of Impact	Proposed Mitigation Measures	
				Action to be taken	Implementing agency
4.	Biological Environment	<ul style="list-style-type: none"> ▪ Disturbance due to noise generating activities and increased vehicular traffic 	Significant and permanent	<ul style="list-style-type: none"> ▪ Effective implementation of traffic management plan to avoid traffic congestion and blocking of access roads ▪ Tree species to be planted which help to increase biodiversity like fruit bearing trees etc. ▪ Long term maintenance of green areas to retain biodiversity of the area as far as possible 	Project proponent
5.	Socio-Economic environment	<ul style="list-style-type: none"> ▪ Health issues due to increase in traffic ▪ Danger to life from accidents/ emergency situations or natural disasters like floods. 	Significant and permanent	<ul style="list-style-type: none"> ▪ Maintenance of road side plantation to prevent air/ noise pollution within site. ▪ Design and provision of traffic signs, traffic safety devices, pedestrian facilities etc. ▪ Adequate parking facility. ▪ Fire fighting provisions within the plot and buildings. ▪ Detailed DMP for implementation 	Project proponent

10.4 BUDGET FOR ENVIRONMENT PROTECTION MEASURES

The capital cost (budgetary) and recurring expenses (estimated) for various environment protection measures have been given in table below:

Table 10-5: Budget during the Operation Phase

Environment Protection Measures	Capital Cost (Rs. In lakh)	Recurring Cost per annum (Rs. In lakh)
Sewage Treatment Plant	310.0	45.0
Solid Waste Management	30.0	4.5
Rain Water Harvesting	340.0	22.0
Green Open Spaces/ Landscaped Areas	110.0	50.0
Energy Saving Features	400.0	40.0
Environmental Monitoring	0.0	15.0
Total	1,190.0	176.5

Thus, the project EMP entails a capital investment of Rs. 1,190.00 lakh and Rs. 176.50 lakh as recurring cost.

10.4.1 Updating of Environment Management Plan (EMP)

Implementation of EMP effectively is important but updating of EMP as and when required is the key of effecting environment management plan. Hence, the proponent shall improve the EMP periodically which will enable effective management of environmental aspects. ISO – 14001 – 2004 system can be used as reference for continual improvement in EMP & environmental performance.

CHAPTER 11. SUMMARY AND CONCLUSION

11.1 PROJECT SUMMARY

The project pertains to lateral development in the Non-Operational area (landside) of CSMIA excluding the airside area. In addition to lateral development, several uses and projects have been identified as part of proposed Non-Operational (cityside) development. Earlier, the project has received environmental clearance dtd. 1st July 2011 which has been revalidated on 20.12.2018 (vide letter no SEIAA-2018/CR-138 Est). At present, the proponent seeks an Amendment in Environment Clearance.

The amendment is due to change in FSI area from 4 to 5 due to modifications to Sanctioned Interim Development Plan & DCR of CSIANA and modifications in the development mix of non-operational (landside) area of CSMIA.

The total built-up area of Non-operational area in CSMIA has decreased from 28,15,737 sq.m. to 24,19,188 sq.m. i.e. decrease of 3,96,549 sq.m. (14.08%), whereas, the built-up area of the remaining 3 building projects is updated in view of updates in development mix/ proposed uses etc. The total built-up area of proposed buildings has increased from 4,98,440 sq.m. to 5,44,558.77 sq.m., and the total construction area has decreased from 8,86,883 sq.m. to 8,77,696.77 sq.m. i.e. change of -9,186.23 sq.m. (-1.04%).

A summary of the proposed environmental features including the project related resource requirements and other environmental infrastructure facilities for wastewater and construction waste management, along with biodiversity and socio-economic features are given in the following table:

Table 11-1: Summary of proposed Environmental Features

Sr.No	Environmental Parameter	For Entire Development	For Four Buildings
1	Water Requirement		
	Domestic (CMD)	7,038	1,338
	Flushing (CMD)	3,163	1,796
	Gardening (CMD)	853	93
	HVAC (CMD)	5,444	778
2	Sewage Generation (CMD)	9,497	1,996
	Recycled Water (CMD)	9,460	1,796
3	Solid Waste Generation		
	Dry waste (MT)	13	4
	Wet Waste (MT)	9	1.5
4	Power		

Sr.No	Environmental Parameter	For Entire Development	For Four Buildings
	Source and Requirement (MVA)	TATA Power – 120 MVA	TATA Power – 35 MVA
	DG Back-up	3.2 MVA for residential and 80 MVA for commercial areas. (40% for all essential services in residential areas and 100% backup for commercial areas)	6 nos. of 2,500 KVA, 10 nos. of 2,000 KVA, 4 nos. of 1,850 KVA, 5 nos. 1,500 KVA

11.2 SIGNIFICANT ENVIRONMENTAL IMPACTS

Potential negative environmental impacts of the proposed project which can be effectively mitigated as explained in this study, are listed below:

The predicted adverse impacts during construction and operation phases of the project are as follows:

- Temporary air/ dust and noise pollution during construction
- Generation of construction waste and debris in the area
- Possibility of surface/ ground water pollution due to construction water runoff
- Vehicular traffic
- Generation of sewage and kitchen waste.

