Architectural Services Department

Programme No. 272RS

Kai Tak Multi-purpose Sports Complex

Environmental Impact Assessment Report

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(Main Text)

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1 INTRODUCTION

1.1 Background

1.1.1 In view of the growing population and general aspirations for healthy life and physical activities, the Hong Kong Government is planning for more sports grounds and indoor sports centres to make up for the general shortage in Hong Kong. Based on population projection, a shortfall of sports centres and standard sports ground in East Kowloon is anticipated. With overwhelming support from the sports communities and the local communities including district councils, the Hong Kong Government has proposed building a Multi-purpose Sports Complex at Kai Tak (hereafter called "Kai Tak Multi-Purpose Sports Complex" or "the Project") which will provide high-quality sports facilities to help alleviate Hong Kong's shortage of public sports facilities and will also provide new venues suitable for hosting major local and international sports events. The Project will comprise a main stadium which shall be multi-functional to optimize utilization and to deliver a spectator experience. The Project will mainly cater for a wide range of major sports events but will also provide venues for other infrequent non-sports activities such as concerts, exhibitions, carnivals, etc.

1.1.2 A Comprehensive Planning and Engineering Review of South East Kowloon Development (SEKD) was commenced in 2004 and a Preliminary Outline Development Plan (PODP) was first prepared. In 2007, Civil Engineering and Development Department (CEDD) of HKSAR commissioned the "Kai Tak Development Engineering Study" including a Schedule 3 Environmental Impact Assessment (EIA) Study, to confirm the feasibility of the proposed development as recommended in the PODP. The Kai Tak Multi-purpose Sports Complex is one of the key components in the PODP. Besides, the statutory Kai Tak Outline Zoning Plan was formulated in 2007 with subsequent changes made in 2009. The latest Kai Tak OZP (No. S/K22/4) was approved in 2012 with the Project as a planned development.

1.1.3 The environmental impacts of the Project have been broadly addressed in the Schedule 3 EIA report for the Kai Tak Development (KTD), which was approved under the Environmental Impact Assessment Ordinance (EIAO) on 4 March 2009. The approved EIA report for the KTD recommended that a further EIA study is required under the EIAO to address the potential environmental impacts of the Project in detail given that the Project has been identified as a designated project under Schedule 2 of the EIAO.

1.2 The Project

1.2.1 The Project site covers a land area of about 28.2 hectares. It is bounded by Central Kowloon Route to the south and dissected by Road D2 in the middle. It is a multi-purpose complex comprising a 50,000-seat Main Stadium, a 7,000-seat Public Sports Ground, an Indoor Sports Centre, and other ancillary/supporting facilities such as car parking spaces, hotel, office area for sports-related organizations and a commercial area. The location and details of the facilities are illustrated in **Figure 1-1**. More detailed description of the Project is given in **Chapter 2**.

1.3 Designated Projects

1.3.1 The Project contains the following designated project elements under Part I, Schedule 2 of the EIAO:

- Item O.6 – An open air concert venue with a capacity to accommodate more than 10,000 persons; and
- Item O.7 – An outdoor sporting facility with a capacity to accommodate more than 10,000 persons.

1.3.2 A project profile (No. PP-509/2014) was submitted by the Architectural Services Department (ArchSD) to EPD for application of an EIA study brief under Section 5(1)(a) of the EIAO on 3 June 2014. An EIA Study Brief (No. ESB- 274/2014) was issued by the Environmental Protection Department (EPD) on 16 July 2014.

1.4 Objectives of the EIA Study

1.4.1 The objective of this Assignment was to carry out an EIA to investigate the environmental acceptability during construction and operation of the Project. Potential environmental impacts were identified and evaluated with recommendations on appropriate mitigation measures. In accordance with Clause 2.1 of the EIA Study Brief, the objectives of the EIA study were:

(i) to describe the Project and associated works together with the requirements and environmental benefits for carrying out the Project;

(ii) to identify and describe elements of community and environment likely to be affected by the Project and/or likely to cause adverse impacts to the Project, including natural and man-made environment and the associated environmental constraints;

(iii) to provide information on the consideration of alternative options of the Project including alternative siting, scale/size, extent, layout, configuration/orientation, design, transport linkage, people dispersion routes/methods after major sports/non-sports events and construction methods with a view to avoiding and minimizing potential environmental impacts to environmentally sensitive areas and sensitive uses; to compare the environmental benefits and dis-benefits of different options; to provide reasons for selecting the preferred option(s) and to describe the part environmental factors played in the selection of preferred option(s);

(iv) to identify and quantify emission sources, including air and gaseous emission, noise emission, sewage and wastewater emission, waste generation and contaminated material generation and determine the significance of impacts on sensitive receivers and potential affected uses;

(v) to identify and quantify any potential losses or damage to flora, fauna and natural habitats;

(vi) to identify and systematically evaluate any potential landscape and visual impacts and to propose measures to mitigate these impacts;

(vii) to identify any negative impacts on sites of cultural heritage and to propose measures to mitigate these impacts;

(viii) to propose the provision of infrastructure or mitigation measures so as to minimize pollution, environmental disturbance and nuisance during construction and operation of the Project;

(ix) to investigate the feasibility, practicability, effectiveness and implications of the proposed mitigation measures;

(x) to identify, predict and evaluate the residual environmental impacts (i.e. after practicable mitigation) and the cumulative effects expected to arise during the construction and operation phases of the Project in relation to the sensitive receivers and potential affected uses;

(xi) to identify, assess and specify methods, measures and standards to be included in the detailed design, construction and operation of the Project which are necessary to mitigate these environmental impacts and cumulative effects and reduce them to acceptable levels;

(xii) to investigate the extent of the secondary environmental impacts that may arise from the proposed mitigation measures and to identify constraints associated with the mitigation measures recommended in the EIA study, as well as the provision of any necessary modification; and

(xiii) to design and specify environmental monitoring and audit requirements to ensure the effective implementation of the recommended environmental protection and pollution control measures.

1.5 Scope of the EIA Study

1.5.1 This EIA report addresses all key potential environmental issues associated with the construction and operation phases of the Project as specified under Clause 3.2 of the EIA Study Brief:

(i) potential air quality impact on sensitive receivers during construction and operation of the Project, including dust emissions during construction, odour, vehicular (including traffic generated from the Project) and other air emissions during operation;

(ii) potential hazard to life impact during the construction and operation of the Project due to the potentially hazardous facilities, including in particular the Ma Tau Kok Gas Works and all associated facilities;

(iii) potential noise impact on sensitive receivers during construction and operation of the Project, including noise generated by construction activities, noise arising from sports as well as non-sports events of the Project (e.g. noise from the public address system and noise from human activities, etc.), traffic noise (including traffic generated from the Project) and fixed plant noise during operation;

(iv) potential water quality impact on relevant water system(s) including the Victoria Harbour (Phase One and Phase Two) Water Control Zone and relevant water sensitive receivers during construction and operation of the Project;

(v) potential sewerage and sewage treatment implications arising from the Project;

(vi) potential waste management implications arising from the construction and operation of the Project, including handling and disposal of construction and demolition materials, chemical waste, food waste and general refuse;

(vii) potential land contamination impact arising from the Project;

(viii) potential ecological impact, including habitat loss and fragmentation during construction and operation of the Project;

(ix) potential landscape and visual impacts due to the construction and operation of the Project; and

(x) potential cultural heritage impact during construction and operation of the Project; and

(xi) potential cumulative environmental impacts of the Project, through interaction or in combination with other existing, committed and planned projects such as Central Kowloon Route, Shatin Central Link, Trunk Road T2, Roads D2 & D3, Metro Park and Station Square in KTD, etc. in the vicinity of the Project, and those impacts which may have a bearing on the environmental acceptability of the Project.

1.6 Structure of EIA Report

1.6.1 The EIA Report comprises the following Chapters:

- Ch. 1 Introduction
- Ch. 2 Project Description
- Ch. 3 Air Quality Impact Assessment
- Ch. 4 Hazard to Life Assessment
- Ch. 5 Noise Impact Assessment
- Ch. 6 Water Quality Impact Assessment
- Ch. 7 Sewerage and Sewage Treatment Implications
- Ch. 8 Waste Management Implications
- Ch. 9 Land Contamination Assessment
- Ch. 10 Terrestrial Ecological Impact Assessment
- Ch. 11 Landscape and Visual Impact Assessment
- Ch. 12 Cultural Heritage Impact Assessment
- Ch. 13 Environmental Monitoring and Audit Requirements
- Ch. 14 Implementation Schedule of Mitigation Measures
- Ch. 15 Environmental Outcomes
- Ch. 16 Conclusion

2 PROJECT DESCRIPTION

2.1 General Description of the Project

2.1.1 The Kai Tak Multi-purpose Sports Complex (the MPSC or the Project) is situated in the North Apron Area of the Kai Tak Development (KTD) site. The site area is about 28.2 hectares. The location of site is indicated as “Other Specified Use” annotated “Stadium” on the approved Kai Tak Outline Zoning Plan No. S/K22/4. It is surrounded by a few major transport links, including the proposed Shatin to Central Link (SCL) tunnel to the north, Central Kowloon Route (CKR) to the south and the possible provision of environmentally friendly linkage system (EFLS) to the east. Road D2 which is under construction will dissect the site into two portions. The Project site, which is in the heart of KTD, is considered as a suitable location for the development of the Multi-purpose Sports Complex.

2.1.2 The proposed multi-purpose complex comprises a 50,000-seat Main Stadium, a 7,000-seat Public Sports Ground, an Indoor Sports Centre, and other ancillary/supporting facilities such as car parking spaces, hotel, office area for sports-related organizations and a commercial area. An application for planning permission under s16 of the Town Planning Ordinance will be submitted to the Town Planning Board for the development of a hotel of a suitable scale within the MPSC and the relaxation of the building height restriction for the Main Stadium. The master layout plans of the Project are shown in **Figures 2-1a** and **2-1b**.

2.2 Need of the Project

2.2.1 The HKSAR Government’s strategic policy for developing sports in Hong Kong has three objectives: (a) to promote sports in the community, (b) to support elite sports, and (c) to make Hong Kong a centre for major international sports events. Sports facilities are provided in accordance with the above policy objectives.

2.2.2 Hong Kong has a general shortage of public sports facilities. Based on the Hong Kong Planning Standards and Guidelines and the population projection for East Kowloon (including the Kowloon City, Kwun Tong and Wong Tai Sin Districts), there will be a shortfall of three sports centres and one standard sports ground by 2021.

2.2.3 Hong Kong also lacks up-to-date venues for staging major international sports events. The existing ageing venues have insufficient seating capacity and lack appropriate supporting facilities and flexibility in operation.

2.2.4 A Comprehensive Planning and Engineering Review of South East Kowloon Development was commenced in 2004. The Planning Department commissioned the Kai Tak Planning Review (KTPR) as Part I of the Comprehensive Review. Three stages of extensive public participation and engagement were carried out under KTPR from 2004 till 2006.

2.2.5 A Preliminary Outline Development Plan (PODP) was formulated as an outcome of the KTPR. The Project was identified as an anchor of the KTD. One of the conclusions of KTPR was that “The community’s views envisage Kai Tak as a hub of sports, recreation, tourism and entertainment.” It was also considered that the events at the Stadium Complex “will be a significant catalyst to re-activate and re-energize the waterfront”.

2.2.6 Based on the PODP, a Kai Tak Outline Zoning Plan was drafted and later approved by the Chief Executive in Council under the Town Planning Ordinance.

2.2.7 Part II of the Comprehensive Review was an engineering feasibility study, which included an EIA study under Schedule 3 of the EIAO. The EIA report was approved by EPD on 4 March 2009. The feasibility of the PODP was confirmed and a Recommended Outline Development Plan (RODP) was formulated. The latest RODP is provided in **Appendix 2B**.

2.2.8 To sum up, the development of a multi-purpose sports complex is a long-awaited project with overwhelming support from the communities including District Councils and the sports sector. It has been planned as a key component of the KTD, and the general feasibility has been established. It will provide new venues suitable for hosting major local and international sports events and help alleviate Hong Kong's shortage of sports facilities and open space for the community. In this sense, the Project makes a direct and significant contribution to realize the Government's policy objectives for sports development.

2.2.9 Without this Project, the site will likely remain for a longer period as a large piece of construction site and carparks. Not only is the view unpleasant, the exposed ground is susceptible to soil erosion. The current land uses are also incompatible with the future surrounding development, not to mention that the demand for sports facility remains unmet. Upon completion of the MPSC, the landscaped area will be grown with vegetation that will help preventing soil erosion and enhancing the landscape and visual quality of the area. The design of the MPSC will be coherent with the surrounding KTD Area in the future. The operation of facilities inside the Project would create job opportunities. The Main Stadium will also serve as a landmark facility in the Project.

2.3 Project Programme

2.3.1 The construction works of the Project are scheduled to commence in 2017 for completion in 2020/2021. The Project is scheduled to commission in 2021.

2.4 Concurrent Projects

2.4.1 During the construction period of the Project, the potential concurrent construction works in the vicinity (500 m from the Project Site) are set out below.

Table 2-1 List of Concurrent Projects

No.	Project	Time Line
1	East Portion of Central Kowloon Route (CKR)	Scheduled for completion in 2021 but possible delay of at least 2 years based on the latest information
2	Reconstruction and Upgrading of Kai Tak Nullah	Scheduled for completion in April 2018
3	Kai Tak Development Stage 4 (Road D2 construction)	Scheduled for completion in 3rd quarter of 2017

No.	Project	Time Line
4	North Apron Remaining Infrastructure	Scheduled for completion in late of 2021
5	Kai Tak Approach Channel and Kwun Tong Typhoon Shelter Improvement Works (Phase 2)	Scheduled for completion in December 2018
6	Shatin Central Link (SCL)	Scheduled for completion in 2019 based on the latest information

2.5 Consideration of Alternative Development Options

2.5.1 In order to fulfil the requirements for international sports events, the Main Stadium is not envisaged as a stand-alone facility. It will be accompanied by a range of supporting facilities that will create a critical mass of development for producing a dynamic and vibrant sports environment. Associated facilities comprise a public sports ground, an indoor sports centre, a warm-up track, a nursery site for maintaining palletised grass when not required for stadium events, car parking, servicing areas, circulation areas, and commercial support provision in the form of hotel, retail, etc. It was estimated that these facilities would require a site of up to 24 hectares.

2.5.2 The Home Affairs Bureau carried out the "Study on Requirements for Major New Sports and Recreation Venues" in 2001 and the findings of the study were updated in 2005.

2.5.3 The 2001 study identified and examined 8 candidate sites that might best accommodate such a sports complex. The assessment criteria for determining the suitability are listed below:

(a) *Land Costs*: The preferred site should be located on Government land, preferably previously identified for stadium development. The potential use and value of the land for other uses (e.g. housing development) or other Government, Institution or Community ("G/IC") facilities to meet district deficit or for long term planning should be considered.

(b) *Compatibility with Surrounding Existing and Proposed Land Uses*: The preferred site should be in an area where adjacent uses have a compatible zoning, i.e. open space, other "G/IC" uses. The adjacent uses should complement the stadium, i.e. sports related uses.

(c) *Proximity to Candidate Use Groups*: The stadium should be located in proximity to users.

(d) *Design Flexibility*: There would be more flexibility in designing a brand new stadium than to upgrade or provide temporary structures at existing venues ill-suited to accommodate large-scale spectatorship.

(e) *Availability of Public Transport Facilities*: Mass transit access is desirable. At minimum, good public access to the site should be achievable. The site should also have comprehensive pedestrian links to all the Public Transport Interchanges. A user-friendly pedestrian environment should also be achievable ensuring easy access and evacuation from the venue.

(f) *Traffic Capacity*: There should be a comprehensive road or rail network, linking the area with other parts of the territory. Multiple road accesses should be achievable.

(g) *Natural Environment*: The site should be set in a pleasant environment. It should be set within a comprehensively designed and conceived landscape framework.

(h) *Environmental Concerns*: Sensitive receivers should not be located in close proximity to the site, e.g. residential uses. The surrounding land uses should also not create adverse impacts to the stadium.

(i) *Infrastructure Capacity*: There should be adequate infrastructure capacity (e.g. roads, drainage, sewerage, electricity, cabling, etc.) to serve a large stadium.

(j) *Land reclamation*: The land should preferably be formed and ready for construction. Land formation would take extra time if stadium is built on newly reclaimed land.

2.5.4 The identified locations and their evaluation of suitability are summarized as follows:

(i) **Northshore Lantau**: It was proposed developing northshore Lantau on reclaimed land. The land may accommodate a new stadium. However, the location is too isolated and remote. The distance may discourage people from using the stadium. From the environmental point of view, it is difficult to justify the reclamation for building a stadium if there are alternative sites. The air quality in the area would also be undesirable for international athletes.

(ii) **West Kowloon Reclamation**: The West Kowloon Reclamation has been developed into a cultural district. A stadium would not be compatible with the existing development. In addition, the space there was not adequate for a stadium of international standards.

(iii) **Tseung Kwan O**: The previously identified site would be amidst existing adjacent residential areas. The area was not earmarked for stadium use and has been subsequently zoned into new residential areas. Noise disturbance from the sports events would be unacceptable for the residents. The compatibility of the stadium with its environment remained a question.

(iv) **Kai Tak Development**: KTD has allocated a site for stadium development. It is located at the southwest of the former airport apron and has been planned to be compatible with its surroundings. The size of the site is adequate for an international stadium. The site is easily accessible by vehicles and will be served by two future SCL stations. The unique location makes the stadium a new landmark for Hong Kong. According to international experiences, the development of an international stadium would also help regenerate the old industrial districts surrounding KTD.

(v) **Mei Foo**: A four-hectare site had been allocated for a regional stadium. It is located in the metro area served by public transport. However, the size of the site and vehicular access to the site cannot support the requirement for an international stadium. The adjacent residents would also object such a development.

(vi) **Tuen Mun**: A 6.35 hectare site has been designated for stadium use. There is a swimming complex and indoor gymnasium nearby. The site is served by Light Rail Transit but not Mass Transit Railway nor major roads. The site area is not sufficient for a stadium of international standards and there are existing residential areas next to the site.

(vii) **Victoria Park**: Victoria Park is well connected with public transport and commercial facilities. However, the current facilities in the park are highly utilized by the public and objections are anticipated for a stadium in the park. The road capacities in the future may not be enough for supporting such a stadium. Furthermore, the proximity of the Hong Kong Stadium to the location is considered undesirable for a mega sports venue.

(viii) **Pak Shek Kok**: A reclamation area next to the Hong Kong Science Park had been zoned for recreation purposes, but subsequently rezoned as residential area. It could accommodate a stadium but not the associated facilities for an international venue. Access to the site could not sustain such a stadium.

2.5.5 It is concluded that the site inside the KTD is most suitable for the stadium development. The planning of the stadium had been incorporated in the KTPR. The layout of the site has been laid down so that the Main Stadium is located by the waterfront. After considering all the key factors including environmental factors in the option selection, the proposed multi-purpose sports complex in KTD is the preferred option to avoid and minimize adverse environmental effects to the maximum practicable extent.

2.6 Consideration of Alternative Construction Methods and Sequences of Works

Construction Activities

2.6.1 Major works of the Project are anticipated to commence in 2017. Pre-construction works for the Project, such as, topographic survey, tree survey, utility survey and ground investigation, will commence in late 2016 for completion by 2017. Concurrent projects which are located in close proximity to the Project site have been scheduled before and after 2017 for construction as detailed in **Section 2.4** above. BEAM Certification and building information management (BIM) will be adopted during the Project design and various building phases so as to enhance the quality of development for ensuring that environmental considerations are fully integrated right at the design, planning, construction and operation stages.

2.6.2 Though precast and prefabrications are carried out outside the Project site, the contractor of the pre-casting and prefabrication activities will adopt good management practices and appropriate pollution control measures to minimize any environmental impacts arising from the casting yards and fabrication workshops.

2.6.3 Upon taking over the site, the Project Contractor's focus should be on boundary hoarding, site accommodation and secure storage areas, temporary utilities, such as power/water supply, setting out and clearance of debris and the temporary site traffic routes, ingress and egress from site to the nearby barging point. It will be important to survey the extent and usefulness of the former airport concrete hard standing which remains vacant. If removal of this concrete slab is deemed necessary using saw cutting, or other heavy duty concrete breaking equipment, dust suppression, watering and noise attenuation measures will be provided as necessary. A Construction Waste Management Plan will be implemented.

2.6.4 In the North Sector, it is likely that steel H-piles will be adopted for the Public Sports Ground and Indoor Sports Centre. Vibration or hydraulic ram equipment should be adequate for initial penetration, to minimize noise emissions, but percussive equipment will be necessary to achieve a final set to satisfy the acceptance criteria of individual piles. Provisions will be made for coring through rock and boulders, and rock sockets. Piling equipment will be suitably shielded or enclosed to comply with noise emission requirements. Generally pile caps will be designed to provide an overall efficient system together with the piling layout so as to minimize excavation, and in particular excavation below ground water level, and thus minimise the operation time of power mechanical equipment. For pile caps below 2.5m deep and basement construction, however, steel sheet piling or equivalent support, i.e. excavation and lateral support (ELS) will be necessary for excavated faces, and to provide a cut-off below the relatively high ground water level. ELS system will be required for excavation deeper than 2.5m and greater than 5.0m in length and as the works may affect any roads, building structures, slopes steeper than 30° or water mains of 75mm in diameter or greater, the affected area being defined as within 45° line up from the base of the excavation to the ground surface. Removal of excavated materials by road vehicles will be strictly controlled, with washing facilities at site exit points and the covered loads will be sent to the disposal areas designated by Civil Engineering and Development Department (CEDD) and EPD. Whenever possible, the adjacent existing marine barging point will be used for off-site disposal. Working within the protection areas adjacent to the existing Kai Tak Tunnel will require special protection measures, including temporary steel casting for piling works and grouting or similar for ground improvement. Drainage and other services will be installed, as the working areas become available.

2.6.5 In the South Sector, the foundation for Main Stadium and hotel/office blocks will likely be steel H piles. The piles will be founded on rock, at a depth of 40 to 50 metres below ground and will be constructed with appropriate means to contain noise emissions. Concrete supplies will come from off-site plants. Disposal of excavated materials will be facilitated by using existing barging point near the south boundary of the Project site.

2.6.6 Conventional concrete structures with a long span steel roof will be proposed for the Public Sports Ground and Indoor Sports Centre. Precast concrete elements like spectator stands, stairs will be extensively used as an alternative to in situ concreting to minimize environmental impacts arising from the concrete mixing on-site. The structures are relatively conventional, and the dust and noise emissions and visual impacts from construction activities can be readily controlled within statutory limits. Early construction of the podium deck crossing Road D2 from above will facilitate working access between the North and South Sectors. The hotel-office blocks are likely to be on reinforced concrete structures, which will be constructed using conventional method. Metal temporary works and metal scaffolding with appropriate screening will be adopted to contain noise, minimize visual impact and airborne emissions.

2.6.7 Construction of the Main Stadium will be the most visible activity of the works on-site. The Main Stadium is assembled from heavy and large steel trusses, requiring specialist lifting plants. The steel trusses are fabricated off-site and the secondary back-up structures and spectator stands would likely be reinforced concrete pre-cast off-site. Access to marine landing facilities will reduce reliance on surrounding roads. The special retractable roof system will be a particular highlight. All equipment and specialist plants will be operated strictly in accordance with statutory noise and dust limits apart from construction safety and any applications for night-works to the Authority should be made only with full justification.

2.6.8 Activities during fitting-out will largely be inside completed building envelopes, so that the works are shielded and thus noise or lighting impacts are minimized. The exception will be building facades, utility connections and external works on hard and soft landscaping, including tree planting, greening and paving works, which are generally daytime activities. In the event that special structures are necessary to contain noise emissions from crowd flows at night-time, such works will be completed during this stage along with the fitting-out.

2.6.9 Miscellaneous finishing works will be in progress during the day-time across the whole of the Project, but these will not be major in nature. Night-time works if necessary will be limited to areas shielded from exterior view.

Alternative Construction Sequence

2.6.10 The proposed construction sequence is based on conventional bottom up construction starting from site clearance, site formation, foundation, superstructure, Mechanical and Electrical (M&E) plants installation, utilities, finishes and external works. The tentative construction programme is shown in **Appendix 2A**.

2.6.11 As the Project site covers approximately 28.2 hectares, it will be practical, economical and environmentally friendly to carry out construction works in geographical zones with construction procedures following **Sections 2.6.1 to 2.6.9** for each zone so as to minimise any cumulative environmental impact. The proposed zoning sequence is shown in **Figure 2-2**. In implementing this zoning sequence, the construction programme of Road D2 which separates the site into two sectors shall be addressed such that the overhead decks at Zones N1 and N4 are constructed to facilitate smooth construction within Project site as a whole. Furthermore, the sewerage connections, as given in **Chapter 7**, and construction material/waste delivery routes, as given in **Chapter 8**, are designed to ensure a smooth interface with the construction of Road D2.

Alternative Construction Method

2.6.12 The construction method will likely be dominated by the Project contractor(s). However, prefabricated construction method should be adopted as far as practicable to minimise material waste and impact caused by noise and dust. The prefabricated construction method will be implemented as contract requirements. Marine access is planned for delivery of prefabricated units direct to the site.

2.7 Selection of Preferred Scenario

2.7.1 Having regard to the findings in **Sections 2.2** and **2.5**, including the consideration of environmental factors, the subject site inside the KTD is considered most suitable for the development of the proposed multi-purpose sports complex.

2.7.2 As discussed in **Section 2.6**, alternative construction methods and sequences of construction works have been considered to maximize the environmental benefits and avoid/minimize adverse environmental impacts arising from the Project. Details of the technical assessments for various environmental issues are provided in later chapters in this EIA report.

3 AIR QUALITY IMPACT ASSESSMENT

3.1 Introduction

3.1.1 This Chapter presents an air quality impact assessment for the construction and operational phases of the Project. By nature of their uses, the Main Stadium, the Public Sports Ground, the Indoor Sports Centre and the associated hotel and office blocks in this Project are also considered air sensitive receivers and the air quality impact on the future uses of these facilities is addressed in this Chapter.

3.1.2 The Project by itself is not an air pollutant source; however, the traffic induced by the operation of the Project may cause additional air quality impact on sensitive receivers along the traffic routes in the area. In this connection, apart from the air sensitive receivers within the boundary of the Project, the operational phase air quality assessment also covers all the existing, committed and planned sensitive receivers within the Study Area where air quality may be potentially affected by the Project. In accordance with Section 3.4.3.2 of the EIA Study Brief, the Study Area is defined by a distance of 500m from the boundary of the Project site, with consideration to be extended to include major existing, planned and committed air pollutant emission sources that may have a bearing on the environmental acceptability the Project. **Figure 3-1** shows the Study Area for air quality impact assessment of the Project.

3.2 Environmental Legislation, Policies, Plans, Standards and Criteria

3.2.1 The criteria and guidelines for evaluating and assessing air quality impact are stated in Section 1 of Annex 4 and Annex 12 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM).

Air Pollution Control Ordinance

3.2.2 The Air Pollution Control Ordinance (Cap. 311) provides for the control of air pollutants from a variety of stationary and mobile sources through the establishment of a set of Air Quality Objectives (AQOs). As of 1st January 2014, a new set of air quality objectives which stipulates maximum concentrations for a range of pollutants, namely nitrogen dioxide (NO_2), sulphur dioxide (SO_2), respirable suspended particulates (RSP or PM_{10}), fine suspended particulates (FSP or $PM_{2.5}$), carbon monoxide (CO), photochemical oxidants (O_3) and lead (Pb) has been in force. The AQOs are listed in **Table 3-1** below.