Significant but temporary negative impacts are most likely to occur during the construction phase. However, the said negative impacts (listed above) are mitigable “and/ or” reversible, through engineering and scientific solutions incorporated in the present EMP, and in the monitoring plan.

The development work on the project site will be undertaken only after securing prior clearances from the MCGM, MMRDA and other authorities as required. For all works, the project proponent will have to obtain applicable clearances from the Maharashtra Pollution Control Board and other concerned authorities. The EMP will also be improved during implementation if there is any change in design or realignment (if deemed necessary).

11.3 FINDINGS AND RECOMMENDATIONS

The upcoming project is notable on account of the following:

1. There are no resettlement or relocation issues associated with this project. On the contrary, attempt will be made such that the eligible local youth are trained and employed in the project during construction and operation phases.
2. The project site is devoid of ecosystems such as Forest, Wetland, Mangroves, Bird Sanctuaries and Animal Migration Corridor. There are no mangroves or other endangered flora and fauna on the site.

3. The State Government has specifically approved the proposed development of the CSMIA Notified Area. The earlier project has a valid environmental clearance for which amendment is sought.
4. Existing road infrastructure will not be over-burdened and care would be taken during construction phase to minimize traffic related problems.
5. Mitigation measures during construction phase for controlling fugitive dust, noise and air pollution will be adopted.
6. Soil erosion prevention through dry season earthwork and “conservation/ use” of top soil for green belt development.
7. The proposed development will also have its own sewage treatment plants and treated waste water will be reused for purposes like flushing, HVAC and gardening.
8. Stormwater management and proposal for rain water harvesting in tandem with existing water drainage network
9. Waste collection during construction phase will be well organized through provision of waste segregation measures, optimum reuse and recycling mechanisms.
10. Waste management during operation phase consisting of waste collection terminals, disposal of the waste in MIAL’s existing waste management system along with recycling of organic waste including kitchen and food waste.
11. Use of renewable energy and energy efficient construction work
12. The greenery of the site will be enhanced with the proposed landscape development. Proposed design aims to retain the green character of the site through equally distributed green pockets throughout the site.
13. Proposed trees will be native and will support biodiversity in the long run.
14. A total capital investment of Rs. 1,190.00 lakh and Rs. 176.50 lakh as recurring cost for maintenance and operation has been envisaged for the implementation of the EMP.
15. A Disaster Management Plan is prepared which will be meticulously followed.

With the implementation of appropriate mitigation measures, the project will be socio economically viable and environmentally sustainable.

11.4 CONCLUSION

MIAL has been granted EC for landside development and construction of 6 buildings by SEIAA on 1st July, 2011 and the validity of the same has been extended vide SIEAA letter no. 2018/CR-138/Est dtd. 20th December, 2018. The project is under implementation and Building No.5 (MLCP-2) has already been constructed and is under operation.

Subsequently, GoM has approved modification/ changes in FSI due to which the project has undergone marginal/ minor changes in the overall builtup area and construction area as detailed in the report. It can be observed that the overall built-up area of landside development has reduced by 14.08%, whereas the total built-up area (FSI Area) of the 6

buildings (now 4 buildings as per amended proposal) has slightly increases, but is still within the total construction area as per valid EC mentioned above.

This has resulted in overall reduction in resource demand for the entire project, but an increase can be seen in the resource requirement for the 4 buildings. However, it shall be noted that the change in demand of utility is well within the current environment approval and hence no major environmental impacts are predicted as per the study carried out. Moreover, demand for most of the utilities has been reduced because of decisions in project development based on the demand assessment of proposed development mix.

Therefore, in view of the utility and services provisions adopted for Non-Operational Area Development (based on higher area under Non-Aeronautical/ Commercial use and higher Built Up Area considered in EC 2011) being on higher side in relation to demand for utility and services as per reduced overall built up area, the proposed infrastructure and utilities planned and under implementation as per earlier demand shall be adequate, even with increase in permissible plot level FSI from 4.0 to 5.0.

The projected demand for utility infrastructure shall be met in phases. Since the planned infrastructure is more than the current requirement considering redundancy, development-mix and connected factors, the proposed minor modifications in built-up and demand are environmentally sustainable.

The EIA report has thoroughly assessed all potential environmental impacts likely to be generated due to the amendment in the project proposal based on the existing baseline environmental status (monitoring period of summer 2019). These impacts are identified to be of temporary and reversible nature for which suitable mitigation measures are recommended.

The proposed mitigation measures recommended in this report for the project are sufficient. It can also be observed that all negative impacts, envisaged during the “post-construction and operation” phase of the project, present no major environmental and ecological concerns, and hence it can be concluded that the project is socio-economically and environmentally sustainable.

CHAPTER 12. DISCLOSURE OF CONSULTANTS ENGAGED

DETAILS OF ENVIRONMENTAL CONSULTANT

Aditya Environmental Services Pvt. Ltd.

Accredited by Quality Council of India – National Accreditation Board for Education and Training (NABET) Sr. No. 3 in A category

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Monitoring Laboratory

Aditya Environmental Services Pvt. Ltd.

Laboratory Approved by Ministry of Environment and Forests (MOEF)

ISO 9001: 2008 and OHSAS 18001 : 2007 certified

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ANNEXURES