Table 3-1 Hong Kong Air Quality Objectives

Pollutant	Averaging time	Concentration limit [i] ($\mu g/m^3$)	Number of exceedances allowed
Sulphur dioxide	10-minute	500	3
	24-hour	125	3
Respirable suspended particulates (PM_{10}) [ii]	24-hour	100	9
	Annual	50	Not applicable
Fine suspended particulates ($PM_{2.5}$) [iii]	24-hour	75	9
	Annual	35	Not applicable
Nitrogen dioxide	1-hour	200	18
	Annual	40	Not applicable
Ozone	8-hour	160	9
Carbon monoxide	1-hour	30,000	0
	8-hour	10,000	0
Lead	Annual	0.5	Not applicable

Note:
[i] All measurements of the concentration of gaseous air pollutants, i.e., sulphur dioxide, nitrogen dioxide, ozone and carbon monoxide, are to be adjusted to a reference temperature of 293Kelvin and a reference pressure of 101.325 kilopascal.
[ii] Respirable suspended particulates means suspended particles in air with a nominal aerodynamic diameter of 10 µm or less.
[iii] Fine suspended particulates means suspended particles in air with a nominal aerodynamic diameter of 2.5 µm or less.

3.2.3 For construction dust, Annex 4 of EIAO-TM specifies a TSP limit concentration averaged over a 1-hour period to be 500 $\mu g/m^3$. Mitigation measures for construction sites have been specified in the Air Pollution Control (Construction Dust) Regulation (Cap. 311R). It also requires contractors and site agents to inform EPD and adopt dust reduction measures while carrying out "Notifiable Works" or "Regulatory Works" as defined under the regulation. Works relevant to this Project include both "Notifiable Works" (site formation, construction of foundation and superstructure of a building) and "Regulatory Works" (stockpiling of dust materials, site clearance).

3.3 Identification of Key Air Pollution Parameters

Construction Phase

3.3.1 The major construction works of the Project would be piling, pile cap construction and backfilling, works for basement structures, superstructure, installation of steel frame and retractable roof of the Main Stadium, builder's works, external works and landscaping works. During the construction phase of the Project, dust would arise primarily from:

- Heavy construction works (piling, pile cap construction, backfilling, basement construction and foundation); and
- Wind erosion of open sites.

3.3.2 Dust emissions from stockpiling are considered as part of wind erosion of open sites for the whole construction site of the Project.

3.3.3 As all construction site vehicles must be washed at the entrance of the site before leaving and after arriving the site, dust emissions from construction vehicle movements out of the site should be insignificant. By adopting the heavy construction emission factor in USEPA AP-42 in the assessment which includes dust emissions from construction vehicle movements inside the construction site, no additional consideration of dust emissions from paved haul roads within the construction site is needed.

3.3.4 For the purpose of the construction dust assessment, 1-hour TSP, 24-hour RSP, annual RSP, 24-hour FSP and annual FSP concentrations have been adopted for the assessment.

Operational Phase

3.3.5 The Air Pollutant Control Ordinance (APCO) (Cap. 311) defines statutory Air Quality Objective (AQO) for 7 common air pollutants including NO_2, SO_2, RSP, FSP, CO, O_3 and lead. According to Appendix A of Section 5(ii) of the EIA Study Brief, representative air pollution parameters including types of pollutants and average time concentrations shall be determined.

3.3.6 The emission sources during the operational phase of the Project would be the vehicular emissions from both the new and existing roads. Nitrogen dioxide (NO_2), respirable suspended particulates (RSP), and fine suspended particulates (FSP) are the key criteria pollutants for assessment of the air quality impact in this Project. Apart from the vehicular emission sources, industrial chimneys and ventilation buildings within 1km from the boundary of project site, as well as the emissions from the To Kwa Wan Typhoon Shelter and Kai Tak Cruise Terminal are also emission sources for the assessment. Therefore, the AQOs for 1-hr NO_2, annual NO_2, 24-hr FSP, annual FSP, 24-hr RSP and annual RSP have been identified as key assessment criteria.

3.3.7 In Hong Kong, sulphur dioxide (SO_2) comes primarily from the combustion of sulphur-containing fossil fuels in power stations and marine vessels. A statutory requirement had been laid down since April 2002 to restrict vehicles to use ULSD (Ultra Low Sulphur Diesel) with a sulphur content of less than 0.005% and the requirement has been further tightened to a sulphur content of less than 0.001% from 1 July 2010 onward. Therefore, emission of SO_2 from vehicles is no longer a significant source. Although the Project is unlikely to contribute a significant amount of SO_2 to the environment, the SO_2 from industrial chimneys, the typhoon shelter and the cruise terminal in the vicinity may have an impact on the Project. Therefore, the AQOs for 10-min and 24-hr SO_2 are also identified as assessment criteria.

3.3.8 Carbon monoxide (CO) is one of the primary pollutants emitted by road transport. However, monitoring results from all of the EPD's air quality monitoring stations show that background CO concentrations are consistently well below the respective criteria. With respect to the compliance of the cumulative impact with the relevant AQO criteria, CO is therefore considered to be non-critical and it is not necessary to be quantitatively assessed. Ozone (O_3) is formed from dioxygen by the action of ultraviolet light and also atmospheric electrical discharges. It is not a primary pollutant in vehicular emissions and thus is not considered as a key criteria pollutant for this Project.

3.3.9 Leaded petrol had been banned in Hong Kong since 1999. As such, it is not considered a key pollutant in vehicular emissions.

3.3.10 To sum up, the following pollution sources are relevant during the operational phase and have been assessed in this Project:

i. Background pollution concentrations;
ii. Vehicle emissions from existing and proposed open road networks within 500 m from the site boundary;
iii. Emissions from portals and ventilation buildings within 500m from the site boundary;
iv. Emissions from To Kwa Wan Typhoon Shelter;
v. Marine emissions from Kai Tak Cruise Terminal; and
vi. Industrial chimneys within 1km from the site boundary.

3.4 Air Sensitive Receivers

3.4.1 In accordance with Annex 12 of the EIAO-TM, any domestic premises, hotel, hostel, hospital, clinic, nursery, temporary housing accommodation, school, educational institution, office, factory, shop, shopping centre, place of public worship, library, court of law, sports stadium or performing arts centre are considered as air sensitive receivers (ASRs).

3.4.2 In accordance with Section 3.4.3.2 of the EIA Study Brief, the air quality impact assessment area is defined by a distance of 500m from the boundary of the Project. The Study Area for air quality impact assessment in this Project is shown in **Figure 3-1**.

3.4.3 Based on the Project construction programme, the construction works shall start in 2017 for completion by 2020/2021. For the planned ASRs without any tentative schedule for completion under the latest Recommended Outline Development Plan (e.g. sub-planning area 2A, 2B, 1K, 1L), it has been assumed that the population intake at these ASRs would be after the completion year of the Project and hence no representative ASRs were selected for the construction phase impact assessment. Nevertheless, the air pollutant concentrations at the general locations of these planned ASRs within the Study Area are presented in the cumulative contour plots for both unmitigated and mitigated scenarios.

3.4.4 The identified ASRs within the Project site include the Main Stadium, Public Sports Ground, and the possible fresh air intake locations for the Indoor Sports Centre, offices and hotel.

3.4.5 ASRs located along the roads with traffic induced by the operation of the Project have been identified for evaluating the potential air quality impact due to the operation of the Project. The major traffic routes include Road D2, Sung Wong Toi Road, To Kwa Wan Road, Kowloon City Road, Shing Kai Road, Olympic Avenue and Prince Edward Road East, etc.

3.4.6 The assessment heights were taken at 1.5m, 5m, 10m, 20m above ground and so on up to the maximum building heights of the respective ASRs. The ASRs are listed in **Table 3-2**. Locations of ASRs in the construction phase and operational phase are shown in **Figure 3-2A** and **Figure 3-2B** respectively.

Table 3-2 Summary of Air Sensitive Receivers

ASR ID	Location	Land Use[i]	Lowest Assessment Level	H[ii]	Dc[iii]	Do[iii]	C[v]	O[vi]
	Prince Edward Road East (Existing ASRs)							
A1	Shek Ku Lung Road Playground	L	1.5	1.5	200	15	✔	✔
A2[vii]	Regal Hotel	R	20	40	300	8	✔	✔
A3	South Mansion	R	1.5	19	170	23	✔	✔
A4	Jenford Building	R	1.5	13	93	6	✔	✔
	Ma Tau Chung Road (Existing ASRs)							
A5	Holy Trinity Church	RE	1.5	12	-	10	✖	✔
A5a	Kam Wah Building	R	1.5	50	-	6	✖	✔
A6	Parc 22	R	1.5	33	200	8	✔	✔
A16	Sung Wong Toi Playground	L	1.5	1.5	117	7	✔	✔
	Ma Tau Kok Area/ Kowloon City Road (Kai Tak Tunnel West Portal) (Existing ASRs)							
A7[vii]	Sky Tower	R	20	165	78	4	✔	✔
A11	Kam Tong Building	R	1.5	34	-	3	✖	✔
A12	Kowloon City Road No.179-183	R	1.5	16	-	4	✖	✔
A14	Mok Cheong Street Residential District	R	1.5	22	-	4	✖	✔
A15	Po Sing Mansion	R	1.5	36	-	5	✖	✔
	To Kwa Wan Area (Existing ASRs)							
A8[vi]	HK Society for Blind Hostel (facing To Kwa Wan Road)	R	5.0	9	-	7	✖	✔
A9	Mok Cheong Street Residential District	R	1.5	14	158	5	✔	✔
A10	Grand Water Front (facing To Kwa Wan Road)	R	1.5	171	-	5	✖	✔
A13	Mok Cheong Street Residential District	R	1.5	22	239	3	✖	✔
A17	Fire Station	G	1.5	10	31	-	✔	✖
A18	Lung To Street No.208	R	1.5	9	186	-	✔	✖
A19	HK Society for Blind Hostel (facing Project Site)	R	1.5	9	97	-	✔	✖
A20	Grand Water Front (facing Project Site)	R	1.5	171	54	-	✔	✖
	Kowloon Bay Area (Existing ASRs)							
A21	EMSD Headquarter	G	1.5	30	18	-	✔	✖
	To Kwa Wan Area (Planned ASRs)							
PA12	Sung Wong Toi Road CDA Site	MU	1.5	95	-	6	✖	✔
PA13 [vii]	Sung Wong Toi Road CDA Site	MU	10	95	-	11	✖	✔
PA14 [vii]	Sung Wong Toi Road R(A) Site	R	10	95	-	13	✖	✔
PA15	KTD Site 5A4	MU	1.5	105	-	14	✖	✔
PA16	KTD Site 5A4	MU	1.5	105	-	11	✖	✔
	Olympic Avenue (Planned ASRs) [vii]							
PA3	KTD Site 1F2	C	1.5	195	-	34	✖	✔
PA4	KTD Site 1M1	C	1.5	35	-	15	✖	✔
PA5	KTD Site 2A1	CSU	1.5	115	-	27	✖	✔
PA6	KTD Site 2A2	CSU	1.5	95	-	26	✖	✔
PA7	KTD Site 2A2	CSU	1.5	95	-	37	✖	✔
PA8	KTD Site 2A3	CSU	1.5	95	-	14	✖	✔

ASR ID	Location	Land Use[i]	Lowest Assessment Level	H[ii]	D_C[iii]	D_O[iii]	C[v]	O[vi]
PA9	KTD Site 2A4	CSU	1.5	95	-	17	✗	✓
PA10	KTD Site 2A5	CSU	1.5	75	-	16	✗	✓
PA11	KTD Site 2A7	C	1.5	75	-	11	✗	✓
	Kai Tak Development Area (Planned ASRs) [viii]							
PA1	KTD Site 1L	R	1.5	100	30	-	✓	✗
PA2	KTD Site 1K	R	1.5	110	22	-	✓	✗
PA17	KTD Site 3B1	CSU	1.5	75	-	52	✗	✓
PA18	KTD Site 3A6	CSU	1.5	95	-	10	✗	✓
PA19	KTD Site 1N1	C	1.5	115	-	18	✗	✓
PA20	KTD Site 1N1	C	1.5	115	-	49	✗	✓
PA21	KTD Site 1K2	R	1.5	125	-	16	✗	✓
PA22	KTD Site 1L3	R	1.5	115	-	13	✗	✓
PA23	KTD Site 1L3	R	1.5	115	-	48	✗	✓
PA24	KTD Site 1L2	R	1.5	115	-	62	✗	✓
PA25	KTD Site 1I3	R	1.5	115	-	121	✗	✓
	MPSC (Planned ASRs)							
ISC	Indoor Sports Centre-Middle	MU	1.5	35	-	176	✗	✓
ISE	Indoor Sports Centre-East	MU	1.5	35	-	113	✗	✓
ISN	Indoor Sports Centre-North	MU	1.5	35	-	193	✗	✓
ISS	Indoor Sports Centre-South	MU	1.5	35	-	109	✗	✓
ISW	Indoor Sports Centre-West	MU	1.5	35	-	172	✗	✓
MSC	Main Stadium-Middle	MU	1.5	70	-	170	✗	✓
MSE	Main Stadium-East	MU	1.5	70	-	133	✗	✓
MSN	Main Stadium-North	MU	1.5	70	-	120	✗	✓
MSS	Main Stadium-South	MU	1.5	70	-	86	✗	✓
MSW	Main Stadium-West	MU	1.5	70	-	153	✗	✓
PSC	Public Sports Ground-Middle	MU	1.5	30	-	103	✗	✓
PSE	Public Sports Ground-East	MU	1.5	30	-	75	✗	✓
PSN	Public Sports Ground-North	MU	1.5	30	-	207	✗	✓
PSS	Public Sports Ground-South	MU	1.5	30	-	28	✗	✓
PSW	Public Sports Ground-West	MU	1.5	30	-	135	✗	✓
OBN	Office Block	C	1.5	38	-	65	✗	✓
OBS	Office Block	C	1.5	38	-	73	✗	✓
HBN	Hotel Block	C	1.5	45	-	10	✗	✓
HBS	Hotel Block	C	1.5	45	-	39	✗	✓

Note:
[i] L – Leisure; R – Residential; G – Government; C – Commercial; MU – Mixed Use; RE – Religious/Place of Public Worship; CSU - Commercial with sensitive uses
[ii] Approximated Building Height Above ground (m)
[iii] **D_C** – separation distance of the ASRs from the nearest emission source during construction phase; **D_O** –separation distance of the ASRs from the nearest emission source during operational phase.
[iv] Assessed during Construction Phase
[v] Assessed during Operational Phase
[vi] This ASR will be re-built with a new layout. The operational phase assessment will adopt the façade closest to the road as sensitive receiver.
[vii] The air intakes / sensitive use for these buildings would be above podium level.
[viii] The description for the ASRs under the ASR group of "Olympic Avenue" and "Kai Tak Development Area" are the site reference number in the Recommended Outline Development Plan.

3.5 Projected Background Air Quality Result of Year 2020 by PATH Model

3.5.1 The 500 m Study Area covers 4 grids of the PATH model, including grids (30, 28), (30, 29), (31, 28) and (31, 29). A summary of the projected background concentrations in Year 2020 is shown in **Table 3-3**. It shows that SO_2, RSP, FSP and NO_2 comply with the AQOs after considering the number of exceedances allowed.

Table 3-3 Summary of Predicted Results from PATH Model in Year 2020

Pollutant	Averaging Time	AQOs [μg/m³]	PATH Model Concentration [μg/m³]			
			Grid [30, 28]	**Grid** [30, 29]	**Grid** [31, 28]	**Grid** [31, 29]
Sulphur dioxide [ii]	10-minute (4th High)	500 (3)	113 [0]	102 [0]	102 [0]	94 [0]
	24-hour (4th High)	125 (3)	23 [0]	22 [0]	22 [0]	21 [0]
RSP [PM_{10}] [iii]	24-hour (10th High)	100 (9)	79 [1]	75 [1]	76 [1]	75 [1]
	Annual	50	42	40	40	40
FSP [$PM_{2.5}$] [iv]	24-hour (10th High)	75 (9)	60 [1]	56 [1]	57 [1]	57 [1]
	Annual	35	30	28	29	28
NO_2	1-hour (19th High)	200	182 [6]	162 [4]	169 [7]	148 [3]
	Annual	40	28	25	25	22

Note:
[i] The number in brackets () refers to number of exceedance allowed per year.
[ii] The number in brackets [] refers to number of exceedances of the background concentration.
[iii] The predicted 4th highest 10-minute SO_2 concentrations presented were calculated by multiplying the predicted maximum hourly SO_2 concentrations by the stability-dependent multiplicative factors. So that, the predicted 4th highest 10-minute SO_2 concentration is equal to the predicted maximum 10-minute SO_2 concentration.
[iv] FSP concentrations were estimated from RSP concentrations.

3.6 Sensitivity Test for Determination of the Worst Assessment Year

Construction Phase

3.6.1 The construction works of the Project are scheduled to commence in 2017 for completion in 2020/2021. The main heavy works (piling, pile cap construction and backfilling & basement structures construction) will take place from the second quarter of 2017 to the first quarter of 2018. Therefore, 2017 has been adopted as the worst assessment year for the construction dust impact assessment.

Operational Phase

3.6.2 In accordance with the EIA Study Brief (No. ESB-274/2014), the air quality impacts of the Project should be assessed based on the highest emission strength from the roads within the next 15 years upon commissioning of the Project. The selected year of assessment shall represent the highest emission scenario given the combination of vehicular emission factors and traffic flows for the selected year.

3.6.3 Construction of the Project is planned to be completed and commissioned in 2020/2021. Since the air quality impacts of future road traffic should be calculated based on the highest emission strength within the next 15 years upon operation of the Project, four representative years – 2021, 2023, 2026 and 2036 were chosen for a sensitivity test. Due to possible delay of the construction program of the Central Kowloon Route (CKR) the works for the CKR is expected to be commissioned by 2023. Therefore, CKR was excluded in the 2021 scenario. EMFAC-HK was employed to estimate the emissions of the existing and proposed roads for future years and the traffic forecasts for 2021 (without CKR), 2023, 2026 and 2036 provided by Project Traffic Consultant were used as input to the model to predict emissions. Details of the assumptions in EMFAC-HK are shown in **Appendix 3.2**.

3.6.4 According to "2010 Hong Kong Emission Inventory Report" published by EPD, tailpipe emissions are the largest source of NO_2 besides navigation. Hence, NO_2 was identified as the key pollutant in determining the emission strengths of future scenario. The result of the sensitivity test showed that the worst assessment year will occur in 2023. Detailed results are shown in **Appendix 3.2**.

3.7 Construction Phase Assessment

3.7.1 This section addresses the construction dust impact through a quantitative assessment approach to evaluate the potential impact on the identified ASRs in accordance with the requirement in Section 3 of Appendix A of the EIA Study Brief.

Assessment Methodology

3.7.2 The assessment of air quality impact in construction phase follows the detailed technical requirements in the EIA Study Brief. The “Pollutants in the Atmosphere and their Transport over Hong Kong (**PATH**)” model was used to predict the future background concentrations of air pollutants. Fugitive Dust Model (**FDM**) was employed to predict the concentrations of air pollutants at the identified ASRs due to emissions from the construction works of this project and concurrent construction works within the study area.

3.7.3 The assessment adopted the 1-hour TSP, 24-hour RSP, annual RSP, 24-hour FSP and annual FSP concentrations as air quality parameters.

<u>Emission Inventory of Dust Emission from Construction Activities</u>

3.7.4 A computational model, FDM, was used to assess the potential dust impact during the construction phase. It is an EPD approved Gaussian Plume model designed for computing air dispersion from fugitive dust sources.

3.7.5 Values for the modelling parameters, including dust emission factors, particles size distributions, surface roughness were obtained from EPD’s “Guideline on choice of models and model parameters” and USEPA AP-42. The surface roughness is closely related to the land use characteristics of a study area and associated with the roughness element height. The sea roughness and urban roughness are assumed to be 0.01 cm and 370 cm, respectively. The area averaged surface roughnesses were taken as 370cm, 259cm, 370cm and 222cm for four PATH grids (30, 28), (30, 29), (31, 28) and (31, 29), respectively. The density of the dust was assumed to be 2.5 g/m^3.

3.7.6 Hourly meteorological data for a full year were extracted from the PATH model in grids (30, 28), (30, 29), (31, 28) and (31, 29) and have been adopted for use in FDM. The stability classes were obtained from a separate model, i.e. PCRAMMET. The minimum mixing height of 121m was adopted from the Hong Kong Observatory in 2010.

3.7.7 According to Section 13.2.3.3 of USEPA AP-42, the emission factor for a typical heavy construction activity is 2.69 Mg/hectare/month. The number of working days for a month and number of working hours per day of the project are anticipated to be 26 days and 12 hours respectively. No construction works are anticipated to be carried out on Sundays. From Table 11.9-4 of USEPA AP-42, the emission factor of wind erosion is 0.85 Mg/hectare/year. The emission factors are listed in **Table 3-4**.

Table 3-4 Emission Factors for Dusty Construction Activities

Emission Source	Activity	Emission Rate (E) (Mg/hectare/month)	Remarks
Piling, Pile Cap Construction and backfilling & basement structures construction for the Project	Heavy Construction Activities	TSP E=2.69[i] RSP E=2.69 × 30%[ii] FSP E=2.69 × 3% [iii]	100% area actively operating 26 days/month, 12 hours/day
	Wind Erosion	TSP E=0.85[iv] RSP E=0.85 × 30%[ii] FSP E=0.85 × 3%[iii]	100% area actively operating 26 days/month, 12 hours/day

Notes:
[i] Section 13.2.3.3 of USEPA AP-42, 5th Edition
[ii] USEPA document Estimating Particulate Matter Emissions from Construction Operations, 1999
[iii] Thompson G. Pace, USEPA. Examination of the Multiplier Used to Estimate $PM_{2.5}$ Fugitive Dust Emissions from PM_{10}, April 2005
[iv] Table 11.9-4 of USEPA AP-42, 5th Edition

3.7.8 As a conservative approach, the active construction area was assumed to be 100% of the Project site for both the short term (hourly and daily) and long term (annual) assessment.

3.7.9 In the mitigated scenario, the active construction areas would have ground watering applied every hour during the works. The adopted dust suppression is 91.7% and is shown in **Appendix 3.1**. The unmitigated scenario does not have any watering for dust suppression.

Potential Concurrent Projects

3.7.10 In order to assess the cumulative construction dust impact, the following concurrent construction sites were also included in this assessment:

- East Portion of Central Kowloon Route (CKR, planned to be completed in 2021 but with possible delay of 2 years based on the latest information),
- Reconstruction and Upgrading of Kai Tak Nullah (planned to be completed in April 2018),
- Kai Tak Development Stage 4 (Road D2 construction) (Planned to be completed in 3rd quarter of 2017),
- North Apron Remaining Infrastructure (planned to be completed in late 2021),
- Kai Tak Approach Channel and Kwun Tong Typhoon Shelter Improvement Works (Phase 2) (planned to be completed in December 2018), and
- Shatin Central Link (SCL planned to be completed in 2019 due to delay).

3.7.11 Based on the current construction works programme of Shatin Central Link, the heavy construction works shall be completed by 2016. Hence, dust emission contribution from SCL during the Project construction work period should be insignificant and thus was not considered in the cumulative impact assessment. On the other hand, construction works for some projects have commenced at the time of this EIA Study, and some of the works should have been completed before commencement of the

Project. In this case, only the outstanding portions of the work sites were considered in this assessment.

3.7.12 Portions of the works sites of Kai Tak Approach Channel and Kwun Tong Typhoon Shelter Improvement Works (Phase 2) that are within the 500m Study Area of the Project were also included for the assessment as typical heavy construction activity. The works zone and corresponding emission strengths for those concurrent projects were based on the approved EIA reports as mentioned in **Section 3.7.10** with updated project programme. Details of the emission factors for all concurrent projects are listed in **Appendix 3.1** and the locations of dust sources are shown in **Figure 3-3**.

Background Air Quality

3.7.13 PATH is a macro-scale air quality model developed by EPD to predict future air quality over the whole Pearl River Delta region including Hong Kong. Currently, the nearest background air quality prediction from the assessment year (2017) is 2015. It was therefore adopted as the background air quality in the assessment year. The hourly background concentrations for RSP were extracted from PATH. The PATH grids corresponding to the 500 m Study Area are (30, 28), (30, 29), (31, 28) and (31, 29).

3.7.14 PATH does not predict TSP and FSP. Since particulates of sizes larger than 10 µm generated from far-field dust sources should have been removed by deposition before reaching the ASRs, the background particulates would mainly be those less than or equal to 10 µm (i.e. PM_{10}/RSP). As a conservative approach, it was assumed that the hourly background concentration of TSP is equal to the hourly RSP concentrations calculated by PATH.

3.7.15 Also, the background daily and annual concentrations of FSP were predicted to be 75% of RSP and 71% of RSP, respectively, according to EPD's "*Guidelines on the Estimation of $PM_{2.5}$ for Air Quality Assessment in Hong Kong*".

Assessment Results

3.7.16 The predicted TSP, RSP and FSP concentrations at each ASR for unmitigated scenario including background contribution are summarized in **Table 3-5**, **Table 3-6** and **Table 3-7,** respectively. Detailed results at different assessment levels are shown in **Appendix 3.8**. Without any mitigation measures, there would be potential exceedance of the hourly TSP criterion at all ASRs. The hourly and annual RSP would exceed the AQO criteria at most of the ASRs. All predicted concentrations of hourly FSP and annual FSP comply with the AQO.

3.7.17 The unmitigated cumulative contour maps of 1st maximum 1-hour TSP, 10th highest 24-hour RSP, annual average RSP, 10th highest 24-hour FSP and annual average FSP at 1.5 m above ground are shown in **Figure 3-5A** to **Figure 3-5E**.

Table 3-5 Unmitigated Cumulative Hourly TSP at ASRs (With Background)

ASR	Description	1st Max. 1-hr TSP
		Criteria=500 (μg/ m³)
A1	Shek Ku Lung Road Playground	**1338.1**
A2	Regal Hotel	**797.6 - 1281.2**
A3	South Mansion	**1173.4** – **1266**
A4	Jenford Building	**1159.3 - 1260.4**
A6	Parc 22	**1041.2 - 1820.4**
A7	Sky Tower	345.7 - **2311.3**
A9	Mok Cheong Street Residential District	**2209.3 - 2541.6**
A16	Sung Wong Toi Playground	**1590.5**
A17	Fire Station	**1495.1 - 1600**
A13	Mok Cheong Street Residential District	**1599 - 2522.4**
A18	Lung To Street No.208	**1283.3 - 1664.5**
A19	HK society for Blind Hostel (facing Project Site)	**2769.2 - 2774.1**
A20	Grand Water Front (facing Project Site)	347.7 - **2040.4**
A21	EMSD Headquarter	**772.6 - 1512.1**
PA1	KTD Site 1L	328.2 - **1807.4**
PA2	KTD Site 1K	403.2 - **2219.9**

* Bolded results represent exceedance of AQO

Table 3-6 Unmitigated Cumulative Daily and Annual RSP at ASRs (With Background)

ASR	No. of Exceed. (24-hr RSP)	10th Max. 24-hr RSP	1st Max. 24-hr RSP	Annual RSP
	AQO=9	**AQO=100 μg/m³**	**AQO=100μg/m³**	**AQO=50μg/m³**
A1	5	95.1	**124.1**	47.9
A2	3 - 9	83.7 - 99.7	**110.4 - 122.8**	45.9 - 48.4
A3	5 - 6	92.2 - 95.6	**116.1 - 119.9**	47.7 - 48.2
A4	5 - 7	93 - 96.8	**121 - 125.7**	47.9 - 48.5
A6	**11 - 26**	**105.4 - 114.3**	**122 - 147.8**	**51.3 - 54.1**
A7	1 - **108**	83.4 - **172.5**	**112.3 - 209.6**	44.4 - **72.6**
A9	**126 - 128**	**212.9 - 223.2**	**268.4 - 280.7**	**80.3 - 82.7**
A16	**13**	**107.5**	**128.8**	**50.5**
A17	**17**	**109.8 - 113.1**	**146 - 151.6**	**53.2 - 53.9**
A13	**109 - 122**	**172.9 - 187**	**226.9 - 264.8**	**70.5 - 77**
A18	**88 - 100**	**150.7 - 169.9**	**180 - 198.5**	**65.7 - 69.9**
A19	**143**	**248.1 - 250.2**	**310.5 - 312.1**	**94.4 - 95.1**
A20	2 - **73**	86.1 - **177.3**	**112.3 - 226.6**	43.2 - **61.8**
A21	3 - 9	89.2 - 99.6	**150.3 - 168.9**	43.8 - 45.1
PA1	1 - **12**	75.8 - **107.9**	**119 - 203.7**	41.8 - **50.3**
PA2	1 - **16**	75.1 - **109.8**	**116.4 - 205.5**	41.9 - **53.2**

* Bolded results represent exceedance of AQO

Table 3-7 Unmitigated Cumulative Daily and Annual FSP at ASRs (With Background)

ASR	No. of Exceed. (24-hr FSP)	10th Max. 24-hr FSP	1st Max. 24-hr FSP	Annual FSP
	AQO=9	**AQO=75μg/m^3**	**AQO=75μg/m^3**	**AQO=35μg/m^3**
A1	1	56.16	**81.81**	29.15
A2	1	55.79 - 56.14	**81.80**	28.9 - 29.15
A3	1	55.79	**81.80**	29.11 - 29.13
A4	1	55.79	**81.80**	29.14 - 29.15
A6	1	55.85 - 55.98	**81.8 - 81.83**	29.44 - 29.72
A7	1	59.8 - 63.02	**84.19 - 84.22**	29.63 - 32.49
A9	2 - 3	67.1 - 67.78	**84.31 - 84.34**	33.26 - 33.53
A16	1	56.13	**81.81**	29.43
A17	1	56.17 - 56.19	**81.86 - 81.88**	29.65 - 29.7
A13	1	63.55 - 63.86	**84.25 - 84.3**	32.29 - 32.94
A18	1	63 - 63.15	**84.22 - 84.24**	31.8 - 32.21
A19	3 - 4	69.63 - 70.01	**84.35 - 84.36**	34.74 - 34.84
A20	1	59.39 - 64.39	**84.19 - 84.65**	29.51 - 31.39
A21	1	56.33 - 56.56	**86.56 - 88.56**	28.59 - 28.72
PA1	1	56.16 - 56.63	**83.41 - 91.9**	28.39 - 29.25
PA2	1	56.16 - 56.35	**83.14 - 92.1**	28.4 - 29.54

* Bolded results represent exceedance of AQO

Construction Dust Mitigation Measures

3.7.18 In order to reduce the dust emissions from the Project for compliance with the TSP and AQOs criteria at ASRs, the following specific mitigation measures are recommended.

3.7.19 Regular watering under a good site practice should be adopted. In accordance with the "Control of Open Fugitive Dust Sources" (USEPA AP-42), watering once per hour on exposed worksites and haul road is proposed to achieve dust removal efficiency of 91.7%. This dust suppression efficiency is derived based on the average haul road traffic, average evaporation rate and an assumed application intensity of 1.3 L/m^2 for the respective watering frequencies. Any potential dust impact and watering mitigation would be subject to the actual site conditions. The extent of watering may vary depending on actual site conditions but should be sufficient to maintain an equivalent intensity of not less than 1.3 L/m^2 to achieve the intended dust removal efficiency.

3.7.20 Dust control measures stipulated in the Air Pollution Control (Construction Dust) Regulation (Cap. 311R) and good site practice shall be adopted. The following dust suppression measures should be incorporated by the Contractor to control the dust nuisance throughout the construction phase:

- Excavated or stockpile of dusty material should be covered entirely by impervious sheeting or sprayed with water to maintain the entire surface wet and then removed or backfilled or reinstated where practicable within 24 hours of the excavation or unloading;

- Dusty materials remaining after a stockpile is removed should be wetted with water and cleared from the surface of roads;

- Stockpile of dusty material should not be extended beyond the pedestrian barriers, fencing or traffic cones;

- The load of dusty materials on a vehicle leaving a construction site should be covered entirely by impervious sheeting to ensure that the dusty materials do not leak from the vehicle;

- Vehicle washing facilities with high pressure water jet should be provided at every discernible or designated vehicle exit point. The area where vehicle washing takes place and the road section between the washing facilities and the exit point should be paved with concrete, bituminous materials or hardcores;

- Where a scaffolding is erected around the perimeter of a building under construction, effective dust screens, sheeting or netting should be provided to enclose the scaffolding from the ground floor level of the building, or a canopy should be provided from the first floor level up to the highest level of the scaffolding;

- Surfaces where any pneumatic or power-driven drilling, cutting, polishing or other mechanical breaking operation takes place should be sprayed with water or a dust suppression chemical continuously;

- Haulage and delivery vehicles should be confined to designated roads;

- Dusty materials on every vehicle's body and wheels should be removed in washing area before leaving the site;

- Regular maintenance of all plant equipment;

- Throttle down or switch off unused machines or machine in intermittent use;

- Exposed earth should be properly treated by compaction, turfing, hydroseeding, vegetation planting or sealing with latex, vinyl, bitumen, shotcrete or other suitable surface stabiliser within six months after the last construction activity on the construction site or part of the construction site where the exposed earth lies.

3.7.21 Exposed earth should be properly treated by compaction, turfing, hydroseeding, vegetation planting or sealing with latex, vinyl, bitumen, shortcrete or other suitable surface stabiliser within six months after the last construction activity on the construction site or part of the construction site where the exposed earth lies.

3.7.22 These requirements should be incorporated into the Contract Specification for the civil works. In addition, a monitoring and audit programme during the construction phase should be implemented by the Contractor to ensure that the construction dust impacts are controlled to within the AQO. Detailed requirements for the monitoring and audit programme are given separately in the EM&A Manual.

Mitigated Construction Dust Level

3.7.23 With the mitigation measures as mentioned in **Sections 3.7.18 to 3.7.22** above, construction dust levels for mitigated scenario are summarized in **Table 3-8**, **Table 3-9** and **Table 3-10**. The detailed results are shown in **Appendix 3.8**. The mitigated cumulative results of hourly TSP, daily RSP, annual RSP, daily FSP and annual FSP comply with the respective criteria at all levels of the identified ASRs.

3.7.24 The mitigated cumulative contour maps of 1st maximum 1-hour TSP, 10th highest 24-hour RSP, annual average RSP, 10th highest 24-hour FSP and annual average FSP at 1.5 m above ground are shown in **Figure 3-5F** to **Figure 3-5J**. Although a few exceedance zones are predicted in the contour plots (mainly within the construction sites boundary), no existing or planned ASRs are located within the exceedance zones.

Table 3-8 Mitigated Cumulative Hourly TSP at ASRs (With Background)

ASR	Description	1st Max. 1-hr TSP
		Criteria=500 (μg/ m^3)
A1	Shek Ku Lung Road Playground	180.5
A2	Regal Hotel	172.5 - 214.5
A3	South Mansion	210.8 - 221.4
A4	Jenford Building	208 - 217.9
A6	Parc 22	170.9 - 249.6
A7	Sky Tower	153.4 - 303.5
A9	Mok Cheong Street Residential District	313.2 - 341.5
A16	Sung Wong Toi Park	222.5
A17	Fire Station	225.6 - 235.7
A13	Mok Cheong Street Residential District	257.9 - 336.8
A18	Lung To Street No.208	213 - 259.3
A19	HK society for Blind Hostel (facing Project Site)	359.1 - 360.6
A20	Grand Water Front (facing Project Site)	153.4 - 328.9
A21	EMSD Headquarter	179.2 - 359
PA1	KTD Site 1L	153.8 - 274.8
PA2	KTD Site 1K	155.9 - 302.1

* Bolded results represent exceedance of AQO

Table 3-9 Mitigated Cumulative Daily and Annual RSP at ASRs (With Background)

ASR	No. of Exceed. (24-hr RSP)	10th Max. 24-hr RSP	1st Max. 24-hr RSP	Annual RSP
	AQO=9	**AQO=100 (μg/ m³)**	**AQO=100 (μg/ m³)**	**AQO=50 (μg/ m³)**
A1	1	74.9	**109.2**	40.8
A2	1	74.4 - 74.9	**109.1 - 109.2**	40.5 - 40.9
A3	1	74.4	**109.1**	40.8 - 40.9
A4	1	74.4	**109.1**	40.8 - 40.9
A6	1	74.8 - 74.9	**109.2 - 109.4**	41.1 - 41.5
A7	1	79.7 - 83.4	**112.3 - 112.6**	41.6 - 45
A9	1	87 - 88.1	**113.5 - 113.7**	46 - 46.5
A16	1	74.9	**109.2**	41.1
A17	1	75.2 - 75.4	**109.7 - 109.8**	41.5 - 41.7
A13	1	84.8 - 85.2	**112.8 - 113.3**	44.6 - 45.8
A18	1	84 - 84.1	**112.6 - 112.8**	44.1 - 44.8
A19	2	90.3 - 90.5	**113.8**	47.7 - 47.8
A20	1 - 2	79.7 - 86.8	**112.3 - 116.7**	41.5 - 44.3
A21	1	75.2 - 80	**117.7 - 127.5**	40.2 - 40.6
PA1	1	74.9 - 77.4	**111 - 123.4**	39.9 - 41.2
PA2	1	74.9 - 77.3	**110.6 - 123.2**	39.9 - 41.5

* Bolded results represent exceedance of AQO

Table 3-10 Mitigated Cumulative Daily and Annual FSP at ASRs (With Background)

ASR	No. of Exceed. (24-hr FSP)	10th Max. 24-hr FSP	1st Max. 24-hr FSP	Annual FSP
	AQO=9	**AQO=75 (μg/ m³)**	**AQO=75 (μg/ m³)**	**AQO=35 (μg/ m³)**
A1	1	55.79	**81.81**	28.38
A2	1	55.79	**81.80**	28.35 - 28.39
A3	1	55.79	**81.80**	28.38
A4	1	55.79	**81.80**	28.38 - 28.39
A6	1	55.82 - 55.85	**81.8 - 81.83**	28.4 - 28.44
A7	1	59.35 - 59.8	**84.19 - 84.22**	29.34 - 29.69
A9	1	59.81	**84.31 - 84.34**	29.79 - 29.84
A16	1	55.84	**81.81**	28.41
A17	1	55.81 - 55.85	**81.86 - 81.88**	28.45 - 28.47
A13	1	59.75 - 59.8	**84.25 - 84.3**	29.65 - 29.76
A18	1	59.67 - 59.76	**84.22 - 84.24**	29.59 - 29.67
A19	1	59.83	**84.35 - 84.36**	29.96 - 29.98
A20	1	59.36 - 59.95	**84.19 - 84.65**	29.33 - 29.61
A21	1	56.16 - 56.35	**83.27 - 84.33**	28.23 - 28.27
PA1	1	56.16 - 56.26	**82.59 - 83.9**	28.2 - 28.33
PA2	1	56.16 - 56.2	**82.55 - 83.89**	28.2 - 28.36

* Bolded results represent exceedance of AQO

Residual Construction Dust Impact

3.7.25 With proper implementation of the recommended mitigation measures, all dust concentrations at ASRs are predicted to comply with the TSP criterion as well as the relevant AQOs for RSP and FSP. Hence, no adverse residual impacts are anticipated during the construction phase.

3.8 Operational Phase Assessment

3.8.1 Potential air quality impacts arising from the operation of the Project are described in this section, including background air quality estimation, identification of air pollution sources and locations of representative ASRs, and the methodology adopted for the assessment. The assessment was conducted in accordance with Section 4 of Appendix A of the EIA Study Brief.

Assessment Methodology

3.8.2 The assessment of air quality impact in the operational phase follows the detailed technical requirements given in the EIA Study Brief. **PATH** (Pollutants in the Atmosphere and their Transport over Hong Kong) model was used to predict the future background concentrations of air pollutants. Air dispersion model **CALINE4** (California Line Source Dispersion Model Version 4) was employed to predict the concentrations of air pollutants at the identified Air Sensitivity Receivers (ASR) due to tailpipe emissions from the existing and planned open road network within the Study Area; whereas **ISCST3** (Industrial Source Complex Short-Term Model) was employed to predict the concentrations due to emissions from chimney, portal, ventilation building, cruise terminal and typhoon shelter.

3.8.3 The assessment focused on two main issues which are the degree of air quality impact caused by and on the Project.

3.8.4 *Air Quality Impact Caused by the Project*: The Project itself is neither a polluting land use nor an air pollution source. The only potential air quality impact arising from the Project is caused by the traffic induced by the spectators/audiences travelling to and from the Project area during the course of major events at the Main Stadium of the MPSC such as sport events and concerts, as well as the traffic induced under the normal operation of the MPSC. The traffic induced by the audiences during major events shall only last for a short period of time (around an hour before and after each event). According to the Traffic Impact Assessment (TIA) report (2009), more than 80% of spectators/audiences would take MTR as their travelling means. Based on the local and overseas operation experiences of stadia of a similar scale, it is envisaged that major events at the Main Stadium of MPSC, especially a full-house event, would not be held frequently. In addition, the parking area in the Project is limited (with capacity of below 1,000). Hence, no major vehicular traffic from the audiences is anticipated. It is estimated that the annual projection of induced traffic under normal operation and under full-event scenario to the total traffic in the Study Area for the worst assessment year (2023) are 2.26% and 2.49% respectively. The vehicular types with major contribution to the induced traffic are taxis and passenger cars which have relatively low air pollutant emissions than heavy good vehicles or buses. The estimated corresponding vehicular emissions, in terms of NOx, arising from the Project is about 1.36% of the total vehicular emission in the Study Area in 2023. To assess the possible impact due to the traffic induced by the Project, the scenarios of "Without Project" and "With Project" were assessed for the worst assessment year. The detailed comparison of traffic flows and emissions of NOx are shown in **Appendix 3.2**.

3.8.5 *Air Quality Impact on the Project*: The users and operation staff of the facilities and venues in the Project may be affected to different extent by the ambient air quality in the area. The Project comprises a Main Stadium, a Public Sports Ground, an Indoor Sports Centre, and other ancillary/supporting facilities such as car parks, hotel, office area for sports-related organizations and commercial areas. Based on the local and overseas operation experience of stadia of a similar scale, it is anticipated that major events at the Main Stadium of MPSC would not be held frequently, and therefore users and operation staff will stay there intermittently. In view of the nature of the air sensitive uses in the Main Stadium, short-term rather than long-term air quality criteria are applicable. On the other hand, users and operation staff of the Public Sports Ground, Indoor Sports Centre, hotel, offices and commercial area may be affected in the short-term and long-term as they may stay there for a considerable length of the time throughout a year. As such, both short-term and long-term air quality impact assessments have been carried out for these receivers.

Background Air Quality

3.8.6 PATH is a macro-scale air quality model developed by EPD to predict future air quality over the whole Pearl River Delta region including Hong Kong. Currently, the nearest background air quality prediction from the worst assessment year (2023) is 2020. It was therefore adopted as the background air quality for the assessment year. The hourly background concentrations for NO_2, SO_2 and RSP were extracted from PATH. The PATH grids corresponding to the 500 m Study Area are (30, 28), (30, 29), (31, 28), and (31, 29). Since PATH does not predict FSP concentration, the background daily and annual concentrations of FSP was predicted as 75% of RSP and 71% of RSP respectively according to EPD's "*Guidelines on the Estimation of PM2.5 for Air Quality Assessment in Hong Kong*".

3.8.7 The air quality impact due to open road traffic within the Study Area was assessed using the near-field Gaussian Models, i.e. CALINE4 and ISCST3. As the default setting of PATH Model also includes open road emissions in its calculation, hence in order to avoid double accounting of emissions, the emissions of all open roads in the relevant PATH grids (correspond to the Study Area) have been removed from the emission inventory in the PATH grids.

3.8.8 Grid-dependent hourly meteorological data in Year 2010 were extracted from the PATH model. The PATH meteorological data, including temperature, wind speed, wind direction were adopted as input to CALINE4 and ISCST3. As no stability class information is available in PATH, PCRAMMET was used to generate such data. The mixing height was capped at 121m as per the real meteorological data.

Open Road Traffic

3.8.9 EMFAC-HK was employed to predict the hourly emission factors for 16 vehicle classes. In combination with the hourly vehicle kilometres travelled (VKT) of each road segment, the hourly fleet-averaged emission factors were obtained. The hourly fleet averaged emission factor together with the hourly traffic flow of each link were then utilized in CALINE4 to simulate the dispersion of vehicle exhaust pollutants induced by the Project and the surrounding open road network. All major roads within 500m of the Study Area were included in the model. The vehicular NOx, RSP and

FSP emissions were calculated using the model. Details of the road network and the input parameters of EMFAC-HK are shown in **Appendix 3.2**. The calculated fleet averaged emission factor and traffic flow in each road link are given in **Appendix 3.3**.

3.8.10 The Ozone Limiting Method (OLM) has been adopted for the conversion of NOx to NO_2 based on the hourly O_3 concentrations predicted by PATH in the corresponding grid for all vehicle emissions. A tailpipe emission NO_2/NOx ratio of 7.5% according to the EPD's "*Guidelines on Choice of Models and Model Parameters*" has also been assumed. The NO_2/NOx conversion has been calculated as follows:

$$[NO_2]_{pred} = 0.075 \times [NO_X]_{pred} + \text{MIN}\ \{0.925 \times [NO_X]_{pred}, \text{ or } (46/48) \times [O_3]_{PATH}\}$$

3.8.11 As the model limits the road height to 10m, roads higher than 10m were set to 10m in model, as a conservative approach. For roads with barriers as a noise mitigation measure, the road type was set to "Fill" and the elevation was set at the top of the barrier. As noise barriers will also restrict the horizontal dispersion of the pollutant plume, the mixing width of this road was set to be the width of the road.

Portal and Ventilation Buildings

3.8.12 All portal and ventilation buildings within the Study Area have been identified based on a desktop study. These include CKR Tunnel east portal, CKR east ventilation building, Kai Tak Tunnel East and West portals, Kai Tak ventilation building and other portal emissions such as CKR Slip Road and Road D2 landscape deck. **Figure 3-4** shows the locations of all portals and ventilation buildings.

3.8.13 According to the Permanent International Association of Road Congress Report (PIARC, 1991), the pollutants were assumed to eject from the portal as a portal jet such that 2/3 of the total emissions was dispersed within the first 50m of the portal and the other 1/3 of the total emissions within the second 50m.

3.8.14 With reference to the approved EIA study "Kai Tak Development" (KTD EIA), 50% of pollutant inside Kai Tak Tunnel was assumed to be emitted through the ventilation building and the remaining pollutant was assumed to be ejected through the tunnel portal.

3.8.15 Reference was also made to the approved CKR EIA report regarding the emission factors for CKR Eastbound Tunnel. The total length of the CKR tunnel is approximately 3.75km and the Central Ventilation Building (CVB) is at some 1.75km from the eastern portal. The current tunnel ventilation system is designed to extract a portion of the emissions (e.g. p%) from the first 2km of the east bound tunnel (EBT) to the CVB. The p% depends on the ratio of air flow rates between CVB and the Tunnel. The remaining portion of emission (e.g. 100-p%) will be mixed with that from the next 1.75km of EBT and 90% of these emissions will then be ventilated to Eastern Ventilation Building (EVB). The remaining 10% will be emitted through the CKR eastern tunnel portal.

3.8.16 The 24-hour emission factor for each tunnel in 2023 has been adopted in compiling the emission inventory of portals and ventilation buildings. The calculation of emission factors for portals and ventilation buildings is given in **Appendix 3.4**. The 24-hour emission factors of different tunnel sections are given in **Appendix 3.4**.

Industrial Chimneys

3.8.17 Reference was made to the approved KTD EIA report for the emission data of industrial chimneys in the Study Area and this has been updated by site survey and made in line with the latest air pollution regulation. The detailed emission information of the industrial chimneys is presented in **Appendix 3.5** and the locations are presented in **Figure 3-4**.

3.8.18 For industrial or marine emission sources, OLM has been adopted for the conversion of NOx to NO_2 based on the predicted O_3 concentrations from the corresponding PATH Grid. The NO_2/NOx conversion has been calculated as follows:

$$[NO_2]_{pred} = 0.1 \times [NO_X]_{pred} + \text{MIN}\ \{0.9 \times [NO_X]_{pred}, \text{ or } (46/48) \times [O_3]_{PATH}\}$$

Cruise Terminal

3.8.19 The ISCST3 dispersion model was employed to predict the air quality impact from emission sources other than road traffic emissions including the marine emissions from the Cruise Terminal, emissions from the typhoon shelter, and the industrial emissions from nearby chimneys within 1km.

3.8.20 According to the approved KTD EIA report, cruise ships will berth at the cruise terminals for one hour and then hotel for 23 hours. For safety of ship manoeuvring, only one ship berthing can take place at any one time. Only after one ship hotels, the second ship can berth at the remaining terminal.

3.8.21 In the KTD EIA report, the emission factors were based on the "Current Methodologies and Best Practices in Preparing Port Emission Inventories, Final Report, January 2006" prepared by ICF Consulting for USEPA. As the document has been updated in 2009, the emission factors of marine emissions have been reviewed and updated accordingly.

3.8.22 Furthermore, the new air pollution regulations "Air Pollution Control (Marine Light Diesel) Regulation" (Cap. 311Y) and "Air Pollution Control (Ocean Going Vessels) (Fuel at Berth) Regulation" (Cap. 311AA) became effective in 2014 and 2015 respectively and the sulphur contents of the vessel fuels are much lowered. Therefore the marine emissions have been re-calculated and are detailed in **Appendix 3.6**.

3.8.23 There are two modes of operation for the cruise ships: berthing mode and hotelling mode. The berthing mode includes 15 minutes for manoeuvring motions of the cruise vessels from the navigation channel to near the cruise terminal, 15 minutes for final manoeuvring around the berth and 30 minutes for hotelling. According to **Appendix 3.6**, emissions from the cruise ship during berthing are higher than emissions during hotelling. As the worst-case scenario, it has been assumed that the two cruise ships would operate in the berthing mode sequentially in the period coincidental with the peak hour of the traffic flow in the cumulative air quality assessment.

Typhoon Shelter

3.8.24 According to the approved KTD EIA report, there were around 60 barges berthing in To Kwa Wan Typhoon Shelter which has an area of about 233,200 m^2. The auxiliary engine power of each barge was assumed to be 82 kW emitting air pollutants at a height of 5m in this assessment as in the approved KTD EIA. As the requirements of sulphur contents for the current vessel fuel in Hong Kong have been recently tightened, the emission rates have been re-calculated and are detailed in **Appendix 3.7**. Location of To Kwa Wan Typhoon Shelter is shown in **Figure 3-4**.

Assessment Results

3.8.25 As mentioned in **Section 3.6**, Year 2023 would be the worst assessment year within 15 years after commencement of the Project. Vehicular emissions (include portal emissions), emissions from the Kai Tak Cruise Terminal and cruise ships, emissions from To Kwa Wan Typhoon Shelter, chimney emissions and emissions from ventilation buildings would all contribute to the cumulative air quality impact on the Project.

3.8.26 Cumulative air quality impact on each identified ASR in this Project was estimated by adding the modelling results due to background air quality by PATH model, open road vehicular emissions by CALINE4, as well as industrial emissions and marine emissions by ISCST3. The predicted cumulative concentrations of different pollutants at each ASR are compared against their respective AQOs.

Cumulative Impact for "Without Project" and "With Project" Scenarios in Year 2023

3.8.27 Cumulative air quality impacts on each identified ASR under the prevailing air quality conditions (i.e. "Without Project") and during operation of this Project (i.e. "With Project") were estimated by summing the modelling results from PATH, CALINE4 and ISCST3. Year 2023 was selected as the worst assessment year in 15 years upon commencement of operation of the Project. The purpose of presenting the "Without Project scenario was to provide a baseline level for comparison with the "With Project" scenario. As to be discussed below, exceedance of the AQO for annual NO_2 concentrations was found at some ASRs with the Project in operation. Hence, with the "Without Project" as a baseline, it is possible to attribute the causes for the exceedance of the AQO and to identify mitigation measures or remedial measures, if any, to render the residual air quality impact acceptable.

3.8.28 The applicable 1-hour, 24-hour and annual average cumulative concentrations of NO_2, RSP, FSP and SO_2 at each ASR at the worst predicted height above ground level are summarized in **Tables 3-11** and **3-12** under the "Without Project" and "With Project" scenarios respectively. Details of the predicted results for all assessment levels of the ASRs are included in **Appendix 3.9**. Contour plots at the worst hit level of the above parameters are illustrated in **Figures 3-6A** to **3-6H** for the "With Project" scenario.

3.8.29 The summary results indicated that the predicted concentrations of the key air pollutants (NO_2, RSP, FSP and SO_2) at Year 2023 are similar under both scenarios. With the exception of the annual NO_2, the predicted concentrations at all the representative ASRs of the key air pollutants (RSP, FSP, SO_2 and hourly NO_2) would comply with the respective AQOs. The contours maps indicated that apart from the 1-hour NO_2 concentration and annual NO_2 concentration plots, no AQO exceedance zone is observed for the other key air pollutants. Since the NO_2 exceedance zones for both 1-hour and annual NO_2 concentrations cover part of the Project site at 1.5mAG, contour plots at podium level (9.5mAG) of the Project are also provided in **Figures 3-6I** to **3-6J**. The contours maps indicated that no ASR will be present in the 1-hour NO_2 exceedance zone. The AQO exceedance zones at the worst level (1.5 mAG) of the "With Project" scenario are described in **Table 3-13**.

Table 3-11 Predicted Cumulative Air Pollutants Concentrations under "Without Project" Scenario at the Worst Level in Year 2023

ASR ID	**NO_2 Conc. (μg/m³)**		**RSP Conc. (μg/m³)**		**FSP Conc. (μg/m³)**		**SO_2 Conc. (μg/m³)**	
	19th Max. 1-hr	**Annual**	**10th Daily**	**Annual**	**10th Daily**	**Annual**	**4th 10-minute**	**4th Daily**
AQO	**200**	**40**	**100**	**50**	**75**	**35**	**500**	**125**
Prince Edward Road East (Existing ASRs)								
A1 – A4	169.2 – 180.7	31.8 – **61.2**	73.2 – 73.9	39.3 – 40.7	55.0 – 55.5	28.0 – 29.2	150.0 – 229.7	22.4
Ma Tau Chung Road (Existing ASRs)								
A5, A5a, A6, A16	173.6 – 185.7	39.0 – **64.3**	73.2 – 73.9	39.6 – 40.7	54.9 – 55.6	28.3 – 29.3	133.3 – 146.0	22.4
Ma Tau Kok Area/ Kowloon City Road (Kai Tak Tunnel West Portal) (Existing ASRs)								
A7, A11, A12, A14, A15	184.7 – 192.1	34.3 – **61.3**	77.9 – 78.4	40.9 – 42.6	58.6 – 58.9	29.1 – 30.7	131.4 – 299.6	23.1 – 23.2
To Kwa Wan Area (Existing ASRs)								
A8 – A10, A13	187.4 – 191.6	**40.9 – 49.6**	78.1 – 78.4	41.2 – 41.5	58.7 – 59.0	29.4 – 29.7	200.3 – 269.4	23.1
To Kwa Wan Area (Planned ASRs)								
PA12 – PA16	184.5 – 191.6	36.1 – **40.1**	77.9 – 78.3	40.9 – 41.2	58.6 – 58.9	29.2 – 29.4	254.3 – 338.7	23.2 – 25.4
Olympic Avenue (Planned ASRs)								
PA3 – PA11	167.9 – 186.4	27.4 – 33.7	73.2 – 74.0	39.1 – 39.4	54.9 – 55.7	27.8 – 28.0	151.0 – 294.2	22.4 – 24.7
Kai Tak Development Area (Planned ASRs)								
PA17 – PA25	146.3 – 189.3	26.9 – 35.9	73.7 – 75.1	39.3 – 39.9	55.3 – 56.4	28.0 – 28.4	291.6 – 436.1	24.3 – 27.0
MPSC (Planned ASRs)								
ASRs within MPSC	163.5 – 192.0	27.2 – **51.7**	73.1 – 78.6	39.1 – 43.5	54.9 – 59.1	27.8 – 31.5	143.1 – 312.6	22.4 – 23.3

* Bolded results represent exceedance of AQO

** The predicted cumulative 4th highest 10-minute SO_2 concentrations presented were calculated by multiplying the predicted cumulative maximum hourly SO_2 concentrations by the stability-dependent multiplicative factors. For conservativeness, the predicted cumulative 4th highest 10-minute SO_2 concentration is the same as the predicted cumulative maximum 10-minute SO_2 concentration.

Table 3-12 Predicted Cumulative Air Pollutants Concentrations under "With Project" Scenario at the Worst Level in Year 2023

ASR ID	NO_2 Conc. (μg/m³)		RSP Conc. (μg/m³)		FSP Conc. (μg/m³)		SO_2 Conc. (μg/m³)	
	19th Max. 1-hr	Annual	10th Daily	Annual	10th Daily	Annual	4th 10-minute	4th Daily
AQO	**200**	**40**	**100**	**50**	**75**	**35**	**500**	**125**
Prince Edward Road East (Existing ASRs)								
A1 – A4	169.2 – 180.7	31.8 – **61.2**	73.2 – 73.9	39.3 – 40.7	55.0 – 55.6	28.0 – 29.2	150.0 – 229.7	22.4
Ma Tau Chung Road (Existing ASRs)								
A5, A5a, A6, A16	173.7 – 185.9	39.4 – **64.4**	73.2 – 74.0	39.6 – 40.7	54.9 – 55.7	28.3 – 29.3	133.3 – 146.0	22.4
Ma Tau Kok Area/ Kowloon City Road (Kai Tak Tunnel West Portal) (Existing ASRs)								
A7, A11, A12, A14, A15	184.7 – 192.2	34.4 – **61.4**	77.9 – 78.4	40.9 – 42.7	58.6 – 58.9	29.1 – 30.7	131.4 – 299.6	23.1 – 23.2
To Kwa Wan Area (Existing ASRs)								
A8 – A10, A13	187.7 – 191.7	**41.2** – **50.2**	78.1 – 78.4	41.2 – 41.6	58.7 – 59.0	29.4 – 29.7	200.3 – 269.4	23.1
To Kwa Wan Area (Planned ASRs)								
PA12 – PA16	184.7 – 191.7	36.2 – **40.2**	77.9 – 78.4	41.0 – 41.2	58.6 – 58.9	29.2 – 29.4	254.3 – 338.7	23.2 – 25.4
Olympic Avenue (Planned ASRs)								
PA3 – PA11	168.0 – 186.4	27.4 – 33.8	73.2 – 74.0	39.2 – 39.4	54.9 – 55.7	27.8 – 28.0	151.0 – 294.2	22.4 – 24.7
Kai Tak Development Area (Planned ASRs)								
PA17 – PA25	146.3 – 189.5	27.0 – 35.9	73.7 – 75.1	39.3 – 39.9	55.3 – 56.4	28.0 – 28.4	291.6 – 436.1	24.3 – 27.0
MPSC (Planned ASRs)								
ASRs within MPSC	163.5 – 192.9	27.3 – **51.9**	73.1 – 78.7	39.1 – 43.5	54.9 – 59.1	27.8 – 31.6	143.1 – 312.6	22.4 – 23.3

* Bolded results represent exceedance of AQO

** The predicted cumulative 4th highest 10-minute SO_2 concentrations presented were multiplying the predicted cumulative maximum hourly SO_2 concentrations by the stability-dependent multiplicative factors. For conservativeness, the predicted cumulative 4th highest 10-minute SO_2 concentration is the same as the predicted cumulative maximum 10-minute SO_2 concentration.

Table 3-13 Details of Exceedance Zones at the Worst Level in the Worst Assessment Year (2023)

Exceedance Zone	Details
19th max. 1-hour NO_2 at 1.5mAG	
Near the Ventilation Building and Tunnel Portal of CKR	Part of the exceedance zone covers the carpark in the eastern part of the Main Stadium at ground level. The rest of the exceedance zone covers the open area and roads. So there is no ASR within the exceedance zone.
Annual NO_2 at 1.5mAG	
Prince Edward Road East, Ma Tau Chung Road, Ma Tau Kok Area/ Kowloon City Road (Kai Tak Tunnel West Portal), and To Kwa Wan Area	The exceedance zone covers roads, schools, shops, church, playground and performing arts centre. For planned land use, some CDA zoned sites and R(A) zoned sites are wholly or partly fall within the exceedance zone. Moreover, the western corner of the hotel within the Project site is also within the exceedance zone. Notwithstanding this, ASR is unlikely located at G/F of the future development in the CDA or R(A) zoned sites. The fresh air intake of the hotel block in MPSC would be located at 5mAG or above.
Near CKR Tunnel Portal, Landscape Deck Portal and Ventilation Building, and MPSC	The exceedance zone covers the Main Stadium, car parking area, government facility buildings and roads. For planned land use, some open space and commercial zoned sites are wholly or partly fall within the exceedance zone. Only the Main Stadium is classified as an ASR. However, as stated in **Section 3.8.5**, audience and operation staff of the Main Stadium will only stay during the course of an event. The building within the commercial use zone is likely to be installed with central air-conditioning system and the air intake in the future is unlikely at ground level. Hence, the long-term air quality impact does not apply to users/staff of the Main Stadium and no adverse air quality impact is expected.

3.8.30 ASRs experiencing exceedance in AQOs in both “Without Project” and “With Project” scenarios are located near road networks, including Prince Edward Road East, Ma Tau Chung Road, Kowloon City Road, Sung Wong Toi Road, To Kwa Wan Road, Mok Cheong Street and the landscape desk opening of the future Central Kowloon Route.

3.8.31 In order to identify the major NO_2 contributor, **Appendix 3.9** tabulates the contributions from different emission sources to annual average NO_2 at ASRs where exceedance occurs, including the background air pollution, traffic emissions (open road vehicular emission and emissions from portal & ventilation building), as well as chimney emissions (industrial chimneys, To Kwa Wan Typhoon Shelter and Cruise Terminal).

3.8.32 It is noted that annual average NO_2 concentrations at most of the identified ASRs in this Project are dominated by the background air pollution level (predicted using PATH) in both "With Project" and "Without Project" scenarios. Contributions from chimneys and marine emissions are relatively low in this region.

Comparison of Annual Average NO_2 Concentrations between "With Project" and "Without Project" Scenarios in Year 2023

3.8.33 In order to investigate whether operation of the Project will cause any adverse impact on the prevailing air quality conditions, the annual average NO_2 concentrations under the "Without Project" and "With Project" scenarios for identified ASRs with annual NO_2 exceedance have been compared in **Table 3-14**. Detailed comparison are shown in **Appendix 3.9**.

Table 3-14 Comparison of Annual NO_2 Concentrations between "With Project" and "Without Project" (Year 2023) for ASRs with Annual NO_2 Exceedance

ASR ID	m above ground	Without Project	With Project and 60 Days Full Event		
		Overall ($\mu g/m^3$)	Overall ($\mu g/m^3$)	Impact From Project	
				($\mu g/m^3$) [i]	% [ii]
AQO = 40 $\mu g/m^3$					
Prince Edward Road East (Existing ASRs)					
A1, A3, A4	1.5	**52.8** – **61.2**	**52.8** – **61.2**	0.03 – 0.05	0.1%
	5.0	**49.7** – **54.0**	**49.7** – **54.1**	0.06	0.1% – 0.2%
	10.0	**42.4** – **43.1**	**42.4** – **43.2**	0.06 – 0.08	0.2%
Ma Tau Chung Road (Existing ASRs)					
A5, A5a, A16	1.5	**40.0** – **64.3**	**40.3** – **64.4**	0.16 – 0.22	0.4% – 0.5%
	5.0	**45.8** – **46.6**	**46.0** – **46.8**	0.19	0.5%
Ma Tau Kok Area/ Kowloon City Road (Kai Tak Tunnel West Portal) (Existing ASRs)					
A11, A12, A14, A15	1.5	**42.2** – **61.3**	**42.4** – **61.4**	0.15 – 0.26	0.4% – 0.6%
	5.0	38.5 – **55.9**	38.7 – **56.0**	0.11 – 0.19	0.3% – 0.5%
	10.0	36.9 – **46.9**	37.1 – **47.0**	0.11 – 0.15	0.3% – 0.4%
To Kwa Wan Area (Existing ASRs)					
A8 – A10, A13	1.5	**41.7** – **49.6**	**41.8** – **50.2**	0.16 – 0.56	0.4% – 1.4%
	5.0	38.7 – **41.5**	38.8 – **41.9**	0.13 – 0.34	0.3% – 0.9%
To Kwa Wan Area (Planned ASRs)					
PA15[iii]	1.5	**40.1**	**40.2**	0.15	0.4%

i. As stated in **Section 3.8.10**, conversion from NOx to NO_2 is based on OLM method. The conversion of NOx to NO_2 is a result of a series of complex photochemical reactions. The NO_2 is based on 7.5% NOx and the background Ozone concentration.
ii. Impact from Project comparing to AQO in percentage.
iii. PA15 is located in KTD Site 5A4 which is zoned as CDA. The fresh air intake of the future development is recommended to be at least 5m above ground.
* Bolded results represent exceedance of AQO.
** Refer to **Table 3-2**, the air intake/sensitive use for A2 and A7 are above podium level (>20mAG) and thus they are not included in the above table even they are located within the exceeding zone of NO_2 shown in **Figures 3-6B** and **3-6J.**
*** Refer to **Section 3.8.5**, audience and operation staff of the Main Stadium will only stay during the course of an event and hence the long-term air quality impact does not apply to users/staff of the Main Stadium. Therefore, the ASRs for the Main Stadium are not included in the above table even they are located within the exceeding zone of annual NO_2 shown in **Figures 3-6B** and **3-6J.**

3.8.34 As shown in **Table 3-14**, the differences of predicted annual NO_2 between the "Without Project" and "With Project" scenarios range from 0.03 μg/m^3 to 0.56 μg/m^3. According to **Appendix 3.9**, apart from ASRs A9 and A13 at 1.5m, the contribution due to the Project at all the ASRs with exceedance of annual NO_2 is less than 1% of the AQO criterion. As the ground floor of A9 and A13 are shops, it is expected that the staff is working at the shops for at most 12 hours a day and 6 days a week instead of continuously for 24 hours a day and 365 days a year. Hence, the actual exposure to the NO_2 shall be less than those predicted.

Study of Annual NO_2 Concentration for "Without Project" and "With Project" Scenarios in Selected Assessment Years from 2023 to 2036

3.8.35 In the previous section, air quality impact at the worst-assessment Year 2023 associated with this Project has been studied, and exceedance of annual NO_2 has been identified at a number of ASRs for both "Without Project" and "With Project" scenarios. In order to investigate the changes in the prevailing air quality conditions and the cumulative annual NO_2 results in the long term across the 15-year assessment year, a further study for Year 2026 and Year 2036 has been conducted for both the "With Project" and "Without Project" scenarios.

3.8.36 The annual average NO_2 concentrations under the "Without Project" and "With Project" scenarios for Year 2036 for identified ASRs with annual NO_2 exceedance in 2023 have been compared in **Table 3-15**. Despite the fact that exceedance of annual NO_2 concentration has been identified in both Year 2023 and Year 2036, the highest annual NO_2 concentration has been reduced from 64.4μg/m^3 in Year 2023 to 46.6μg/m^3 in Year 2036, (about 28% reduction as shown in **Table 3-14** and **Table 3-15**). In addition, the number of ASRs exceeding the AQO for annual NO_2 has been largely reduced from 15 to 5 (about 67% reduction) from Year 2023 to Year 2036 as shown in **Table 3-16**. Therefore, the overall air quality is expected to be gradually improving from Year 2023 to Year 2036.

3.8.37 The annual average NO_2 level in Year 2036 is expected to exceed the AQO at only five representative ASRs in Year 2036 (i.e. A1, A4, A5a and A9 at G/F and A15 at G/F & 1/F). A1 represents Shek Ku Lung Road Playground immediately north of Prince Edward Road East and the southern part of the playground would fall within the AQO annual NO_2 exceedance zone. A4, A5a, and A9 where exceedance was predicted represent shops at ground level on Prince Edward Road East, Ma Tau Chung Road, and Mok Cheong Street respectively. A15 where exceedance is predicted represents shops at ground level and residences on 1st floor level of the buildings in the vicinity of Po Sum Mansion on Kowloon City Road. Moreover, the exposure to NO_2 for the users at playground (A1) and the staff of the shops (A4, A5a and A9) should be limited as they will not stay continuously for 24 hours a day and 365 days a year.

3.8.38 It should be noted that the exceedance of annual NO_2 at these ASRs is mainly caused by background air quality which is dominated by vehicle emissions from existing roads, whilst the NO_2 generated off-site from the induced traffic of the Project contributes less than 1% to the AQO criterion at all the ASRs in Year 2036, and this contribution does not cause any additional increase in the number of ASRs exceeding the AQO for annual NO_2 as shown in **Table 3-16**.

3.8.39 **Figures 3-6K** to **3-6P** show contour plots for comparing the annual average NO_2 concentration under "Without Project" and "With Project" scenarios at 1.5m and 5.0m above ground in Years 2023, 2026 and 2036. As seen from the above mentioned contour plots, increases in the exceedance zone due to the contribution from the Project in the assessment years are unnoticeable. Moreover, the exceedance zones are localized on some road sections and the covered areas are significantly reduced in Year 2036. **Table 3-17** describes the details of the ASRs within the annual NO_2 exceedance zones in Year 2036.

Table 3-15 Comparison of Annual NO_2 Concentrations between "With Project" and "Without Project" (Year 2036)

ASR ID	**m above ground**	**Without Project**	**With Project and 60 Days Full Event**		
		Overall (μg/m³)	**Overall (μg/m³)**	**Impact From Project**	
				(μg/m³) [i]	**% [ii]**
AQO = 40 μg/m³					
Prince Edward Road East (Existing ASRs)					
A1, A3, A4	1.5	38.9 – **45.3**	38.9 – **45.3**	0.05 – 0.06	0.1%
	5.0	36.9 – 39.6	36.9 – 39.7	0.05 – 0.07	0.1% – 0.2%
	10.0	32.9 – 33.3	32.9 – 33.4	0.05 – 0.06	0.1% – 0.2%
Ma Tau Chung Road (Existing ASRs)					
A5, A5a, A16	1.5	32.4 – **46.4**	32.6 – **46.6**	0.14 – 0.19	0.4% – 0.5%
	5.0	34.2 – 34.6	34.3 – 34.8	0.12 – 0.14	0.3% – 0.4%
Ma Tau Kok Area/ Kowloon City Road (Kai Tak Tunnel West Portal) (Existing ASRs)					
A11, A12, A14, A15	1.5	35.4 – **51.7**	35.5 – **51.8**	0.10 – 0.17	0.3% – 0.4%
	5.0	33.9 – **46.9**	34.0 – **47.0**	0.09 – 0.13	0.2% – 0.3%
	10.0	33.1 – 39.5	33.2 – 39.6	0.09 – 0.10	0.2% – 0.3%
To Kwa Wan Area (Existing ASRs)					
A8 – A10, A13	1.5	36.3 – **41.3**	36.5 – **41.6**	0.12 – 0.36	0.3% – 0.9%
	5.0	34.8 – 36.9	34.9 – 37.1	0.09 – 0.22	0.2% – 0.6%
To Kwa Wan Area (Planned ASRs)					
PA15	1.5	36.1	36.2	0.11	0.3%

i. As stated in **Section 3.8.10**, conversion from NOx to NO_2 is based on OLM method. The conversion of NOx to NO_2 is a result of a series of complex photochemical reactions. The NO_2 is based on 7.5% NOx and the background Ozone concentration.
ii. Impact from Project comparing to AQO in percentage.
iii. PA15 is located in KTD Site 5A4 which is zoned as CDA. The fresh air intake of the future development is recommended to be at least 5m above ground.
* Bolded results represent exceedance of AQO.

Table 3-16 Number of Representative ASRs exceeding AQO Criteria for Annual NO_2

Group of ASR	Without Project		With Project and 60 Days Full Event	
	Year 2023	**Year 2036**	**Year 2023**	**Year 2036**
Prince Edward Road East	3	2	3	2
Ma Tau Chung Road	3	1	3	1
Ma Tau Kok Area / Kowloon City Road (Kai Tak Tunnel West Portal)	4	1	4	1
To Kwa Wan Area (Existing ASR)	4	1	4	1
To Kwa Wan Area (Proposed ASR)	1	0	1	0

[i] Detailed results are shown in **Appendix 3.9**.

Table 3-17 Details of Exceedance Zones in Year 2036

Exceedance Zone	Details
Annual NO_2 at 1.5mAG	
Prince Edward Road East (Existing ASRs)	The exceedance zone covers the southern portion of a playground, part of Princess Edward Road East and some shops at the northwest side of the road. The staff in the shops would at most work for 12 hours a day. The exposures of the users of playground and staff in shops are expected to be limited instead of continuous.
Ma Tau Chung Road	The exceedance zone covers part of Ma Tau Chung Road, some shops along the road and part of the landscaped area of a playground. As mentioned above, the limited exposures of the users of playground and staff in the shops are expected.
Ma Tau Kok Area/ Kowloon City Road (Kai Tak Tunnel West Portal)	The exceedance zone covers shops near Kowloon City Road, Ma Tau Kok Road and Pau Chung Street. The exceedance zone also covers part of a performing arts centre. As mentioned above, the limited exposures of the staff in the shops are expected.
To Kwa Wan Area	The exceedance zone covers some shops along Mok Cheong Street. As mentioned above, the limited exposure of the staff in the shops is expected.
Near CKR Portal Tunnel Portal, Landscape Deck Portal and Ventilation Building, and MPSC	The exceedance zone covers the southeastern portion of Main Stadium, car parking area, and roads. Only the Main Stadium is classified as ASR. However, as stated in **Section 3.8.5**, the audience and operation staff of the Main Stadium will only stay in during course of an event. Hence, the long-term air quality impact does not apply to users/staff of the Main Stadium and no adverse air quality impact is expected.
Annual NO_2 at 5.0mAG	
Ma Tau Kok Area/ Kowloon City Road (Kai Tak Tunnel West Portal)	The exceedance zone covers residential buildings near Kowloon City Road, Pau Chung Street, San Shan Road and Ma Tau Kok Road. The exceedance zone also covers a home for the aged and two kindergartens in Pau Chung Street.
Near CKR Portal Tunnel portal, Landscape Deck Portal and Ventilation Building, and MPSC	The exceedance zone covers the southeastern portion of Main Stadium, car parking area, and roads. Only the Main Stadium is classified as ASR. However, audience and operation staff of the Main Stadium will only stay during the course of an event. Hence, the long-term air quality impact does not apply to users/staff of the Main Stadium and no adverse air quality impact is expected.

Mitigation Measures

3.8.40 As indicated in **Table 3-14** and **Table 3-15**, the Project would only contribute a maximum of 1.4% of the AQO to the identified ASRs where AQO exceedances for the annual average NO_2 in Year 2023 occur. It will further be reduced to a maximum of 0.9% of the AQO in Year 2036. Various mitigation measures targeting on mitigating NO_2 levels have been explored. Details of the recommended mitigation measures are set out below.

Traffic Management

3.8.41 Traffic management is one of the measures explored in this Study. Most vehicles visiting MPSC would travel from Tsim Sha Tsui and Hung Hom (including vehicles from Cross Harbour Tunnel) via Chatham Road North, East Kowloon Corridor, Kowloon City Road reaching To Kwa Wan to Road D2 (see **Table 3** and **Annex I** in **Appendix 3.2**). One of the options is to direct the traffic especially those heavy vehicles carrying equipment to enter the MPSC via Road D2 from Kai Tak East instead of from To Kwa Wan in order to reduce the traffic loadings on Mok Cheong Street, To Kwa Wan Road, Ma Tau Kok Road, Kowloon City Road and Sung Wong Toi Road. This may be done by restricting the entry of the vehicular traffic from east bound of Road D2 to turn right or left into the sports complex.

3.8.42 However, to bypass To Kwa Wan, vehicles would have to detour via Prince Edward Road East through Mongkok, or Central Kowloon Route through west Kowloon. Drivers are expected to use Road D2 via To Kwa Wan and take advantage of the roundabout on the east of the Project site to enter MPSC from the west bound of Road D2. This would further increase the loadings of the already heavily congested roads and require longer travelling distance to the MPSC. Therefore, restricting the entry of vehicular traffic from the east bound of Road D2 is not practical. In addition, the total emissions from these vehicles would be higher due to the extra mileage of travel and would have created unnecessary traffic on Roads D2 and D3.

Restriction on loading and unloading time

3.8.43 While it is not viable to restrict the heavy vehicles to enter the MPSC site via Road D2, it is possible to restrict the loading and unloading of these heavy vehicles to off-peak hours. This measure would reduce traffic loading on the roads in nearby area during the peak hours and in turn would reduce vehicle emissions.

Reduction of Emissions at Source

3.8.44 Another measure considered is the reduction of emissions at source. This can be done by requiring vehicles under the management control of the future MPSC operator to use electric vehicles (EV) such as electric saloon cars/coaches during the operation of the MPSC. In order to encourage the use of EV, it is recommended further that EV charging points and EV charging enabling facilities on par with Government's best practice guide should be provided at the carparks within the MPSC site. A review on the provision of EV charging facilities will be reviewed by the future operator. Subject to the outcomes of the review to be carried out by the future operator, the provision of the EV charging facilities may be further enhanced to meet the prevailing demand. The operator shall also give priority to EV using the car parking spaces as far as practicable. For example, the operator may develop a booking system for the parking spaces for private cars. EV owners can have the privilege to book car parking spaces earlier than other non-EV owners.

Reduction of Car Parking Spaces

3.8.45 Car parking spaces will be provided for the sport venues, retail area, office and hotel to cater for their operation requirements. The number of car parking spaces for the venues and facilities has made reference to similar overseas stadiums and follow the Hong Kong Planning Standard and Guidelines (HKPSG) as appropriate. The lower limits of parking provisions for retail area, office and hotel in the HKPSG have been adopted as far as practicable to discourage use of cars. Possible reduction in the car parking spaces has been considered (reduced from 1,200 to below 1,000) to account for the different peak utilization periods of the venues and facilities. The Transport Department has also advised that any downward adjustment of the number of parking spaces is not recommended from the traffic point of view and shall be supported by traffic figures. In any case, car parking spaces for coaches, goods vehicles and working/services/emergency vehicles would be less than 300.

Recommended Mitigation Measures

3.8.46 All practical measures to limit vehicle emissions from MPSC will be implemented by the operator include: -

- Provision of electric vehicle (EV) charging facilities in at least one-third of the car parking spaces for private cars;
- Provision of EV charging enabling facilities in all car parking spaces provided for private cars;
- Giving priority to EV using the car parking spaces as far as practicable;
- If the operator provides transport services for the staff and/or guests, electric saloon cars, coaches, etc. should be used under normal operation; and
- Entry of heavy goods vehicles to MPSC should avoid peak hours, weekdays from 7 am to 10 am and from 4 pm to 7 pm, except for major events (i.e. with more than 20,000 persons).

3.8.47 Regarding the possible air quality impact on the Project, the fresh air intake of the hotel block in MPSC shall be located at least 5mAG.

Evaluation of Residual Impact

3.8.48 As presented in the preceding sections, all the air quality criteria as stipulated in the Air Quality Objectives and in the EIAO-TM are met, with the exception of the annual NO_2.

3.8.49 The recommended mitigation measures in **Section 3.8.46** would help reduce the annual NO_2 emissions but their benefits are not easily quantifiable for the purpose of evaluating the residual impacts. As such, the residual impacts are evaluated based upon the assessment results in **Table 3-14** to **Table 3-15** which would potentially be further reduced when the future operator puts in place the mitigation measures as far as practicable during the project implementation stage. On this basis, exceedance of AQO for annual NO_2 is predicted in localised areas as shown in **Figures 3-6K** to **3-6L**. Notwithstanding this, based on **Table 3-14** and **Table 3-15**, the maximum project contribution to the identified exceedances of the annual average NO_2 in 2023 is only 1.4% of the AQO, and it will be reduced to a maximum of 0.9% of the AQO in Year 2036.

3.8.50 The residual air quality impacts are evaluated in the following sections in accordance with Section 4.4.3 of EIAO-TM with a view to examining whether the residual air quality impact arising from the Project will cause long term serious environmental implications.

Air Quality Impact due to the Project

3.8.51 The Project itself is not an air pollution source. Referring to **Appendix 3.9**, the AQO exceedance of the annual NO_2 under the "With Project" scenario is dominated by the background air pollution level. According to the contour plots in **Figure 3-6K** to **Figure 3-6P**, the annual NO_2 concentration exceedance zones predicted in 2023 are not widespread but localised areas which will be largely reduced in Year 2036. In other words, the geographical extent of the impacts caused by the induced traffic from the Project is not long range but occurs in the road network in the vicinity of the Project. Moreover, the Project will not cause noticeable increases in the exceedance zones in both assessment years as seen from the contour plots under the "Without Project" and "With Project" scenarios.

3.8.52 As shown in **Table 3-14** and **Table 3-15**, the highest predicted annual NO_2 concentration at the identified ASRs (representing shops at Kam Wah Building near Ma Tau Chung Road) is 64.4 $\mu g/m^3$ in Year 2023, which will be reduced to 46.6 $\mu g/m^3$ in Year 2036. The exceedances are largely due to the background air pollution levels, and the contribution from the Project is only 0.19 $\mu g/m^3$ (i.e. 0.5% of the AQO limit) at the identified ASR in Year 2036. As mentioned in **Section 3.8.34**, the staff would at most be working for 12 hours a day and 6 days a week, and therefore they would have limited exposure to this level of NO_2. On this basis, the magnitude of contribution to the cumulative annual NO_2 concentration due to the Project when considered in conjunction with the impacts from prevailing background and other potential projects in Year 2036 is considered minimal, and therefore the potential associated health effect from the minimal additional air pollutants caused by the Project itself is considered negligible and unlikely to be a key concern.

Continuous Improvement of Air Quality Conditions

3.8.53 With the implementation of the air quality improvement programmes currently being undertaken by the Government, such as "A Clean Air Plan for Hong Kong" which aims to tackle roadside air pollution and to reduce marine emissions, continuous air quality improvement in the territory is expected. This is supported by the assessment results in **Table 3-15**. Based on these assessment results, the predicted magnitude of annual NO_2 concentrations at all the representative ASRs will be reduced from the worst assessment year of Year 2023 to Year 2036 (15 years after the Project commencement). Furthermore, the number of ASRs being exposed to NO_2 levels exceeding the annual criteria will be largely reduced from 15 to 5 from Year 2023 to Year 2036. As demonstrated by the improving trend of air quality conditions, the air quality impact arising from the Project will be off-set in the longer term by the Government's air quality improvement programme. The likelihood of future adverse environmental impacts caused by the operation of the Project itself is not high.

3.8.54 As shown in **Figures 3-6K** to **3-6P**, the exceedance zones for annual NO_2 in Year 2023 and Year 2036 are localised. The affected areas and hence the likely size of community affected are not widespread. As seen from the mentioned above contour plots, increases in the exceedance zones due to the contribution from the Project in both assessment years are unnoticeable. Based on the assessment results, similar population would be affected without the Project. The affected communities mainly consist of the staff in the shops at ground floor, who have limited exposure to the NO_2 impact. As air quality improves over time, the small affected population in Year 2023 will be further reduced to a limited size in Year 2036. Details of the estimated likely size of the affected population are shown in **Appendix 3.10**.

<u>Others Considerations</u>

3.8.55 The non-compliance of annual NO_2 AQO criterion occurred only in some localised areas which are considered not of regional concern. In addition, the residual impact would not cause any ecological or cultural heritage concerns.

3.8.56 Pollutant concentrations predicted by PATH in Year 2020 have been adopted for the background air quality for the assessment years from Year 2023 (the worst assessment year) to Year 2036 (15 years after the commencement of the Project). In consideration of air quality improvement schemes implemented by the Government that would gradually take effect following Year 2020, the use of the Year 2020 PATH background in predicting pollutant concentration in Years 2023 to Year 2036 is considered conservative. As such, both the likelihood and degree of uncertainty of adverse environmental impacts are minimized.

3.8.57 Based on the analysis in **Sections 3.8.48** to **3.8.56** above, it is clearly demonstrated that the residual impact of annual NO_2 is predominantly caused by existing background concentrations unrelated to this Project, and the impacts caused by this Project itself are minimal. It is thus concluded that the residual air quality impact caused by the Project will not cause long term serious environmental implications.

3.9 Conclusion

3.9.1 This Chapter presents an air quality impact assessment for the construction and operational phases of the Project.

3.9.2 Potential air quality impacts from the construction works of the Project would mainly be related to construction dust from site clearance, excavation, foundation and site formation works. Construction dust impact arising from this Project with consideration of concurrent projects has been assessed for both the unmitigated and mitigated scenarios. With proper implementation of the recommended mitigation measures, it has been assessed that all dust concentrations at ASRs are predicted to comply with the TSP criterion as well as the relevant AQOs for RSP and FSP. Hence, there are no adverse residual air quality impacts anticipated during the construction phase.

3.9.3 The air emission sources during operational phase include open road traffic emissions, marine emissions from the Kai Tak Cruise Terminal, emissions from To Kwa Wan Typhoon Shelter, industrial emissions from nearby chimneys within 1km of the Project site, and the background pollutant concentration predicted by PATH. Based on the sensitivity test result, Year 2023 is the worst assessment year within the next 15 years upon commissioning of the Project in Year 2021. CALINE4 has been used to predict the pollution concentrations from traffic emissions while ISCST3 has been used to predict the concentrations from other sources.

3.9.4 The only air emission source due to the Project is the induced traffic along the traffic routes leading to or from the future MPSC, while the Project does not produce air emissions of significant amounts. Cumulative impact for both “Without project” and “With project” scenarios have been assessed. Based on the modelling results, it is predicted that the concentrations in respect of 10-min. SO_2, hourly SO_2, daily RSP, annual RSP, daily FSP, annual FSP, and hourly NO_2 at all the identified ASRs would be in compliance with the AQOs for both scenarios.

3.9.5 Although part of the Main Stadium falls within the annual NO_2 exceedance zone, spectators/audience/staff of the Main Stadium will only stay during the course of events, and hence, the long-term air quality impact does not apply to users/staff of the Main Stadium. As the hotel shall be serviced by a central air conditioning system, no adverse impact is anticipated so long as the fresh-air intake points of the building are located outside the annual NO_2 exceedance zone (at least 5m above ground).

3.9.6 ASRs located along the roads with traffic induced by the operation of the Project have been identified for evaluating the potential air quality impact due to the operation of the Project. Exceedances of annual average NO_2 were found only at 1.5m, 5m and 10m levels of some identified ASRs. Assessment results indicated that exceedances at most of the ASRs are largely due to the background air pollutant levels, and the same ASRs would have annual average NO_2 exceeding the AQOs even without the Project.

3.9.7 With the implementation of the air quality improvement programmes currently being undertaken by the Government, such as “A Clean Air Plan for Hong Kong” which aims to tackle roadside air pollution and to reduce marine emissions, continuous air quality improvement in the territory is expected. Based on these assessment results, the pollutant concentrations would be largely reduced and the number of ASRs complying with the AQOs would be increased from Years 2023 to 2036. Furthermore, the number of ASRs being exposed to NO_2 levels exceeding the annual criterion will be largely reduced from 15 to 5 (i.e. A1, A4, A5a and A9 at G/F and A15 at G/F & 1/F) from Year 2023 to Year 2036. A1 represents the playground to the north of Prince Edward Road East. A4, A5a, and A9 where exceedance was predicted represent shops at ground level on Prince Edward Road East, Ma Tau Chung Road, and Mok Cheong Street respectively. A15 where exceedance is predicted represents shops at ground level and residences on 1st floor level of the buildings in the vicinity of Po Sum Mansion on Kowloon City Road. The exceedance for annual NO_2 at these ASRs is mainly due to the background air pollution levels, whilst the highest NO_2 generated off-site from the induced traffic of the Project contributes 0.9% to the AQO criterion in Year 2036, and this contribution does not cause any additional increase in the number of ASRs exceeding the AQO for annual NO_2.

3.9.8 The non-compliance of annual NO_2 AQO criterion occurs only in some localised areas which are considered not of regional concern. In addition, the residual impact would not cause any ecological or cultural heritage concerns.

3.9.9 Pollutant concentrations predicted by PATH in Year 2020 have been adopted for the background air quality for the assessment years from Year 2023 (the worst assessment year) to Year 2036 (15 years after the commencement of the Project). In consideration of air quality improvement schemes implemented by the Government that would gradually take effect following Year 2020, the use of Year 2020 PATH background in predicting pollutant concentration in Years 2023 to 2036 is considered conservative. As such, both the likelihood and degree of uncertainty of adverse environmental impacts are minimized.

3.9.10 Various options of mitigation measures have been explored. Practical measures to be implemented include: (a) provision of electric vehicle (EV) charging facilities in at least one-third of the car parking spaces for private cars, (b) provision of EV charging enabling facilities in all car parking spaces for private cars, (c) giving priority to EV using the car parking spaces as far as practicable, (d) use of electric saloon cars and coaches in the transport services for staff and/or hotel guests under normal operation (if such services are provided by the future operator), and (e) restricting entry of heavy vehicles during peak hours (7 a.m. to 10 a.m. and 4 p.m. to 7 p.m.) in weekdays, except for major events (i.e. with more than 20,000 persons).

3.9.11 The mitigation measures recommended above would help reduce the annual NO_2 emission but their benefits are not easily quantifiable for the purpose of evaluating the residual impact. As such, the residual impacts are evaluated based upon the assessment results which would potentially be further reduced when the future operator puts in place the mitigation measures as far as practicable during the project implementation stage.

3.9.12 Residual environmental impacts have been evaluated in accordance with the Section 4.4.3 of EIAO-TM. Assessment results show that the exceedances of annual average NO_2 are mainly resulted from the relatively high concentrations of background air pollution in Kowloon City and To Kwa Wan Districts, and the impact magnitude for changes in ambient pollutant concentrations due to the Project is considered minimal in the assessment area. With the implementation of the air quality improvement schemes currently being undertaken by the Government, continuous air quality improvement in the territory is expected. The small affected population in Year 2023 will further be reduced to a limited size in Year 2036. Based on the assessment results, similar population would be affected even without the Project. Through the evaluation of the residual environmental impacts in **Sections 3.8.48** to **3.8.57**, it is considered that the Project will not cause long term serious environmental implications.

3.9.13 In conclusion, the Project would not impose adverse air quality impact on the assessment area and the residual impacts are insignificant.

4 HAZARD TO LIFE ASSESSMENT

4.1 Introduction

4.1.1 In accordance with Clause 3.4.4.1 of the EIA Study Brief (No. ESB-274/2014), relevant hazard to life assessment findings related to the Project should be reviewed in order to determine whether an updated hazard to life assessment in the EIA study is necessary. If an updated hazard to life assessment is required to be carried out, technical assessment requirements stipulated in Clauses 3.4.4.2 to 3.4.4.4 of the EIA Study Brief should be followed.

4.2 Legislation, Standards and Criteria

4.2.1 The estimated risk levels of the hazardous sources shall be compared with the risk guidelines stipulated in the EIAO-TM Annex 4 to determine the acceptability. As set out in Annex 4 of the EIAO-TM, the risk guidelines comprise individual risk guideline and societal risk guidelines. For individual risk, maximum level of off-site individual risk should not exceed 1 in 100 000 per year (i.e.$1x10^{-5}$ /year). The societal risk guidelines for acceptable risk levels assessment criteria is also defined in Figure 1 in Annex 4 of the EIAO-TM as provided in **Appendix 4.1**.

4.3 Review of Hazard to Life assessment Findings in Previous EIA Study

4.3.1 The EIA Report "*Comprehensive Feasibility Study for The Revised Scheme of South East Kowloon Development*" was completed in mid-2001 and approved on 25 September 2001 (No.: AEIAR-044/2001) for the comprehensive feasibility study for the revised scheme of South East Kowloon Development. Since the report was prepared in 2001, an update was conducted by the Kai Tak Development (KTD) EIA as mentioned below.

4.3.2 The KTD EIA Report was completed in 2008 and approved on 4 March 2009 (No.: AEIAR-130/2009) for the "*Kai Tak Development Engineering Study cum Design and Construction of Advance Works – Investigation, Design and Construction*". It falls under Item 1 Schedule 3 of the EIAO. The Project site was included under this study.

4.3.3 According to the Hazard to Life Assessment in the KTD EIA, several hazardous sources were identified as shown in **Table 4-1** below. The locations of identified hazardous facilities shown in Figure 11.1.1 of the KTD EIA report is also provided in **Appendix 4.2** for reference.

Table 4-1 Hazardous Sources Identified in the Kai Tak Development EIA Report

Hazardous Sources	Locations	Remarks	Distance to the nearest Project Site Boundary (m)
Ma Tau Kok Gas Works (North Plant) and its associated facilities	To Kwa Wan Road, Ma Tau Kok	A designated PHI due to storage of more than 15 tonnes of Town Gas, with a Consultation Zone (CZ) of 300m radius from the mid. point between the two gas holders of the North Works. Associated facilities include the gas pigging station, naphtha unloading jetty, pressure regulating station, landing point for the two 400mm diameter submarine gas pipelines and other operational related facilities situated at the seafront site just next to the Kowloon City Ferry Pier. According to the EIA Report (No. AEIAR-153/2010) Installation of Submarine Gas Pipelines and Associated Facilities from To Kwa Wan to North Point for Former Kai Tak Airport Development, the existing twin 400mm diameter submarine gas pipelines were proposed to be diverted. The Ma Tau Kok gas pigging station shall be relocated close to the existing DSD To Kwa Wan Sewage Treatment Works (about 700m further away from the Project site in compare with the existing pigging station location)	~400m from the North Plant; ~350m from the Pigging station
Chlorine Dock	Cheung Yip Street, Kowloon Bay	It is confirmed in the approved KTD EIA Report that there is plan to decommission and relocate the existing chlorine dock outside the project boundary of Kai Tak Development prior to the future land uses of the KTD Project. Hazard assessment of this hazard source is not required.	N/A
DGV Ferry Pier	Kwun Tong	A ferry pier for DG ferries carrying dangerous goods vehicles.	> 2500m

Hazardous Sources	Locations	Remarks	Distance to the nearest Project Site Boundary (m)
Kerry DG Warehouse (Kowloon Bay)	7 Kai Hing Road, Kowloon Bay	A DG warehouse for storage of dangerous goods.	>1500m
Petrol cum LPG Filling Stations and Dedicated LPG Filling Stations	Within or in Vicinity to KTD Area	Address of the Petrol cum LPG Filling Stations are: • Wang Chin Street, Kowloon Bay • Kai Fuk Road, Kowloon Bay (West Bound) • 8 Kai Fuk Road, Kowloon Bay (West Bound) • 7 Kai Fuk Road, Kowloon Bay (East Bound) • Kai Fuk Road, Kowloon Bay (East Bound) • Address of the Dedicated LPG Filling Stations area: • Wai Lok Street, Kwun Tong • Cheung Yip Street, Kowloon Bay	>480m to >1300m
Explosives Storage and Blasting Operations for KTD	Express within KTD Area	It is confirmed in the KTD EIA Report that no explosives would be used for the construction activities.	N/A

<u>Ma Tau Kok Gas Works North Plant (MTKGWNP)</u>

4.3.4 The MTKGWNP is one of the Towngas production plants in Hong Kong and is classified as a Potentially Hazardous Installation (PHI) which is located adjacent to part of the planning area of the KTD. The plant is located at To Kwa Wan Road with Ma Tau Kok Road and San Shan Road to the northeast and southwest of its boundary respectively.

4.3.5 The Ma Tau Kok Gas Works (North Plant) is located over 400m from the nearest boundary of the Project and hence the whole Project site is outside the 300m Consultation Zone (CZ) of the PHI.

4.3.6 In addition to the gas production plant, there are other associated gas facilities in Ma Tau Kok which are over 350m from the Project boundary. These include the gas pigging station, naphtha-unloading jetty, pressure regulating station, landing point for the two 400mm diameter submarine gas pipelines and other operational related facilities situated at a seafront site just next to the Kowloon City Ferry Pier. According to the approved EIA Report (No. AEIAR-153/2010) "*Installation of Submarine Gas Pipelines and Associated Facilities from To Kwa Wan to North Point for Former Kai Tak Airport Development*", the existing twin 400mm diameter submarine gas pipelines were proposed to be diverted. The Ma Tau Kok gas pigging station shall be relocated close to the existing DSD To Kwa Wan Sewage Treatment Works where the new proposed location is over 900m from the Project site.

4.3.7 Potential hazards associated unloading, storage and processing of liquid Naphtha during the gas production process and the hazards related to storage and transmission of Towngas were identified in the approved KTD EIA Report. Hazardous scenarios include pool fire, jet fire, flash fire, fireball, and bund fire were considered.

4.3.8 Assessment results in the approved KTD EIA report indicated that the 10^{-5} per year individual risk contour is located inside the boundary of the MTKGWNP. The Project site is located far away from the 10^{-9} per year individual risk contour and thus the potential risk on the Project is minimal. Since the population of the Project is outside the Consultation Zone of the PHI, the societal risk results in the approved KTD EIA report would not be affected by the Project and the results and conclusion in the approved KTD EIA report are still valid for the Project. The KTD EIA mentioned that the individual risk of the PHI is in compliance with the TM criteria and the societal risk level can be reduced as low as practicable for meeting requirements stipulated in the Hong Kong Risk Guidelines.

<u>Chlorine Dock/ DGV Ferry Pier / Kerry DG Warehouse (Kowloon Bay)</u>

4.3.9 It is confirmed in the approved KTD EIA Report that the chlorine dock is confirmed to be decommissioned and relocated outside the project boundary of KTD prior to future development. Therefore, hazard arising from the Chlorine Dock is not considered. The DGV Ferry Pier and the Kerry DG Warehouse are located over 1.5km away from the Project site. Referring to the assessment results in the approved EIA report, the Project site is located far away from the 10^{-9} per year individual risk contour. No potential hazard on the Project is anticipated.

<u>Petrol cum LPG Filling Stations and Dedicated LPG Filling Stations</u>

4.3.10 The study area of 150m radius from the petrol cum LPG station / dedicated LPG station is adopted in the approved KTD EIA Report. It is consistent with other approved EIA studies where 150m study area of the LPG sites was considered. Since the nearest station is about 480m away from the Project site, no potential hazard on the Project arising from the petrol/LPG stations within or in vicinity of KTD is anticipated.

<u>Explosives Storage and Blasting Operations for KTD</u>

4.3.11 It is confirmed in the approved KTD EIA Report that no explosives would be used for the construction activities in the KTD. No blasting operation is required for the Project. Therefore, hazard arising from the explosives storage or blasting operations for KTD/the Project construction is not considered.

4.4 Review of Existing and Planned Hazard Source in KTD

4.4.1 Based on the latest available information (including on-site survey and review of OZPs and the latest Recommended Outline Development Plan), no new potentially hazardous installation (PHI) is proposed in the KTD area, and all existing/planned hazardous sources within or in vicinity of KTD have been considered in the approved EIA report for the KTD.

4.5 Conclusion

4.5.1 Hazard to Life Assessment in KTD area was fully addressed in the approved Schedule 3 EIA Report for Kai Tak Development (Register No.: AEIAR-130/2009). It has been concluded that no adverse hazard to life impact on the future occupants of the KTD is anticipated. Based on the latest available information, no new PHI is proposed in KTD area and all existing/planned hazardous sources within or in vicinity of KTD were considered in the approved KTD EIA report. The project site falls outside all the Consultation Zones / study areas of the identified hazardous sources. Hence, the findings of the hazard to life assessment related to the Project in the approved EIA report for the KTD remain valid, i.e. adverse potential hazard to life impact during the construction and operation on the Project is not anticipated, and no further hazard to life assessment is required.

5 NOISE IMPACT ASSESSMENT

5.1 Introduction

5.1.1 This chapter presents the potential noise impacts on noise sensitive receivers during the construction and operation of the Project. All existing and planned noise sensitive receivers in the Study Area have been identified from base maps, the latest Outline Zoning Plan (OZPs), the latest Recommended Outline Development Plan (RODP), and the approved planning application, as appropriate, and were verified on site. Noise impacts due to construction of the Project and traffic induced by its operation have been assessed. As the Project would encompass sports events in the Main Stadium and the Public Sport Ground, musical events in the Main Stadium, and human activities from crowd dispersion after a major event at the Main Stadium, these activities and the induced road traffic before and after major events in the Main Stadium are potential noise sources and their potential noise impacts have been assessed. Furthermore, potential impacts arising from fixed noise sources such as building services systems and ventilation systems have also been assessed in this Chapter.

5.2 Environmental Legislation, Policies, Standards and Criteria

Construction Phase

5.2.1 Construction noise is governed by the Noise Control Ordinance (NCO), the Environmental Impact Assessment Ordinance (EIAO), and their subsidiary requirements. A number of Technical Memoranda (TM) have been issued under the NCO and the EIAO to stipulate control approaches and criteria. Potential noise impacts on sensitive receivers could be assessed in accordance with the criteria and methodology given in the TM which are:

- TM on Environmental Impact Assessment Process (EIAO-TM) (Annex 5, 13)
- TM on Noise from Construction Work other than Percussive Piling (GW-TM)

5.2.2 Noise impact arising from general construction activities other than percussive piling during the non-restricted hours (i.e. 07:00-19:00 hours of any day not being a Sunday or general holiday) are assessed against the noise criteria as stipulated in the EIAO-TM and reproduced in **Table 5-1**.

Table 5-1 Construction Noise Standards during Non-Restricted Hours

Uses	Noise Standards [1], dB(A), Leq (30 mins)
All domestic premises including temporary housing accommodation	75
Hotels and hostels	75
Educational institutions including kindergartens, nurseries and all others where unaided voice communication is required	70 65 (During examinations)

Notes:
[1] The above standards apply to uses which rely on opened windows for ventilation.

5.2.3 According to the preliminary construction programme, it is very likely that the proposed construction works would be carried out during non-restricted hours only.

Operation Phase

Road Traffic Noise

5.2.4 Table 1A of Annex 5 in the EIAO-TM defines the noise criteria for road traffic noise in term of L_{10} (1-hour) at various noise sensitive receivers (NSRs):

- 70 dB(A) for all domestic premises including temporary housing accommodation, hotels and hostels, offices;
- 65 dB(A) for educational institutions including kindergartens, nurseries and all others where unaided voice communication is required, and places of public worship and courts of law;
- 55 dB(A) for hospital, clinics, convalescences and homes for the aged, diagnostic rooms, wards.

Notes:
[1] The above standards apply to uses that rely on opened windows for ventilation.
[2] The above standards should be viewed as the maximum permissible noise levels assessed at 1m from the external façade.

5.2.5 For the purpose of traffic noise assessment, the roads with induced traffic due to the operation of the Project are identified and included in the assessment. According to paragraph 5.(i)(a) in Appendix C of the Study Brief of the Project, the traffic noise impact shall be considered significant if the traffic noise level with the Project is greater than that without the project at the design year by 1.0 dB(A) or more.

Operational Noise from Fixed Sources

5.2.6 Fixed noise sources, such as the public address system, building services systems, and the operation of the Main Stadium, Public Sports Ground and Indoor Sports Centre for sports events are controlled under the NCO and Technical Memorandum for the Assessment of Noise from Places Other than Domestic Premises, Public Places or Construction Sites (IND-TM). More stringent criteria for assessing noise impacts from fixed plant are recommended in the EIAO-TM for planning purposes. A noise criterion of 5 dB below the appropriate acceptable noise levels (ANLs) shown in the IND-TM or the prevailing background noise levels, whichever is the lower has been adopted for the assessment of fixed noise source impact in relation to the Multi-purpose Sports Complex (MPSC) operation.

5.2.7 The Project site will be located in the developed urban areas during its operational phase. Noise measurements have been conducted for the prevailing background noise levels at representative locations. The locations and justifications for selecting these locations shall be discussed in **Sections 5.3** & **5.4**. It will be shown that the measured noise levels were higher than ANL – 5 dB (refer to **Appendix 5.1A** for details). Therefore ANL – 5 dB has been adopted as the criteria for the noise impact assessment for fixed sources. The ANLs for different area sensitivity ratings (ASRs) and the adopted criteria are summarized in **Table 5-2** below.

Table 5-2 Acceptable Noise Levels and Adopted Criteria for Fixed Noise Sources

Time Period	ANL / Criteria (ANL – 5), dB(A) Leq (30 mins)		
	ASR A	ASR B	ASR C
Day (07:00 to 19:00 hours)	60 / 55	65 / 60	70 / 65
Evening (19:00 to 23:00 hours)			
Night (23:00 to 07:00 hours)	50 / 45	55 / 50	60 / 55

5.2.8 The ASR depends on the type of area and the degree of impact that Influencing Factors (IFs) have on the NSRs and is determined according to **Table 5-3** below. Industrial areas, major roads or the area within the boundary of Hong Kong International Airport shall be considered to be an IF.

Table 5-3 Area Sensitivity Ratings

Type of Area containing NSR	Degree to which NSR is affected by IF		
	Not Affected	Indirectly Affected	Directly Affected
(i) Rural area, including country parks or village type developments	A	B	B
(ii) Low density residential area consisting of low-rise or isolated high-rise developments	A	B	C
(iii) Urban area	B	C	C
(iv) Area other than those above	B	B	C

Noise from Music, Singing and Instrument Performing Activities

5.2.9 The approved Schedule 3 EIA report “Comprehensive Feasibility Study for the Revised Scheme of South East Kowloon Development” (AEIAR-044/2001) was conducted based on no event/activity held in the MPSC after 11 pm. The subsequent approved Schedule 3 EIA report for the Kai Tak Development (AEIAR-130/2009) specified that the acceptability of the operation of the Stadium Complex after 11 pm should be demonstrated by a noise impact assessment during its detailed design stage.

5.2.10 The NCO, EIAO-TM, and local noise guidelines do not specify any quantitative assessment criteria applicable to noise from music, singing and instrument performing activities during night-time. Noise standards from recognized national/international organizations have been reviewed and no appropriate quantitative assessment criteria have been identified for such noise at night time, i.e. 23:00 to 07:00 hours.

5.2.11 The Noise Control Guidelines issued by the Environmental Protection Department for Music, Singing and Instrument Performing Activities are referred to in this Project. As the main purpose of the Main Stadium is for sports events, the number of musical activities is anticipated to be low, i.e. no more than 20 events in a year. For musical events which will be held infrequently in the Main Stadium, noise levels from the activities (including rehearsals and main events) should not be more than 10 dB above the prevailing background noise level, as measured at one metre from the exterior building façade of any nearby NSR, between 07:00 and 23:00 hours, according to the above guidelines. For night time activities, i.e. 23:00 to 07:00 hours, noise from such activities should not be audible within any nearby noise sensitive receivers according to the same guidelines. A Places of Public Entertainment License is required for any musical activity held in the Main Stadium.

5.2.12 As there is no quantitative criterion for "not audible" events, the best way to carry out a noise assessment for a planned project such as this MPSC is to assess the noise from a similar activity. However, there is no similar venue in Hong Kong with a capacity similar to this MPSC for a night-time noise activity. Hence, it is recommended that should the future operator of this MPSC plan to hold any musical events at the Main Stadium during the night-time period (i.e. 11 p.m. to 7 a.m.), the operator is obliged to ensure that the noise impacts arising from the night-time musical events will comply with the noise requirements under the NCO.

Noise from Human Activities

5.2.13 The Project site will have direct access to the future Shatin-Central Link (SCL) Kai Tak Station and To Kwa Wan Station. According to the approved traffic impact assessment report as part of the feasibility study of MPSC (Agreement No. 9AT 034 dated November 2009), over 80% of spectators (before and after events) at MPSC are expected to use the mass transit system for transportation. The podium deck is the major crowd dispersion route for the spectators leaving the Project site. It connects those functional blocks of the sports complex as well as the parks near the Indoor Sports Centre and the Main Stadium, and is a public place.

5.2.14 In this Project, noise from human activities in public places would arise mainly from crowd dispersal after events. In Hong Kong, noise from public places (including those from human activities) is controlled under s.4 & s.5 of the NCO. Any person causes any noise which is a source of annoyance to any person commits an offence. s.4 & s.5 of the NCO are mainly enforced by the Hong Kong Police Force (HKPF). In general, crowd dispersion itself is not a source of annoyance especially during daytime/evening. Similar to other crowd dispersion controls after major events in Hong Kong, it is anticipated that the HKPF shall take crowd management control measures along dispersal routes for the MPSC. In case of any misbehaviour or abnormal act in the crowd, the HKPF would take necessary and appropriate action. According to the HKPF, individual persons making specific noise e.g. shouting persistently, playing instruments, and using loudspeakers, and refusing to stop after repeated warnings might constitute an offence under s.4 of the ordinance.

5.3 Description of the Environment

5.3.1 The Project site is situated to the northwest of the runway of the former Kai Tak Airport. It is bounded by the proposed Sung Wong Toi Park and waterfront area near Ma Tau Kok to the southwest and the Central Kowloon Route (CKR) to the southeast. Both the areas on the northeast and northwest of the site are zoned for residential use.

5.3.2 Currently, the Project site and its adjacent lands are either works areas for various projects under the Kai Tak Development (KTD) or leased out as temporary car parks. Road D2 (Shing Kai Road) is a new district distributor in the KTD under construction. It dissects the Project site into two pieces and serves as the access road to the Project site during its operation phase.

5.3.3 The existing land uses on the western side of the MPSC are commercial, industrial and residential uses. This area is exposed to the heavy traffic on the existing Sung Wong Toi Road and Olympic Avenue. Upon the commencement of MPSC, Road D2 will introduce extra traffic to these roads. Moreover, the area currently accommodates more than 200 vehicle repair workshops. Along with the traffic noise, these garages are also contributing noise to the area.

5.3.4 There are planned residential areas on the northern side of the Project site, and the future Kai Tak Station is located further northeast. The ground level of the station and its vicinity is a planned Station Square. According to the “Recommended Outline Development Plan” dated November 2013 as provided in **Appendix 2B**, land on the residential zones fronting the Project site is designated as “shops and services” and “eating place” uses only. Land provision of such uses spread along both sides of the Station Square. The planning intention is to create a vibrant street environment. Therefore, even though the area will not be subject to significant traffic noise, there would be noise from such neighbourhood and commercial activities.

5.4 Noise Sensitive Receivers

5.4.1 In order to evaluate the noise impacts from the Project, representative noise sensitive receivers (NSRs), which rely on opened windows for ventilation, within 300m from the boundary of the Project site have been identified. Only the first layer of NSRs has been identified for assessment because this layer would provide acoustic shielding for those receivers behind.

5.4.2 The Main Stadium, Public Sports Ground and the Indoor Sport Centre are not classified as noise sensitive receivers by nature of their uses. On the other hand, as the office and hotel components of the Project will be provided with central ventilation, the traffic noise standards in the EIAO-TM do not apply to these receivers either.

5.4.3 The Study Area of 300m from the boundary of the Project site and the locations of the representative NSRs are shown in **Figure 5-2**. **Table 5-4** lists the representative NSRs for construction noise assessment. Referring to the Project construction programme, the construction works shall start in 2017 and are anticipated to complete by 2020/2021. For the planned NSR without any tentative schedule for completion under the latest RODP (e.g. sub-planning area 2B, 1K, 1L), it has been assumed that it would have population intake before the completion of the Project as a conservative approach and hence they have also been considered for construction phase impact assessment. After considering the time required for building design and construction work, the population intake time for those planned NSR without any tentative schedule is assumed after year 2018.

Table 5-4 Representative Noise Sensitive Receivers for Construction Noise Assessment

NSR	Location	Land Use	Status	Max Building Height, mAG	Distance to Project Boundary, m
CN1	1 Hing Yan Streets	Residential	Existing	18	247
CN2	Ma Tau Kok 13 Streets	Residential	Existing	18	181
CN3	HK society for Blind Hostel	Residential	Existing	9	142
CN4	Ma Tau Kok 13 Streets	Residential	Existing	18	244
CN5	Sky Tower	Residential	Existing	141	224
CN6	KTD Site 1H3	Residential	Planned	105	281
[1]CN7	Sung Wong Toi Road R(A) site	Residential	Planned	95	83
[2]CN8	Sung Wong Toi Road CDA Site	Mixed Use	Planned	95	162
[3]CN9	KTD Site 2B6	Residential	Planned	100	55
[3]CN10	KTD Site 2B4	Residential	Planned	100	55
[3]CN11	KTD Site 2B1	Mixed Use	Planned	125	54
[3]CN12	KTD Site 1K3	Residential	Planned	125	26
[3]CN13	KTD Site 1L3	Residential	Planned	45	74

[1] Abandoned EMSD workshop to be redeveloped into Housing Development without confirmed commencement date

[2] Abandoned Warehouse on CDA zoned land

[3] Planned land uses without confirmed commencement date.

5.4.4 **Table 5-5** lists the representative NSRs for operational noise assessment including the potential impact from the sports events and music, singing and instrument performing activities. Their locations are shown in **Figure 5-2**.

Table 5-5 Representative Noise Sensitive Receivers for Operational Noise Assessment

NSR	Location	Land Use	Status	Max Building Height, mAG	ASR [1]
N1	Ma Tau Kok 13 Streets	Residential	Existing	18	B
N2	Sky Tower	Residential	Existing	141	C
PN1	KTD Site 5A4	Mixed Use	Planned	60	B
PN2	Sung Wong Toi Road R(A) Site	Residential	Planned	116	B

NSR	Location	Land Use	Status	Max Building Height, mAG	ASR [1]
PN3	Sung Wong Toi Road CDA Site	Mixed Use [2]	Planned	96	C
PN4	Sung Wong Toi Road CDA Site	Mixed Use [2]	Planned	96	C
PN5	KTD Site 2B4	Residential	Planned	100	B
PN6	KTD Site 2B3	Residential	Planned	100	B
PN7	KTD Site 2B1	Mixed Use	Planned	125	B
PN8	KTD Site 1K3	Residential	Planned	125	B
PN9	KTD Site 1L3	Residential	Planned	45	B

Note:
[1] The corresponding ASRs of the NSRs are determined based on the best available information. The ASRs determined in this report should not bind the Authority when enforcing the NCO based on the contemporary conditions.
[2] The sites are classified as Comprehensive Development Area (CDA) and the future use is uncertain at the current stage. The current uses of the sites are abandoned warehouse, industrial building, and factory. As the Project is not a new road project nor a road improvement project, off-site at-source mitigation measures are considered not feasible. Future noise sensitive uses on these sites should take into account those noise sources in the area including the Project. The assessment on these planned NSRs aims to indicate the possible noise constraints on the CDA sites for planning of any noise sensitive use within the sites.

5.4.5 The KTD area including the Project site and surrounding NSRs is considered an urban area. There are three groups of NSRs. For NSRs facing Sung Wong Toi Road and Olympic Avenue, the major background noise source is the heavy traffic on these roads. According to the latest Traffic Census, the annual average daily traffic of the section of Sung Wong Toi Road between Tam Kung Road and Kai Tak Tunnel exceeded 30,000 and hence road traffic is considered an IF directly affecting the NSRs N2, and PN3-PN4. The second group of NSRs includes the planned NSRs at the housing site (PN2) along Sung Wong Toi Road. As the NSR is located over 300m away from the above IF, the NSR is not considered to be affected by the IF and thus the ASR is classified as “B”. The third group of NSRs includes the planned residential and CDA development sites located along the future station square and Road D3. Since those NSRs are not affected by the IF, the ASR is again classified as “B”. A noise survey of the prevailing background noise levels has been conducted at the locations marked in **Figure 5-2**.

5.4.6 For those NSRs which are located at the residential areas next to MPSC or besides the proposed Station Square, a vibrant street environment is expected. In order to estimate the background noise levels at these locations, noise measurement was conducted at an existing site with a similar street environment. The selected location was Bridges Street at Sheung Wan, and is shown in **Figure 5-3**. The site consisted of high-rise residential buildings on top of shops at ground floor and was influenced by very low road traffic. As the development at Bridges Street was similar to the future development at Station Square (designated as “shops and services” and “eating place” uses at ground with high-rise residential at top), it is considered that the noise background at Bridges Street was representative of the noise environment at the future Station Square.

5.4.7 The background noise measurements were conducted at 5.5m above ground in order to simulate the future background noise level at the first level residential floor. The measurement points were at least 2m away from any structure to eliminate possible façade reflection. The measured prevailing background noise levels, together with the proposed noise criteria for fixed noise and music noise, are summarized in **Table 5-6**. Since the measured 15-minute average background noise levels were higher than the measured 30-minute averages, it was considered more conservative to adopt the lowest minimum 30-minute average background noise level as the 15-minute average music noise criterion in this Project. Details of the measurement results can be found in **Appendix 5.1A**.

Table 5-6 Assessment Criteria for Representative Noise Sensitive Receivers

NSR	Prevailing Background Noise Adopted, dB(A), Leq (30 mins)		Assessment Criteria, before/after 23:00,	
	Day & Evening time (07:00 to 23:00 hours)	Night time (23:00 to 07:00 hours)	Fixed Noise dB(A), Leq (30 mins)	Music Noise dB(A), Leq (15 mins)
N1, PN1-PN2	65	63	60 / 50	75/not audible
N2, PN3-PN4	67	64	65 / 55	77/not audible
PN5-PN9	63	59	60 / 50	73/not audible

5.4.8 NSRs located along the roads with induced traffic due to the operation of the Project are selected for evaluating the potential traffic noise impact due to the operation of the Project and are listed in **Table 5-7**. Locations of the selected NSRs, the study boundary and the road sections with induced traffic due to the Project are shown in **Figure 5-4**. The major traffic routes are Road D2 (Shing Kai Road), Sung Wong Toi Road, To Kwa Wan Road, and Olympic Avenue. It is considered that these routes are sufficient to evaluate the induced traffic noise impact since traffic diversion would occur at each and every road junction, causing the contribution of the induced traffic to diminish as roads/routes are further away from the MPSC and to an insignificant level at the study boundary. Road sections for the traffic noise study are shown in **Figure 5-5**. Photos of all existing NSRs can be found in **Appendix 5.1B**.

Table 5-7 Noise Sensitive Receivers for Induced Traffic Noise Assessment

NSR	Location	Land Use	Status	Ground mPD (m)	Height of First NSR above Ground Level (m)	No. of Storeys
TN1	Sir Robert Block Health Centre	Clinic	Existing	6.1	1.2	3
TN2	Lee Kau Yan Memorial School	Educational	Existing	6.0	1.2	7
TN3	South Mansion	Residential	Existing	6.3	6.2	5
TN4	Jenford Building	Residential	Existing	6.4	6.2	3

NSR	Location	Land Use	Status	Ground mPD (m)	Height of First NSR above Ground Level (m)	No. of Storeys
TN5	Holy Trinity Church	Place of Public Worship	Existing	6.0	1.2	3
TN6	Parc 22	Residential	Existing	5.5	4.2	11
TN7	Sky Tower	Residential	Existing	4.8	22.9	52
TN8	HK society for Blind Hostel	Residential	Existing	4.0	1.2	3 [4]
TN9	Ma Tau Kok 13 Streets	Residential	Existing	4.0	4.2	4
TN10	Grand Waterfront	Residential	Existing	4.5	12.2	58
TN11	Kam Tong Building	Residential	Existing	5.3	5.2	11
TN12	Kowloon City Road No. 183	Residential	Existing	4.5	5.2	4
TN13	Ma Tau Kok 13 Streets	Residential	Existing	4.3	4.2	7
TN14	Ma Tau Kok 13 Streets	Residential	Existing	4.7	4.2	7
TN15	Po Sing Mansion	Residential	Existing	5.3	4.2	12
TN16	The Latitude	Residential	Existing	6.3	31.2	49
TN17	Trade and Industry Tower with Community Hall	Government [1]	Existing	5.0	11.2	18
TPN3	KTD Site 1F2	CDA-Commercial (Committed) [2]	Planned	5.0	1.2	65
TPN4	KTD Site 1M1	CDA-Commercial (Committed) [2]	Planned	5.0	1.2	11
TPN5	KTD Site 2A1	CDA-Commercial with sensitive uses (Committed) [2]	Planned	6.0	1.2	31
TPN6	KTD Site 2A2	CDA-Commercial with sensitive uses (Committed) [2]	Planned	6.0	1.2	28
TPN7	KTD Site 2A2	CDA-Commercial with sensitive uses (Committed) [2]	Planned	6.0	1.2	28
TPN8	KTD Site 2A3	Commercial with sensitive uses (Committed) [2]	Planned	6.0	1.2	28

NSR	Location	Land Use	Status	Ground mPD (m)	Height of First NSR above Ground Level (m)	No. of Storeys
TPN9	KTD Site 2A4	Commercial with sensitive uses (Committed) [2]	Planned	6.0	1.2	25
TPN10	KTD Site 2A5	Commercial with sensitive uses (Committed) [2]	Planned	6.0	1.2	25
TPN11	KTD Site 2A7	Commercial (Committed) [2]	Planned	5.5	1.2	25
TPN12	Sung Wong Toi Road CDA Site	Mixed Use (Not Committed) [3]	Planned	5.0	6.2	31
TPN12A	Sung Wong Toi Road CDA Site	Mixed Use (Not Committed) [3]	Planned	5.0	6.2	31
TPN13	Sung Wong Toi Road CDA Site	Mixed Use (Not Committed) [3]	Planned	5.0	6.2	31
TPN14	Sung Wong Toi Road R(A) Site	Residential	Planned	4.0	18.2	36
TPN15	KTD Site 5A4	Residential (Not Committed)	Planned	4.0	1.2	35
TPN16	KTD Site 5A4	Residential (Not Committed)	Planned	3.8	1.2	35
TPN17	KTD Site 3B1	Commercial with sensitive uses (Committed) [2]	Planned	4.9	1.2	25
TPN18	KTD Site 3A6	Commercial with sensitive uses (Committed) [2]	Planned	4.7	1.2	31
TPN19	KTD Site 1N1	Commercial (Committed) [2]	Planned	4.6	1.2	38
TPN20	KTD Site 1N1	Commercial (Committed) [2]	Planned	4.6	1.2	38
TPN21	KTD Site 1K2	Residential (Committed)	Planned	5.0	1.2	41
TPN22	KTD Site 1L3	Residential (Committed)	Planned	5.0	1.2	38
TPN23	KTD Site 1L3	Residential (Committed)	Planned	5.0	1.2	38
TPN24	KTD Site 1L2	Residential (Committed)	Planned	5.0	1.2	38
TPN25	KTD Site 1I3	Residential (Committed)	Planned	5.0	1.2	38
TPN26	KTD Site 1B4	Educational	Planned	5.0	6.2	6

Notes:
[1] Trade and Industry Tower with Community Hall is equipped with central ventilation and do not rely on opened windows for natural ventilation, quantitative assessment of the noise impact is therefore not necessary.
[2] Planned commercial buildings of Kai Tak Development Area will operate with central ventilation and do not rely on opened windows for natural ventilation, quantitative assessment of the noise impact is therefore not necessary.
[3] The sites are classified as Comprehensive Development Area (CDA) and the future use is uncertain at the current stage. The current uses of the sites are abandoned warehouse, industrial building, and factory. As the Project is not a new road project nor a road improvement project, off-site at source mitigation measures is considered not appropriate. The assessment on these planned NSRs aims to indicate the possible noise constraints on the CDA sites for planning of any noise sensitive use with the sites.
[4] The building of The Hong Kong Society for the Blind will redevelop in-situ. Its future height is considered in the traffic noise assessment.

5.5 Assessment Methodology

Construction Noise

5.5.1 The construction works are planned to start in early 2017 for completion by the end of 2020/2021. The works are very likely to be carried out during non-restricted hours. The assessment methodology of construction noise impact is based on the Technical Memorandum on Noise from Construction Work other than Percussive Piling (TM-GW) which is issued under the NCO. Calculation are based on the following standard formula:

$$SPL = SWL - DC + FC$$

where

SPL – Sound Pressure Levels at receiver, in dB(A)
SWL – Sound Power Levels of Powered Mechanical Equipment (PME), in dB(A)
DC – Distance Correction, in dB(A) by $DC = 20\times\log_{10}(D) + 8$, D is the slant distance between the NSR and noise source location in metres
FC – Façade Correction of 3 dB

5.5.2 The sound power levels in Table 3 of TM-GW have been used for the assessment. For mitigated scenario, reference was made to sound power levels of other commonly used PME and the Quality PME in the EPD website but the future contractor(s) are free to use similar types of PME with same or lower SWLs. Where no relevant sound power level (SWL) was found in the TM-GW, reference was made to the specifications of the plant available in the market and previous similar studies or from measurements taken at other sites in Hong Kong. A 10 dB reduction can be applied to the NSRs as screening correction for situation without direct line of sight to the sites.

5.5.3 Plant inventory and construction programme for the Project as presented in **Appendices 5.2A** and **5.2B** respectively for various construction activities were developed by the Project Engineering Consultant. Appropriate on-time percentages of all items of PME were assumed and are shown in **Appendix 5.2A**. The Project Engineering Consultant has confirmed that the proposed plant inventories and the associated % on-time are practical and adequate for completing the works within the scheduled timeframe.

5.5.4 According to the TM-GW, all PME items required for a particular construction activity would be located at the notional source position where such activity is to be performed. The assessment was based on the cumulative SWL of PME used for each location. To predict the noise level, PME was divided into groups required for each discrete construction task. The objective was to identify those items of PME within the same group that would be in use concurrently in the worst scenario. The sound pressure level at each NSR due to each construction task was calculated based on the number of plant and the distance between the plant locations and the receiver. The noise level at each NSR was then predicted by adding up the SPLs of all concurrent construction tasks.

5.5.5 Cumulative construction noise impact has been assessed taking into account the concurrent projects in the vicinity of the Project area as shown in **Table 5-8**. For those concurrent projects classified as Designated Projects, reference was made to the corresponding EIA reports or the latest Environmental Review Reports for the applications of Variations of Environmental Permits (VEPs) for the construction works activities. Based on the latest available information from Civil Engineering and Development Department (CEDD), Planning Department (PlanD), Highways Department (HyD), and MTR Corporation Limited (MTRCL), the construction periods for the concurrent projects are listed in the table below.

Table 5-8 Concurrent Projects Considered during the Construction Phase

Name of Project	Project Proponent	Construction Periods
Shatin to Central Link (SCL) - Tai Wai to Hung Hom Section	MTRCL	2011 – 2019
Kai Tak Development (KTD)	CEDD	2008 – 2019
Central Kowloon Route (CKR)	HyD	2017 – 2022

Operational Road Traffic Noise

5.5.6 Traffic noise was predicted using the methodology provided in the UK Department of Transport "Calculation of Road Traffic Noise (CRTN)" 1988. The assessment was based on the projected peak hour flows for the worst year within 15 years after operation of the Project in Year 2021. Based on the traffic forecast provided by the Project Traffic Consultant, the PM peak hour flows in Year 2036 are the maximum projected peak hour traffic flow within 15 years from the commencement of the Project. Road traffic noise levels are presented in terms of noise levels exceeded for 10% of the one-hour period during the peak traffic flow, i.e. $L_{10,1hr}$ dB(A).

5.5.7 In determining whether the traffic noise impact due to the Project is considered significant, traffic noise impact arising from the traffic routes during the operation of the Project has been assessed for the design year. The traffic noise impact is considered significant if the traffic noise levels with the Project are higher than the corresponding levels without the Project in the design year of Year 2036 by 1.0 dB(A) or more. The peak hour of the traffic induced by the Project will be the hours before holding of musical events in the Main Stadium in the evening. Such peak hour will coincide with the PM peak hour (18:00 to 19:00 hours) of the general road traffic.

The projected Year 2036 PM peak hour traffic flows and percentage of heavy vehicles for with and without Project scenarios were therefore adopted for the assessment and are attached in **Appendix 5.3A**.

5.5.8 Roads surface types in the traffic noise assessment are shown in **Figure 5-9**. Information about the road types with low noise road surfacing of the existing roads, CKR, and planned roads in KTD was obtained from HyD and CEDD.

Operational Noise from Fixed Sources

Spectator Noise Level Determination

5.5.9 In order to determine the unit sound power level of the spectators, i.e. the sound power level per person, noise surveys were conducted at different positions of the spectator stands of the Hong Kong Stadium during a few sports events. The distribution of spectators in each event was recorded by photographic means in order to determine the distribution of the sound sources for subsequent noise simulation.

5.5.10 An iterative process was used to determine the unit sound power level. Initially, an approximate unit sound power was used to simulate the sound level at a reference position. The unit sound power level was adjusted iteratively in order to match the measured noise level at the reference location. The detailed measurement records and justification are provided in **Appendix 5.4B**.

Calculation Principles of the Noise Model

5.5.11 As the noise emissions from the Main Stadium are highly complex, involving multiple sound reflections and absorption from the spectator stands and transmission through the structure and the roof of the stadium, a special acoustic modelling technique for the stadium is required. For the purpose of this noise assessment, a proprietary ray-tracing software was used. It is a 3D model that takes into account the specific building design and acoustic properties of the building components. **Figure 1** to **Figure 4** of **Appendix 5.4A** show the 3D model built using 3D SketchUp and the acoustic models built using the ray-tracing program. In the noise model, internal partitions were omitted for simplicity and only the outermost and innermost layers were modelled.

5.5.12 The acoustic model uses a ray tracing method for sound reflections. Each source is assumed to emit tens of thousands of sound rays at different directions.

5.5.13 The rays are reflected off the model surfaces to varying directions due to scattering, and with each reflection, the energy of each sound ray is reduced due to sound absorption at the point of reflection. A secondary source is assumed at each reflection point for the calculation of sound pressure levels at receivers.

5.5.14 When a ray hits a surface which allows sound transmission, the penetrated ray carries reduced energy which is dependent on the transmission loss assigned to the surface.

5.5.15 Air absorption is also included. Energy carried in the rays would gradually dissipate in the air, according to the specified temperature and humidity. In high frequency bands like 4000Hz and 8000Hz, air attenuation would be more significant[1].

1: Based on standard acoustic principles, air attenuation decreases with decreasing temperature and increasing humidity. The minimum temperature recorded at the King's Park meteorological station in 2011-2015 is 6.1°C.

5.5.16 All calculations would stop when a pre-determined time has passed, after most energy from the sound pulse has been dissipated through various means. The total energy arrived at a receiver is summed to give the sound pressure level at the receiver.

5.5.17 Since reflections due to façade have already been taken into account by ray tracing, no façade correction is necessary in the calculations.

5.5.18 The sound transmission losses adopted in the model for the base structure, fixed roof and retractable roof are provided in **Annex I** of **Appendix 5.4A**.

5.5.19 In order to verify the validity of the simulation results of the ray-tracing program, a calibration against noise measurement results obtained in a local sports event was carried out. Details of the calibration are documented in **Appendix 5.4D**. The calibration indicated that the results of the ray-tracing program were close to or higher than the measured results. Hence, the simulation results should be conservative.

Sports events at Main Stadium

5.5.20 Noise produced by the spectators and the public address system were the two types of noise sources that were assessed. The spectators were modelled as 272 point sources located on the spectator stands, as shown in **Figure 7** of **Appendix 5.4A**. They represented a full-house event of 50,000 persons in total. The sound power level per person was determined to be 85.4 dB(A), Leq (30min) through the on-site measurement of sports events held in the Hong Kong Stadium. Details are elaborated in **Appendix 5.4B**. The sound power frequency spectrum[2] for “Loud” voice was adopted in the modelling. A directivity profile of the voice of human beings[3] was used for the sources representing spectators.

5.5.21 In order to reduce the noise impact from the public address (PA) system, a distributed system of loudspeakers was adopted. It was assumed that the PA system in the Main Stadium should consist of 60 loudspeakers distributed over and directed towards the spectator stands. The directivity of the sound power of the loudspeaker is shown in **Appendix 5.4E**. The average sound power level for each of them shall be 104.2 dB(A) in order to produce a sound level of 70-75 dB(A) at the spectator stands. The arrangement of loudspeakers is shown in **Figure 8** of **Appendix 5.4A**.

5.5.22 The acoustic model was used to calculate the sound levels at the façades of the closest identified representative NSRs in the Project. The locations and heights of the receivers are shown in **Figure 9** of **Appendix 5.4A**.

In the assessment for MPSC, this temperature and 100% relative humidity are adopted as the worst case scenario. For the calibration in Appendix 5.4D, the average temperature (27.0°C) and relative humidity (70.5%) during the event period at King’s Park meteorological station were used.

2: The spectrum for “Loud” voice can be found in Table 1 of the following document:
http://www.odeon.dk/pdf/Application_Note_SpeechTransmissionIndex.pdf

3: Reference for human voice directivity:
http://nparc.cisti-icist.nrc-cnrc.gc.ca/npsi/ctrl?action=shwart&index=an&req=20378930

Sports events at Public Sports Ground

5.5.23 The same calculation principles in assessing the noise impact due to activities held in the Main Stadium were adopted to assess the noise impact due to sport activities held in the Public Sports Ground. A few 3D images and the corresponding acoustic models of the Public Sports Ground are shown in **Figure 1** to **Figure 4** of **Appendix 5.4C**.

5.5.24 The model took into account the sound absorption of the running tracks and football field of the Public Sports Ground. It also took into account a patch of lawn (or other noise absorptive surface) on the eastern edge for further reducing sound reflection.

5.5.25 The structure and the cover of the Public Sports Ground were modelled with different sound transmission losses. The adopted specifications in the model are provided in **Annex I** of **Appendix 5.4C**.

5.5.26 For a full house event at the Public Sports Ground, the 7,000 spectators were modelled as 59 point sources located on the spectator stand, as shown in **Figure 5** of **Appendix 5.4C**. The sound power frequency spectrum and directivity profile of spectators were the same as those for the Main Stadium. The same sound power level per person for a sports event in the Main Stadium, i.e. 85.4 dB(A), Leq (30min) was adopted for the audience in the Public Sports Ground.

5.5.27 For the purpose of this assessment, it has been assumed that the public address system shall comprise of 10 loudspeakers pointing towards the spectator stands. The directivity of the sound power of each loudspeaker is shown in **Appendix 5.4E**. The sound power level for each of them was taken to be 104.2 dB(A) in order to produce a sound level of 70-75 dB(A) (designed sound pressure level at spectator stand for announcement) at the audience positions. The positioning of the loudspeakers is shown in **Figure 6** of **Appendix 5.4C**.

5.5.28 The acoustic model simulated the noise levels at the facades of the identified representative NSRs in the close vicinity of MPSC. The locations and heights of the receivers are shown in **Figure 7** of **Appendix 5.4C**.

5.5.29 The parameters of the public address system for the Main Stadium and the Public Sports Ground are summarized in **Table 5-9**. A renowned local sound system expert has been consulted for the reasonableness of the system.

Table 5-9 Parameters of PA Systems in the Main Stadium and the Public Sports Ground Assessment

Parameters	Main Stadium	Public Sports Ground
No. of Loudspeakers	60	10
Positions and Orientations	Refer to Figure 8 of Appendix 5.4A	Refer to Figure 6 of Appendix 5.4C
Sound Power Level per Loudspeaker	104.2 dB(A)	
Frequency Spectrum	Refer to Table 6 of Appendix 5.4A	
Directivity of Loudspeaker	Refer to Appendix 5.4E	
Sound Level at Spectator Stand	70 – 75 dB(A)	

Noise from Sources of Building Services System

5.5.30 As advised by the Project's building services engineer, a District Cooling System (DCS) shall be used for the whole MPSC. The only noise sources from the DCS would be the air handling units with the discharge fans for the air intake and exhaust. Based on a preliminary selection of air handling units by the engineer, the SWL of a discharge fan adopted in the assessment was 92 dB(A). According to a preliminary design of cooling load for the Project, 180 air handling units would be sufficient.

5.5.31 The worst-affected NSRs, which are closest to the MPSC, are chosen for calculating the noise levels due to the building services system operation. The planned locations of the air intakes/exhaust outlets are shown in **Figure 5-7**. The SWLs (details in **Appendix 5.5**) of the intakes/exhaust outlets due to the building services system operation are summarised in **Table 5-10**.

Table 5-10 Average SWL for the Air Handling Unit for Different Buildings

Location	**Number of Fans for Air Handling Units**	**Total SWL, dB(A)**
Main Stadium Eastern façade	60	109.8
Main Stadium Western façade	60	109.8
Public Sports Ground	5	99.0
Indoor Sport Centre	19	104.8
Commercial Area a	18	104.6
Commercial Area b	18	104.6
Total	**180**	

Noise from Music, Singing and Instrument Performing Activities at Main Stadium

5.5.32 In order to determine the power levels of the noise sources in similar musical performances, sound pressure levels at 1 second intervals in 1/3 Octave Bands were measured inside the Queen Elizabeth Stadium during a rock & roll/pop music event on 23 October 2015. The highest recorded 15 minutes unweighted sound pressure levels (Leq 15min) at the auditorium were shown in **Figure 14** of **Appendix 5.4A**. Depending on the age and physical conditions of a person, the audible range for human can be from 20 Hz to 20 kHz. As the ear is less sensitive to low frequency sound, A-weighting should be applied to instrument-measured sound levels to account for the relative loudness perceived by human ears. **Figure 15** of **Appendix 5.4A** shows the A-weighted sound pressure levels ($L_A$eq 15min) in the audible frequency range. As the nearest NSR to the boundary of Main Stadium would be over 200m away, the sound pressure levels at the receivers should be further reduced.

5.5.33 Musical events may be held in 2 different settings. In Concert Setting 1, a 3-sided stage is located at the Northern end of the stadium field. In Concert Setting 2, a 4-sided stage is set up at the centre of the field. Noise assessments for both settings have been carried out.

5.5.34 Noise from the loudspeakers and noise from the audience were assessed. The audience was modelled as 272 point sources distributed on the seating area of the 2 different concert settings, as shown in **Figure 10** and **Figure 11** of **Appendix 5.4A**. The directivity of the sound power of each loudspeaker is shown in **Appendix 5.4E**. It has been assumed that there will be 50,000 persons in each setting. The sound power frequency spectrum and directivity profile applied to sports event assessment were adopted. Since the sound from audience and loudspeakers cannot be differentiated during a musical event, the sound power of audience cannot be determined through the noise measurement of a typical musical event. As a conservative approach, the sound power level per person in a sports event was adopted for the audience of musical events. Hence, the sound power level in terms of Leq (15min) per person was determined to be 86.8 dB(A). Details are provided in **Appendix 5.4B**.

5.5.35 For the purpose of this assessment, the loudspeakers were positioned and set so that most of the seating area in the 2 concert settings would receive a volume of 96.5 dB(A) or above from the loudspeakers and this sound pressure level at the seating area is already higher than the highest 15 min. noise level of 96.1 dB(A) recorded inside the Queen Elizabeth Stadium. These sound levels were considered to be sufficient for typical music concerts based on onsite measurement of music events in Hong Kong. Reference was made to the sound frequency spectrum in Table 8 of the noise assessment for the Copper Box of Queen Elizabeth Olympic Park at London[4] for the noise spectrum setting at each loudspeaker. This spectrum was found to be more conservative than the measured sound spectrum since the sound intensities at the low frequency bands were higher in the former. Details can be referred to **Appendix 5.4A**. The proposed locations of loudspeakers for musical events are shown in **Figure 12** and **Figure 13** of **Appendix 5.4A** respectively.

5.5.36 The parameters of musical concert loudspeakers for the 2 concert settings in the Main Stadium are summarized in **Table 5-11**. A renowned local sound system expert has been consulted for the reasonableness of the parameters.

Table 5-11 Parameters of Loudspeakers of Music Events in the Main Stadium

Parameters	Concert Setting 1	Concert Setting 2
No. of Loudspeakers	7	12
Positions and Orientations	Refer to Figure 12 of Appendix 5.4A	Refer to Figure 13 of Appendix 5.4A
Sound Power Level per Loudspeaker	Loudspeaker 1-5: 134.1 dB(A) Loudspeaker 6-7: 131.1 dB(A)	130.6 dB(A)
Frequency Spectra	Refer to Table 6 of Appendix 5.4A	
Directivity of Loudspeaker	Refer to Appendix 5.4E	

5.6 Acoustic Design for the Project

Acoustic Design Adopted for the Main Stadium

5.6.1 In order to reduce the noise impact arising from the Main Stadium, a basic acoustic design has been adopted for the purpose of this noise assessment. While the design will be subject to the final design of the future operator, it is the responsibility of the future operator under the Environmental Permit to provide the same or better soundproofing performance. In a nutshell, the design is to make the structure of the stadium soundproofing and complete in order to minimize sound leakage from the stadium.

4: Noise assessment report for musical event held at the Copper Box: http://planningregister.londonlegacy.co.uk/swift/MediaTemp/2705-41515.pdf

5.6.2 The structure shall comprise multiple layers of concrete walls, corridors and functional rooms surrounding the stadium field. This massive structure is expected to provide significant soundproofing. The entrances of the stadium shall have special acoustic design (e.g. double acoustic doors) such that the soundproofing performance of the structure will not be compromised. Details of entrances of the main stadium are provided in **Table 7** and **Figure 16** of **Appendix 5.4A**.

5.6.3 The Main Stadium shall incorporate a retractable roof which shall comprise of four panels of equal sizes along the North-South direction. The top two panels shall be movable and the side panels shall be fixed. The maximum opening of the roof will be approximately half of the total area of the panels. When holding a sports event or music event, the roof will be opened by moving the top panels to overlay on the side panels under normal circumstances. The retractable roof, which forms part of the design of the Main Stadium, will be closed when needed. There shall be no gap between the fixed part of the roof and the structure so as to prevent noise leakage. A closed-up view of the retractable roof indicating the size of opening is shown in **Figure 5** and **Figure 6** of **Appendix 5.4A**.

5.6.4 To increase the soundproofing performance of the roof, acoustic panels shall be attached underneath the fixed roof of the main stadium. The adopted sound absorption specification of the panels is listed in **Table 4** of **Appendix 5.4A**.

Acoustic Design Adopted for the Public Sports Ground

5.6.5 The design of the Public Sports Ground includes a cover over the spectator stand to mitigate the noise from the spectators. **Figure 3** and **Figure 4** in **Appendix 5.4C** show the proposed extent of the cover.

5.6.6 To increase the soundproofing performance of the cover, sound absorption panels shall be attached underneath the entire cover. The adopted sound absorption specification of the panels is listed in **Table 1** of **Appendix 5.4C**.

5.7 Identification of Environmental Impacts

Construction Phase

5.7.1 The major construction activity of the Project would involve piling works and pipe cap construction, foundation works, superstructure, builder works, and external works. There will be several concurrent construction projects within the construction programme of the Project including Sha Tin Central Link (SCL), Kai Tak Development (KTD), and Central Kowloon Route (CKR). Construction noise from these concurrent projects will be key noise sources to the identified NSRs under the Project.

Operation Phase

5.7.2 The Project comprises a 50,000 seat Main Stadium, a 7,000 seat Public Sports Ground, a 5,500 seat Indoor Sports Centre, and other ancillary/supporting facilities. In identifying the potential noise impact during its operation phase, the mode of operation of the MPSC has been considered.

5.7.3 According to the proposed mode of operation, no organized events would be held concurrently in the Main Stadium and the Public Sports Ground. Nonetheless, the public may be free to use the venues when there is no organized event. If an organized event is being held at the Main Stadium, community activities such as jogging, training, amateur ball games, and activities supporting the organized event (excluding rehearsal for a music event) in the Main Stadium such as warm up, hospitality, etc. may be held at the Public Sports Ground, and vice versa. When the activities are not organized, the number of people is expected to be small, and no amplifier nor loudspeakers are used. Therefore, noise from the community activities would be insignificant. No quantitative assessment is required. Even if the Main Stadium and the Indoor Sports Centre operate at the same time period, there would be at least 1 hour time lag between the opening/finishing times at these two facilities. As a result, the worst case scenario would be the noise from the 50,000-seat Main Stadium only.

5.7.4 Traffic induced by the Main Stadium would aggravate the traffic noise impact on the NSRs along the traffic routes during the operation of the Project including the existing Prince Edward Road East, To Kwa Wan Road, Sung Wong Toi Road, various local distributors, and the new Road D2. Existing and planned NSRs along these roads would be impacted by induced road traffic noise.

5.7.5 Sport activities held in the Main Stadium and Public Sports Ground would produce noise from spectators and the public address system. As the Main Stadium and the Public Sports Ground would not operate simultaneously, noise from these two facilities was assessed separately.

5.7.6 No cooling tower nor compressor unit would be used for normal operation of the Project since the District Cooling System (DCS) would be used for the whole MPSC. Exhaust fans and fresh air intake fans of the air handling units are the identified outdoor noisy plants in the Project.

5.7.7 Entertainment activities, such as musical concerts, would make use of loudspeakers with powerful bass. The spectators participated in such activities would also create noise. The Main Stadium would incorporate specific acoustic design so as to mitigate the noise impact from musical concerts held inside. The effectiveness of mitigation measures is evaluated in the following sections.

5.7.8 Noise is also produced by the crowd during its dispersion. Activities held in the Project should normally end during daytime or evening time (i.e. before 11:00 p.m.), with the possible exception for musical concerts held in the Main Stadium. Public Sports Ground and Indoor Sports Centre are common in Hong Kong. Considering the time period of their operation (normally from 7:00 a.m. to 11:00 p.m.), crowd dispersion from these two facilities would not cause annoyance to nearby NSRs and should not be a concern.

5.7.9 The finishing times of operation between the Main Stadium and the Indoor Sports Centre shall be separated by more than 1 hour through the management control of the future operator. According to a crowd dispersal study, this duration will be long enough to disperse all the spectators from a full-house event held in the Main Stadium. Therefore, there should be no overlapping dispersion, and the worst scenario in terms of crowd dispersal noise would be that due to the dispersal of 50,000 persons from the Main Stadium.

5.8 Prediction and Evaluation of Environmental Impacts

Construction Noise

5.8.1 The construction of the Project would involve site preparation, piling, pile cap construction, basement construction, superstructure, builder work, external work, and landscape works. For the unmitigated scenario, the quantities and sound power levels (SWLs) of the Powered Mechanical Equipment (PME), notional distances between sources and NSRs, detailed calculations and summary of the construction noise of the Project are provided in **Appendices 5.2C – 5.2F**. The types, quantities, and percentages on-time of the plants have been reviewed by the Project Engineering Consultant and were confirmed to be feasible and practical for the purpose of this EIA. The locations of the construction sites of the Project and those of the concurrent projects can be found in **Figure 5-1a** and **Figure 5-1b** respectively.

5.8.2 The unmitigated construction noise impacts on the selected NSRs are shown in **Table 5-12**. The unmitigated construction noise levels at most NSRs would exceed the noise criterion by 1 dB to 8 dB. Mitigation measures would be required to reduce the construction noise.

Table 5-12 Unmitigated Construction Noise Impact, dB(A)

NSR	Nature of Use	Predicted Maximum Noise Level from the Project, dB(A), Leq (30min)	Noise Criteria, Leq (30min), dB(A)	Exceedance, Leq (30min), dB
CN1	Residential	**78**	75	3
CN2	Residential	**79**	75	4
CN3	Residential	**81**	75	6
CN4	Residential	**77**	75	2
CN5	Residential	**76**	75	-
CN6	Residential	75	75	-
CN7	Residential	**82**	75	7
CN8	Mixed Use	**77**	75	-
CN9	Residential	**81**	75	6
CN10	Residential	**82**	75	7
CN11	Mixed Use	**82**	75	7
CN12	Residential	**83**	75	8
CN13	Residential	**81**	75	6

Operational Road Traffic Noise

5.8.3 Traffic noise levels have been predicted for the identified NSRs and are summarized in **Table 5-13**. Detailed calculation results with and without the Project are provided in **Appendix 5.3B**. The following paragraphs will discuss the potential noise impacts at different NSRs in this study.

Table 5-13 Unmitigated Road Traffic Noise Impact, dB(A)

NSR	Noise Criteria dB(A), L_{10}	Without MPSC Development dB(A), L_{10}	With MPSC Development dB(A), L_{10}	Difference dB(A), L_{10}	Significant Contribution (≥1.0 dB(A))
TN1	55	84-84	84-84	0.0-0.0	N
TN2	65	81-81	81-81	0.0-0.0	N
TN3	70	83-83	83-83	0.0-0.0	N
TN4	70	84-86	84-86	0.0-0.0	N
TN5	65	83-83	83-83	0.2-0.2	N
TN6	70	78-82	79-82	0.3-0.4	N
TN7	70	72-77	73-77	0.4-0.4	N
TN8	70	71-79	71-80	0.6-0.8	N
TN9	70	79-80	79-81	0.3-0.4	N
TN10	70	71-79	71-79	0.1-0.2	N
TN11	70	72-77	72-77	0.1-0.1	N
TN12	70	76-78	76-78	0.2-0.2	N
TN13	70	74-78	74-79	0.8-0.8	N
TN14	70	76-78	76-78	0.6-0.6	N
TN15	70	78-81	79-81	0.1-0.2	N
TN16	70	76-82	76-82	0.0-0.0	N
TN17	70	70-77	70-77	0.0-0.1	N
TPN3	70	73-75	74-75	0.1-0.1	N
TPN4	70	77-79	77-79	0.0-0.0	N
TPN5	70	79-81	79-81	0.0-0.1	N
TPN6	70	79-81	79-81	0.0-0.1	N
TPN7	70	68-70	68-70	0.1-0.1	N
TPN8	70	79-81	79-81	0.0-0.1	N
TPN9	70	80-82	80-82	0.0-0.1	N
TPN10	70	80-81	80-81	0.1-0.1	N
TPN11	70	75-77	75-77	0.2-0.2	N
TPN12	70	70-78	71-79	0.9-1.0	Y
TPN12A	70	70-78	71-78	0.8-0.9	N
TPN13	70	70-78	71-79	1.0-1.0	Y
TPN14	70	61-72	59-73	-1.9-1.0	Y
TPN15	70	71-78	71-78	0.2-0.3	N
TPN16	70	72-77	72-77	0.1-0.3	N
TPN17	70	78-79	78-79	0.0-0.1	N
TPN18	70	76-83	76-83	0.0-0.0	N
TPN19	70	77-80	77-81	0.1-0.2	N
TPN20	70	67-69	67-70	0.9-1.0	Y
TPN21	70	63-68	62-68	-1.2-0.0	N

NSR	Noise Criteria dB(A), L_{10}	Without MPSC Development dB(A), L_{10}	With MPSC Development dB(A), L_{10}	Difference dB(A), L_{10}	Significant Contribution (≥1.0 dB(A))
TPN22	70	61-67	61-68	0.1-0.6	N
TPN23	70	68-69	68-70	0.6-0.8	N
TPN24 (G-9/F)	70	64-66	65-67	1.1-1.6	Y
TPN24 (10-37/F)	70	68-70	69-71	0.6-0.8	N
TPN25	70	56-67	58-67	0.6-1.5	Y
TPN26	65	70-71	71-71	0.5-0.5	N

5.8.4 Existing NSRs (TN1 to TN17): The predicted noise levels at all existing NSRs (except 1/F of TN17) exceed the noise criterion of 70 dB(A) by 1 to 16 dB. However, the noise contribution to the overall noise level due to the traffic induced by the Project would be less than 1.0 dB. Therefore, the traffic noise impact on these existing sensitive receivers due to the operation of the Project is not considered significant.

5.8.5 Planned NSRs (TPN3 to TPN6, TPN8 to TPN11, TPN12A, TPN15 to TPN19, TPN23 to TPN24 (10-37/F), TPN26): The predicted noise levels at those planned NSRs exceed the noise criterion of 70 dB(A). However, the noise contribution due to the traffic induced by the Project would be less than 1.0 dB and thus the potential impact is considered insignificant.

5.8.6 Planned NSRs (TPN7, TPN22): The predicted noise levels at the two planned NSRs comply with the noise criterion of 70 dB(A) and the noise contribution due to the traffic induced by the Project would be less than 1.0 dB. No adverse traffic noise impact on these NSR is anticipated.

5.8.7 Planned NSRs (TPN20, TPN21, TPN24 (G-9/F) TPN25): Although the noise contribution due to the operation of Project is considered significant (+1.0 dB to +1.6 dB) at these NSRs, the predicted noise levels (with Project) at these NSRs comply with the 70 dB(A) noise criterion. Hence, no adverse traffic noise impact on these NSRs is envisaged with the Project and no mitigation measure would be required.

5.8.8 Planned NSRs (TPN14): The assessment results indicated that the overall increase in traffic noise levels due to the Project would be 1.0 dB(A) or more at the R(A) zoned site facing Sung Wong Toi Road. The predicted unmitigated traffic noise levels at this planned NSR would exceed the noise criterion of 70 dB(A) by 1 to 3 dB(A) for residential dwellings. This exceedance level would not create unacceptable constraints on the proposed development. Nevertheless, the Housing Department would carry out an environmental assessment study (EAS) for the proposed development at the detailed design stage. The EAS would include the required mitigation measures so that all residential flats at the site would not be exposed to road traffic noise levels above the 70 dB(A) criterion.

5.8.9 Planned NSRs (TPN12 and TPN13): The selected assessment points represent the potential noise sensitive receivers in the CDA zoned sites where the existing uses are warehouse, industrial building and factory. The planned uses for the CDA zone are not committed at this stage. The predicted traffic noise levels at the planned NSRs would exceed the noise criterion of 70 dB(A) for domestic premises at the boundary of the CDA sites directly facing Sung Wong Toi Road. The noise contribution due to the operation of the Project is considered significant since the traffic noise levels would increase by 1.0 dB or more. Notwithstanding this, for a CDA development, a planning application is required for Town Planning Broad approval. The future developers of the CDA sites would need to carry out an Environmental Assessment (EA) to support the planning application. The EA would include the required mitigation measures so that all noise sensitive receivers (NSRs) at the sites would not be exposed to road traffic noise levels above the respective criterion.

Operational Noise from Sports Events

5.8.10 Sports events will be held in the Main Stadium and Public Sports Ground. Noise from these events would consist of noise from the spectators and noise produced by the public address systems.

5.8.11 The retractable roof of the Main Stadium shall be movable along the North-South direction. As mentioned in **Section 5.5**, acoustic features will be adopted in the design of the Main Stadium. The unmitigated case presented in this section has assumed that the retractable roof will be fully opened and this is the preferred option for sports events to be held during the daytime and evening time period.

5.8.12 The predicted noise levels at the NSRs under such circumstances have been calculated. The maximum noise levels at these NSRs are summarized in **Table 5-14** and are detailed in **Appendix 5.4A**.

Table 5-14 Noise Levels from Sports Events at Main Stadium (Retractable Roof Fully Opened)

NSR	Location	*ASR	Predicted Noise Level / Assessment Criteria, dB(A), Leq (30min)	
			Daytime / Evening	Night-time (11:00 p.m. – 7:00 a.m.)
N1	Ma Tau Kok 13 Streets	B	23 / 60	No Night Time Sport Event in Main Stadium
N2	Sky Tower	C	48 / 65	
PN1	KTD Site 5A4	B	43 / 60	
PN2	Sung Wong Toi Road R(A) Site	B	55 / 60	
PN3	Sung Wong Toi Road CDA Site	C	48 / 65	
PN4	Sung Wong Toi Road CDA Site	C	45 / 65	
PN5	KTD Site 2B4	B	48 / 60	
PN6	KTD Site 2B3	B	48 / 60	
PN7	KTD Site 2B1	B	49 / 60	
PN8	KTD Site 1K3	B	53 / 60	
PN9	KTD Site 1L3	B	29 / 60	

* Area Sensitivity Ratings refer to Table 5-2

5.8.13 With the proposed size of the opening of the retractable roof, the predicted noise levels at the identified NSRs comply with the daytime and evening time noise criteria. As all sports events held in the Main Stadium should finish before 23:00 hours, no night time noise impact is anticipated. Moreover, as mentioned in **Section 5.7.3**, no organized events would be held concurrently in the Main Stadium and the Public Sports Ground. Hence no cumulative impact from the two facilities is anticipated.

5.8.14 Assessment results indicated that the operation noise levels at receivers from sports events during daytime/evening time period would not be adverse even the retractable roof is in an open position.

5.8.15 Potential noise levels at representative sensitive receivers were predicted for the Public Sports Ground based on a full-house (7,000 spectators) sports event. The predicted noise levels at the NSRs are summarized in **Table 5-15** and detailed in **Appendix 5.4C**. The results indicated that the noise levels at the NSRs would comply with the relevant noise criteria. Hence no adverse noise impact is anticipated. As no night time (after 11:00 p.m.) sports event is anticipated in the Public Sports Ground, no noise impact in the night time from the Public Sports Ground is anticipated.

Table 5-15 Noise Levels from Sports Events at Public Sports Ground

NSR	Location	*ASR	Predicted Noise Level / Assessment Criteria, dB(A), Leq (30min)	
			Daytime / Evening	Night-time (11:00 p.m. – 7:00 a.m.)
N1	Ma Tau Kok 13 Streets	B	50 / 60	No Night Time Sport Event in Public Sports Ground
N2	Sky Tower	C	55 / 65	
PN1	KTD Site 5A4	B	53 / 60	
PN2	Sung Wong Toi Road R(A) Site	B	60 / 60	
PN3	Sung Wong Toi Road CDA Site	C	58 / 65	
PN4	Sung Wong Toi Road CDA Site	C	56 / 65	
PN5	KTD Site 2B4	B	59 / 60	
PN6	KTD Site 2B3	B	60 / 60	
PN7	KTD Site 2B1	B	57 / 60	
PN8	KTD Site 1K3	B	59 / 60	
PN9	KTD Site 1L3	B	51 / 60	

* Area Sensitivity Ratings refer to Table 5-2

Noise from Fixed Plants

5.8.16 Assuming that the intake/exhaust fans of air handling units would be located at the worst location (closest to the nearby NSRs) for each development in the MPSC, the predicted unmitigated noise level at the worst affected NSRs are shown in **Table 5-16**.

Table 5-16 Unmitigated Fixed Plants Noise Level, dB(A)

NSR	Location	Unmitigated SPL, dB(A), Leq (30min)	Noise Criteria (Day/Night), dB(A), Leq (30min)
PN2B	Sung Wong Toi Road R(A) site	62	60/50
PN5	KTD Site 2B5	58	60/50
PN7	KTD Site 2B1	58	60/50
PN8	KTD Site 1K3	60	60/50
PN9	KTD Site 1L3	58	60/50

5.8.17 Without mitigation measures, noise impact arising from the fixed plants would exceed the night-time noise criteria at all the NSRs. Mitigation measures are required to render the noise impact from the fixed plant acceptable.

Cumulative Noise Impact from Sports Events and Fixed Plant

5.8.18 As all sports events held in the Main Stadium or in the Public Sports Ground should finish before 23:00 hours, no night time noise impact is anticipated. Moreover, as mentioned in **Section 5.7.3**, no events would be held concurrently in the Main Stadium and the Public Sports Ground. The cumulative noise impacts from sports events and fixed plant are considered for the two scenarios, namely the sports event at the Main Stadium and the fixed plant, and the sports event at the public sports ground and the fixed plant during the daytime/evening period. The unmitigated cumulative noise levels for the two scenarios are shown in **Table 5-17** and **Table 5-18**.

Table 5-17 Cumulative Noise Levels from Sports Events at Main Stadium and Fixed Plant

NSR	Location	Predicted Noise Level / Assessment Criteria, dB(A), Leq (30min)	
		Daytime / Evening	Night-time (11:00 p.m. – 7:00 a.m.)
N1	Ma Tau Kok 13 Streets	62/60	No Night Time Sport Event in Main Stadium
N2	Sky Tower	62/65	
PN1	KTD Site 5A4	62/60	
PN2	Sung Wong Toi Road R(A) Site	63/60	
PN3	Sung Wong Toi Road CDA Site	62/65	
PN4	Sung Wong Toi Road CDA Site	62/65	
PN5	KTD Site 2B4	58/60	
PN6	KTD Site 2B3	59/60	
PN7	KTD Site 2B1	59/60	
PN8	KTD Site 1K3	60/60	
PN9	KTD Site 1L3	58/60	

5.8.19 Apart from NSR N1 and planned NSR PN1 and PN2 where there would be exceedance of the noise criteria by 2-3 dB, noise levels at all the identified NSRs would comply with the relevant criteria. The main contribution to the noise exceedance would be noise from fixed plant. Noise mitigation measures for the fixed plant are considered necessary to render the impact acceptable.

Table 5-18 Cumulative Noise Levels from Sports Events at Public Sports Ground and the Fixed Plant

NSR	Location	Predicted Noise Level / Assessment Criteria, dB(A), Leq (30min)	
		Daytime / Evening	**Night-time (11:00 p.m. – 7:00 a.m.)**
N1	Ma Tau Kok 13 Streets	62/60	No Night Time Sport Event in Public Sports Ground
N2	Sky Tower	63/65	
PN1	KTD Site 5A4	62/60	
PN2	Sung Wong Toi Road R(A) Site	64/60	
PN3	Sung Wong Toi Road CDA Site	63/65	
PN4	Sung Wong Toi Road CDA Site	63/65	
PN5	KTD Site 2B4	62/60	
PN6	KTD Site 2B3	62/60	
PN7	KTD Site 2B1	61/60	
PN8	KTD Site 1K3	62/60	
PN9	KTD Site 1L3	59/60	

5.8.20 The cumulative noise impact would exceed the noise criteria by 1 to 4 dB for NSRs PN1, PN2, and PN5 to PN8. Further noise mitigation measures for the fixed plant are recommended to render the noise impact acceptable.

Noise from Music, Singing and Instrument Performing Activities

5.8.21 Although the main purpose of the Main Stadium is for sports events, musical activities such as concerts are also planned for the Main Stadium of the Project even though the frequency is expected to be low.

5.8.22 Concerts would be held in the Main Stadium with different settings. In Setting 1, a 3-sided stage is located at the northern end of the field. In Setting 2, a 4-sided stage is located at the centre of the field. Both settings have been modelled for noise impact assessment. More information of the noise modelling can be found in **Section 5.5** and **Appendix 5.4A**.

5.8.23 Loudspeakers in concerts would produce noise with a strong bass. A typical spectrum and sound power from a musical event were adopted for the loudspeakers. Modelling results indicated that the audience under the two concert settings could receive a noise level of 96.5 dB(A) or above at most of the seating area from the loudspeakers and this level was considered to be sufficient for typical Rock & Roll concerts based on on-site sound measurement in music events in Hong Kong.

5.8.24 The predicted noise levels at the NSRs with the retractable roof fully opened have been calculated and are summarized in **Table 5-19**. Further details can be found in **Appendix 5.4A**. Results indicated that the potential noise impact arising from musical events in the Main Stadium would comply with the daytime/evening noise criteria for all NSRs even with the retractable roof fully opened.

5.8.25 At present, there is no quantitative noise criterion for night time musical events. In order to assess the potential noise impact for such events, the most appropriate way was to carry out a noise assessment for a similar venue in Hong Kong. However, no such venue was available for such assessments. Nevertheless, specific acoustic designs (as mentioned .in **Sections 5.6.1-5.6.4**) will be in place at the Main Stadium to mitigate the noise. Should the future operator plan to implement any musical events at the Main Stadium during night-time period (i.e. 11 p.m. to 7 a.m.), the operator is obliged to comply with the NCO requirements.

Table 5-19 Noise Levels from Musical Events at Main Stadium (Retractable Roof Fully Opened)

NSR	**Location**	**Predicted Noise Level, dB(A) Leq (15 min)**		**Assessment Criteria, dB(A), Leq (15 min)**	
		Concert Setting 1	**Concert Setting 2**	**Daytime / Evening**	**Night-time**
N1	Ma Tau Kok 13 Streets	30	36	75	Not Audible
N2	Sky Tower	57	58	77	
PN1	KTD Site 5A4	54	53	75	
PN2	Sung Wong Toi Road R(A) Site	64	70	75	
PN3	Sung Wong Toi Road CDA Site	58	58	77	
PN4	Sung Wong Toi Road CDA Site	55	55	77	
PN5	KTD Site 2B4	56	57	73	
PN6	KTD Site 2B3	56	57	73	
PN7	KTD Site 2B1	58	58	73	
PN8	KTD Site 1K3	62	61	73	
PN9	KTD Site 1L3	38	41	73	

Human Noise during Crowd Dispersion at Public Places

5.8.26 Noise impact due to crowd dispersion in public places during night-time has been addressed. To assess the possible annoyance from human activities including crowd dispersion during night time, local events with comparable crowd dispersal nature and scale have been reviewed. Among events each with a comparable scale of crowd and dispersal nature in Hong Kong, Chinese New Year's Eve flower had over 50,000 visitors and the events were conducted beyond mid-night. Since the operation time of the flower market event would last until early morning hours (until 4:00 a.m.), it was selected for assessing whether the noise from crowd would constitute annoyance to the nearby residents along the dispersal routes.

5.8.27 Under the NCO, enforcement of the noise causing annoyance in public places, as mentioned above, is mainly done by HKPF. Annoyance means that the noise is intolerable and should not be present from a reasonable person’s point of view considering the use of the noise sensitive receivers affected and the time. Similar to the practice in other countries, the HKPF would identify the noise source after receipt of the noise complaint. The HKPF would conduct investigation and enforce in rational manner according to the circumstances.

5.8.28 For the purpose of this planned project, two acoustic professionals with normal auditory sense were deployed to investigate the noise situation at the Victoria Park flower market. The aim was to assess whether crowd noise would cause annoyance at sensitive receiver locations. Victoria Park flower market was chosen because it had the highest visitor number among other flower markets in Hong Kong.

5.8.29 Prior to the investigation, a site survey was conducted to ascertain the accessibility of the noise sensitive receivers along the roads with special traffic arrangement near the flower market during opening of the market. Apart from a few low-rise residential buildings along Lockhart Road (between East Point Road and Cannon Street), no access could be gained. Typically, these few buildings at Lockhart Road were unaffected by traffic noise because of the special traffic arrangement and had openings at the staircase to simulate the effect of an opened window in a residential unit. A residential building at No. 541 of Lockhart Road was selected for the assessment. The road was one of the crowd dispersal routes that were closed for pedestrian access only. The assessment was conducted on 5th and 7th of February 2016 from 23:00 to 00:00 at 4/F of the staircase of the residential building. The assessment level at 4/F was chosen to simulate the lowest residential floor level of the planned NSRs in KTD area.

5.8.30 The perception of the acoustic professionals was that the crowd noise was audible, especially if someone paid attention to the noise at the staircase during the investigation period. No raised voice was heard during the investigation. However, the crowd noise was not considered intolerable considering the use of the noise sensitive uses affected and the time. It was found that noise from the people on the streets was not a source of annoyance to the local residents.

5.8.31 Reference was made to the noise complaint records obtained from HKPF. As shown in **Table 5-20** below, the number of complaints on noise from crowds on streets near the Chinese New Year Eve flower market at Victoria Park received by the HKPF in each of the past 5 years was rare, not to mention the number of valid complaints.

Table 5-20 Complaint Record of Noise from Crowds on Streets

	2012	2013	2014	2015	2016
Total no. of noise complaint for the concerned period and locations	1	3	0	2	1
No. of Valid complaints	0	0	0	0	0

5.8.32 With the operation experience of the Hong Kong Stadium, it can be foreseen that major events at the Main Stadium of MPSC are infrequent, especially a full-house event which would require crowd dispersal after 11:00 p.m. Despite the findings of the above assessment, there would be measures to reduce the potential human noise impact.

5.9 Mitigation of Environmental Impacts

Construction Noise

5.9.1 Construction noise impact can be mitigated with the following measures:

(a) Adopt good site practice, such as throttle down or switch off equipment unused or intermittently used between works.

(b) Regular maintenance of equipment to prevent noise emission due to impair.

(c) Position mobile noisy equipment in locations away from NSRs and point the noise sources to directions away from NSRs.

(d) Use silencer or muffler for equipment.

(e) Make good use structures for noise screening.

(f) Use Quality Powered Mechanical Equipment (QPME) and quiet equipment which produces lower noise level.

(g) Erect movable noise barriers of 3m height to shed large plant equipment (breaker, backhoe, mobile crane) or hand-held items (poker, wood saw, power rammer, compactor) near low-rise NSR, with special design where necessary, e.g. with noise absorbing material or bend top. Its length should be at least five times greater than its height. The minimum surface density of the movable noise barrier is 10 kg/m^2. It is anticipated that a noise reduction of at least 5 dB can be achieved. Alternatively, acoustic shed/enclosure/silencer (generator, air compressor, concrete pump) or acoustic mat (piling) can be adopted. A noise reduction of 10 dB can be achieved.

(h) Carry out regular site inspection to audit the implementation of mitigation measures.

(i) Carry out noise monitoring and audit throughout the construction period.

Table 5-21 Quality PME or Quiet Plant for Construction Work

PME	Code	Example	SWL, dB(A)
Breaker, mini-robot (mounted)	Others*	-	115
Saw, circular, wood	BSS501Z	Makita – BSS501Z#	103
Crane, mobile (diesel)	EPD-01477	KOBELCO, CKE2500-2	104
Excavator / Loader, wheeled / tracked	EPD-01431	DOOSAN, DX225LC	103

*http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf

#Catalogue available from http://www.makita.de/uploads/media/BSS500-B_02.pdf

5.9.2 With the use of quality PME, quiet PME, and movable noise barriers, the predicted construction noise levels at all representative NSRs are shown in **Table 5-22** below. For the mitigated scenario, the quantities and SWLs of the PME, detailed calculation and summary of the construction noise levels of the Project are provided in **Appendix 5.2G – 5.2J**. The results indicated that the construction noise levels at all NSRs would comply with the recommended noise criterion in EIAO-TM.

Table 5-22 Mitigated Construction Noise Impact from the Project, dB(A)

NSR	Nature of Use	Predicted Maximum Noise Level from the Project, dB(A), Leq (30 min)	Noise Criterion, dB(A), Leq (30 min)	Exceedance, dB(A)
CN1	Residential	68	75	-
CN2	Residential	70	75	-
CN3	Residential	71	75	-
CN4	Residential	67	75	-
CN5	Residential	66	75	-
CN6	Residential	65	75	-
CN7	Residential	72	75	-
CN8	Mixed Use	68	75	-
CN9	Residential	73	75	-
CN10	Residential	73	75	-
CN11	Mixed Use	73	75	-
CN12	Residential	74	75	-
CN13	Residential	72	75	-

5.9.3 There will be totally three concurrent projects during the construction period of the Project. The total construction noise levels of the concurrent projects have been calculated. The sound power levels, corresponding notional distances, detailed calculations and summary of the construction noise levels of the concurrent projects are provided in **Appendix 5.2K – 5.2N**.

5.9.4 The predicted cumulative noise levels with concurrent projects can be found in **Appendix 5.2P** and **Table 5-23** below. Apart from the NSRs CN7, CN8, and CN13, the construction noise levels at all the NSRs would comply with the noise criterion for daytime construction activities. The detailed breakdown of the cumulative construction noise levels with exceedance at the representative NSRs are shown in **Table 5-24** below.

Table 5-23 Cumulative Construction Noise Impact (Mitigated)

NSR	Nature of Use	Predicted Cumulative Maximum Noise Level, dB(A), Leq (30 min)	Noise Criteria, dB(A), Leq (30 min)	Exceedance, dB(A), Leq (30 min)
CN1	Residential	71	75	-
CN2	Residential	74	75	-
CN3	Residential	75	75	-
CN4	Residential	72	75	-
CN5	Residential	75	75	-
CN6	Residential	73	75	-
CN7	Residential	**82**	75	7
CN8	Mixed Use	**82**	75	7
CN9	Residential	74	75	-

NSR	Nature of Use	Predicted Cumulative Maximum Noise Level, dB(A), Leq (30 min)	Noise Criteria, dB(A), Leq (30 min)	Exceedance, dB(A), Leq (30 min)
CN10	Residential	73	75	-
CN11	Mixed Use	73	75	-
CN12	Residential	75	75	-
CN13	Residential	**78**	75	3

Table 5-24 Breakdown of Cumulative Construction Noise Impact for the NSRs with Exceedance

NSR	Predicted Maximum Noise Level, dB(A), Leq_{30min}			Number of Months with Exceeded Noise Level
	Cumulative	Project	Concurrent Projects	
CN7	**82**	72	**81**	6
CN8	**82**	68	**82**	6
CN13	**78**	72	**77**	12

5.9.5 According to the results in **Table 5-24**, the exceedance of the noise criterion would be due to other concurrent projects, and these "other concurrent projects" would have caused exceedance of the noise criterion.

Operational Road Traffic Noise

5.9.6 According to **Sections 5.8.4** – **5.8.8**, potential traffic noise impact due to the Project is either insignificant or the overall traffic noise levels comply with the 70 dB(A) criterion, except for the planned NSRs at the two CDA zone sites (TPN12, TPN13) and a housing site (TPN14). No adverse traffic noise impact would be induced due to the operation of the Project.

5.9.7 The existing uses of the planned NSRs TPN12 and TNP13 are warehouse, industrial buildings and factories. The existing use of the planned NSRs TPN14 is E&M Workshop. The selected assessment points represent the potential noise sensitive receivers in the CDA zoned sites and a public housing site. Assessment results indicated that the noise contribution due to the operation of the Project was significant.

5.9.8 The Housing Department would carry out an environmental assessment study (EAS) for the proposed housing development at the detailed design stage. The EAS would include the required mitigation measures so that all residential flats at the site would not be exposed to road traffic noise levels above the 70 dB(A) criterion. The planned uses of the CDA zoned sites are not committed at this stage. For a CDA development, a planning application is required for Town Planning Board approval. The future developers of the CDA sites would carry out an Environmental Assessment (EA). The EA would include the required mitigation measures so that all noise sensitive receivers (NSRs) at the site would not be exposed to road traffic noise levels above the respective criterion.

Noise from Sport Events

5.9.9 As mentioned in **Section 5.5**, acoustic features will be adopted in the design of the Main Stadium and Public Sports Ground and they are summarized below:

Mitigation Measures for Main Stadium

5.9.10 The structure of the stadium shall be soundproofing and complete. The entrances of the stadium shall have special acoustic design (e.g. double acoustic door) such that the soundproofing performance of the structure is not compromised. Details of entrances of the main stadium are provided in **Table 7** and **Figure 16** of **Appendix 5.4A**.

5.9.11 The gap between the base structure of the stadium and the fixed roof shall be air-tight to avoid noise leakage. Apart from the soundproofing structure and fixed roof of the main stadium, the retractable roof, which forms part of the design of the Main Stadium, shall be closed when needed. Rubber bearing or other devices with similar function shall be used to avoid the noise leakage between the fixed roof and the retractable roof. To increase the soundproofing performance of the roof, acoustic panels shall be attached underneath the fixed roof of the main stadium.

5.9.12 A distributed public address system shall be adopted with the loudspeakers directed towards the spectator stand.

5.9.13 For sports events in the Main Stadium as discussed in **Section 5.8.13**, the predicted operation noise levels at receivers during daytime/evening time period are within the criteria (ANL – 5 dB) even with the retractable roof fully opened. Adverse noise impact arising from sports events in the Main Stadium is not anticipated.

Mitigation Measures for Public Sports Ground

5.9.14 A cover shall be built over the spectator stand. To increase the soundproofing performance of the cover, sound absorption panels shall be attached underneath the entire cover.

5.9.15 For sports events in the Public Sports Ground as mentioned in **Section 5.8.15**, no adverse noise impact on NSRs is anticipated as the noise levels would comply with the relevant noise criteria for sports events during daytime/evening time period. No additional mitigation measure is required.

Noise from Fixed Plant

5.9.16 Partial enclosures and silencers shall be used to reduce noises from the fixed plant. According to the *Good Practices on Ventilation system Noise Control* issued by the EPD, partial enclosures and silencers can effectively reduce the noise level by 10-20 dB. A value of 15 dB was used for the noise mitigation in the calculation.

5.9.17 The mitigated noise levels were found to comply with the noise criterion at the worst-affected receivers, and hence the noise from the building services system operation should not be a concern. The noise levels at the representative NSRs are listed in **Table 5-25**. Detailed calculation can be found in **Appendix 5.5**.

Table 5-25 Noise Levels at the Representative NSRs for Fixed Plants

NSR	Location	Mitigated SPL, dB(A), Leq (30 min)	Noise Criteria (Day/Night), dB(A), Leq (30 min)
PN2B	Sung Wong Toi Road R(A) site	47	60/50
PN5	KTD Site 2B5	43	60/50
PN7	KTD Site 2B1	43	60/50
PN8	KTD Site 1K3	45	60/50
PN9	KTD Site 1L3	43	60/50

Cumulative noise impact

5.9.18 As mentioned in **Section 5.9.16**, noise level from the fixed plant could be effectively reduced by adoption of the above noise mitigation measures. The mitigated cumulative noise impact for the noise from a sports event in the Main Stadium and the fixed plant, and the noise from a sports event in the Public Sports Ground and the fixed plant are shown in **Table 5-26** and **Table 5-27** respectively. Assessment results indicated that the cumulative noise impact on all the identified NSRs would comply with the noise criteria. No further mitigation measures are required.

Table 5-26 Mitigated Cumulative Noise Levels from Sports Events at Main Stadium (Retractable Roof Fully Opened) and the Fixed Plant

NSR	Location	Predicted Noise Level / Assessment Criteria, dB(A), Leq (30 min)	
		Daytime / Evening	Night-time (11:00 p.m. – 7:00 a.m.)
N1	Ma Tau Kok 13 Streets	47/60	No Night Time Sport Event in Main Stadium
N2	Sky Tower	51/65	
PN1	KTD Site 5A4	48/60	
PN2	Sung Wong Toi Road R(A) Site	56/60	
PN3	Sung Wong Toi Road CDA Site	51/65	
PN4	Sung Wong Toi Road CDA Site	49/65	
PN5	KTD Site 2B4	49/60	
PN6	KTD Site 2B3	51/60	
PN7	KTD Site 2B1	50/60	
PN8	KTD Site 1K3	54/60	
PN9	KTD Site 1L3	44/60	

Table 5-27 Mitigated Cumulative Noise Levels from Sports Events at Public Sports Ground and the Fixed Plant

NSR	Location	Predicted Noise Level / Assessment Criteria, dB(A), Leq (30 min)	
		Daytime / Evening	Night-time (11:00 p.m. – 7:00 a.m.)
N1	Ma Tau Kok 13 Streets	52/60	No Night Time Sport Event in Public Sports Ground
N2	Sky Tower	56/65	
PN1	KTD Site 5A4	54/60	
PN2	Sung Wong Toi Road R(A) Site	60/60	
PN3	Sung Wong Toi Road CDA Site	58/65	
PN4	Sung Wong Toi Road CDA Site	56/65	
PN5	KTD Site 2B4	59/60	
PN6	KTD Site 2B3	60/60	
PN7	KTD Site 2B1	57/60	
PN8	KTD Site 1K3	59/60	
PN9	KTD Site 1L3	52/60	

Noise from Music, Singing and Instrument Performing Activities

5.9.19 With the implementation of the recommended mitigation measures (**Sections 5.6.1 – 5.6.4** refer), the potential noise impact arising from the musical events at the Main Stadium during daytime/evening period (i.e. 7 a.m. to 11 p.m.) would comply with the noise criteria stipulated under the Noise Control Guidelines for Music, Singing and Instrument Performing Activities. Should the future operator plan to implement any musical events at the Main Stadium during night-time period (i.e. 11 p.m. to 7 a.m.), the operator is obliged to ensure that the noise impacts arising from the said night-time musical events will comply with the noise requirements under the NCO.

Human Noise during Crowd Dispersion

5.9.20 In addition to normal dispersal routes above the podium, routes have been proposed on the ground level for directing the crowd towards the future Kai Tak Station and To Kwa Wan Station for crowd dispersion at night-time. Under such circumstances, the crowd would be directed to disperse under the podium at ground level. There would be covers above some sections of the night-time crowd dispersal routes. Such covers would partially screen the crowd dispersal routes from the planned residential sites although the covers are not to be provided as noise mitigation measures for the Project. For the crowd moving toward the Kai Tak Station, spectators would be directed to leave the site through or along the Indoor Sports Centre Building (ISCB) to reduce the exposed sections of the crowd dispersal routes. For the dispersal routes toward To Kwa Wan Station, the exit from the Project site is designed near the Sung Wong Toi Park. The proposed night-time crowd dispersal routes are presented in **Figure 5-6**.

5.9.21 For the crowd dispersal route to the Kai Tak Station, the exposed sections of the night-time crowd dispersal route could be further reduced if all spectators moving toward the Kai Tak Station are directed to leave the site through the ISCB. However, this alternative route is not adopted as the crowd dispersal time would be much longer due to the width constraints in the internal access of the ISCB while the operation of the car park inside the ISCB would be adversely affected.

5.9.22 For the crowd dispersal route to the To Kwa Wan Station, a section of the crowd dispersal route between the Main Stadium and the Road D2 would be along the western periphery of the Project boundary. It should be noted that a common lobby at ground level will be provided for the hotel and office block. The common lobby would provide better security and access control for the hotel and office block. Alternative crowd dispersal route passing through the common lobby of the hotel and office block is not adopted for security and access control reasons.

5.9.23 Option for construction of an underground walkway/subway between the Project site and the MTR stations is considered impracticable as the underground dispersal route toward Kai Tak Station would intercept the Kai Tak Nullah and an archaeological feature of high cultural significance (Sacred Hill) has been identified adjoining the To Kwa Wan Station. Possible constraints for the construction of an underground walkway to the two future MTR stations are shown in **Figure 5-8**.

5.9.24 Due to the width constraints of the internal access and the road crossings, the crowd dispersal time for routes under the podium at ground level would be longer than that on the podium deck. Therefore the dispersal routes under the podium are not intended to totally replace the normal dispersal route on the podium. Based on the MPSC operating consultant's estimation, the majority of the crowd can be dispersed within 30 minutes if the normal routing on podium deck is used. In order to ensure that the majority of the crowd dispersion through the normal routes would not be extended to the night-time period, the normal routes would not be adopted for major events (i.e. more than 20,000 persons) which would finish at or later than 10:30 p.m.

5.9.25 The future Operator should arrange its staff members to marshal the dispersion of crowds after 10:30 p.m. in an orderly manner from the exits of the Main Stadium all the way to the two nearby MTR stations. Placards should be used to advise attendees of the events to keep the noise down. No loudspeakers should be used for any verbal communication between the marshalling staff and the attendees. If any attendees are found to raise the voice or make any noise beyond control even after verbal advice by the marshalling staff, the Police should be called in to restore the situation.

5.9.26 Based on the preliminary design of the Station Square, a covered walkway outside the northern boundary of the Project site toward the future Kai Tak Station is proposed. Such features would partially screen the crowd dispersal routes from most of the planned residential site although the covers are not to be provided as noise mitigation measures for the Project.

5.10 Evaluation of Residual Impacts

Construction Phase

5.10.1 According to **Table 5-22**, there would be no exceedance of the construction noise criterion due to the Project after noise mitigation at all the NSRs. As shown in **Table 5-23**, there would also be no exceedance of the construction noise criteria due to the Project after noise mitigation and the concurrent projects at the NSRs except NSR CN7, CN8 & CN13. Nevertheless, the exceedance would be mainly caused by other concurrent projects and would be transient in nature.

Operation Phase

5.10.2 The additional traffic noise impact caused by the Project on all the existing, planned and committed noise sensitive receivers would be either insignificant or the overall traffic noise levels would comply with the noise criterion during the operation of the Project, except the CDA zone sites and a housing site along Sung Wong Toi Road.

5.10.3 The future uses of the CDA zoned sites at southwest of the Project site near Sung Wong Toi Road are not committed at this stage. For a CDA development, a planning application is required for Town Planning Board approval. An Environmental Study (ES) is required for supporting the planning application. If any one of these CDA zoned sites contains noise sensitive uses, the ES should propose noise mitigation measures to demonstrate that road traffic noise levels at any noise sensitive use within the site would comply with the relevant noise criterion stipulated in the Hong Kong Planning Standard and Guidelines (HKPSG).

5.10.4 For the planned housing site, the predicted unmitigated traffic noise levels at this planned NSR would exceed the noise criterion of 70 dB(A) by 1 to 3 dB. This exceedance level would not create unacceptable constraints to the proposed development. The Housing Department would carry out an environmental assessment study (EAS) for the proposed development at the detailed design stage. The EAS would include the required mitigation measures so that all residential flats at the housing site would not be exposed to road traffic noise levels above the 70 dB(A) criterion.

5.10.5 With the implementation of the recommended mitigation measures mentioned in **Sections 5.6.1 – 5.6.4**, the potential noise impact arising from the musical events at the Main Stadium during daytime/evening period (i.e. 7 a.m. to 11 p.m.) would comply with the noise criteria stipulated in the Noise Control Guidelines for Music, Singing and Instrument Performing Activities. Should the future operator plan to implement any musical events at the Main Stadium during night-time period (i.e. 11 p.m. to 7 a.m.), the operator is obliged to comply with the requirements under the NCO.

5.10.6 The mitigated fixed plant noise levels would comply with the noise criterion at the worst-affected receivers

5.10.7 The mitigated cumulative noise levels due to noise from sports events in the Main Stadium and all the fixed plant, and the mitigated cumulative noise levels due to sports events in the Public Sports Ground and all the fixed plant would comply with the noise criteria at all NSRs. No adverse cumulative operation noise impact is anticipated.

5.10.8 Noise from human activities in public places would arise mainly from crowd dispersal after events. In general, crowd dispersion is not a source of annoyance especially during daytime/evening. For the possible crowd dispersal in night time, i.e. after 11:00 p.m., an assessment of noise from human activities during dispersion of crowd associated with a local event of a comparable scale and dispersal nature in public places in night time had been conducted. The assessment found that the noise did not constitute a source of annoyance to the local residents. Nevertheless, specific dispersal routes would be designed for the crowd dispersion through ground level for minimizing the exposed sections of the dispersal routes and hence noise from the human activities after 10:30 p.m.

5.11 Environmental Monitoring and Audit

Construction Phase

5.11.1 Regular noise monitoring is recommended at representative NSRs during the construction stage to ensure that relevant noise criteria can be met and the noise mitigation measures are effective. The EM&A requirement are detailed in a standalone EM&A Manual.

Operation Phase

5.11.2 The designated use of the Main Stadium and Public Sports Ground is for holding sports events. Noise from these events is mainly from the spectators. Unlike music events, there would be no extensive use of loudspeakers during sports events and noise from the PA system is only intermittent in nature.

5.11.3 According to **Table 5-26**, the predicted noise levels at NSRs during sports events are well below the ANL – 5dB criteria and hence the corresponding prevailing background noise levels. It is implausible that any significant noise impact can be identified through noise monitoring. Hence there is no need to conduct noise monitoring for sports events.

5.11.4 Holding music events is not the designated use of the Main Stadium. The acoustic settings and sound characteristics for different types of music events vary from each other. Noise monitoring is proposed for music events held in the Main Stadium during the first 3 years of operation. It is considered that three years are sufficient to capture the representative and the highest levels of operation noise of the Main Stadium for different types of music events. After the 3-year monitoring period, the findings of monitoring should be reviewed in order to determine whether further monitoring will be necessary.

5.11.5 The organizer of music activities should appoint an appropriate person to monitor the noise situation during the activities. Also, the organizer should provide a manned complaint hotline to respond to complaints from nearby NSRs immediately.

5.11.6 Real time noise monitoring at selected locations shall be conducted for any music event held in the Main Stadium during daytime or evening time periods and the corresponding actions shall follow the Event and Action Plan in the EM&A Manual. Trigger and Action Levels and corresponding follow-up actions have been established. The Action Level is the background noise level (BGL) +10 dB in Leq(5mins). The Trigger Level in Leq(15min) is 3 dB lower than the BGL +10 dB. Whenever the measured noise level in Leq(5min) exceeds the Action Level at any of the monitoring points, closing of the retractable roof shall start immediately. If the measured noise level in Leq(15min) reaches the Trigger Level, the organizer should be informed to reduce the noise levels. If the noise levels measured (rounded up or down to the nearest integers) in the two following 15-min time periods keep raising, closing of the retractable roof shall also start immediately even the Action Level is not exceeded.

5.12 Conclusion

5.12.1 Construction noise would inevitably be generated from the use of PME on site. With the implementation of mitigation measures such as adoption of good site practice and use of quieter PME and mobile noise barriers, levels of construction noise from the Project at all the representative noise sensitive receivers have been predicted to comply with the daytime noise criterion.

5.12.2 During the operational phase of the Project, potential traffic noise impact on surrounding noise sensitive receivers has been predicted and evaluated. Assessment results indicated that insignificant additional traffic noise impact will be caused by operation of the Project or the overall traffic noise levels would comply with the noise criterion at most of the affected NSRs. No excessive traffic noise impact would be induced due to the operation of the Project. For the planned housing site and the CDA zoned sites at southwest of the Project site near Sung Wong Toi Road, the potential traffic noise level on the noise sensitive receivers should comply with the noise criterion by adoption of mitigation measures at receivers.

5.12.3 Based on the mode of operation for the Project, no organized events shall be conducted simultaneously in the Main Stadium and the Public Sports Ground.

5.12.4 Potential noise impact arising from the operation of the Main Stadium, including sports and musical events, as well as the potential noise impact from human activities in public places has been assessed and found to comply with the noise criterion in the daytime/evening period with the acoustic design in place. Also, the potential noise impact for sports events in the Public Sports Ground has also been evaluated and similarly found to comply with the noise criterion in the daytime/evening period with the acoustic design in place. Fixed plant noise would exceed the noise criterion; however, with noise mitigation, the mitigated fixed plant noise levels would comply with the noise criterion at the worst-affected receivers.

5.12.5 The mitigated cumulative noise levels due to sports events in the Main Stadium and all the fixed plant, and the mitigated cumulative noise levels due to sports events in the Public Sports Ground and all the fixed plant would comply with the noise criteria at all NSRs. No adverse cumulative operation noise impact is anticipated.

5.12.6 Music events held in the Main Stadium would generate noise. With the implementation of the recommended mitigation measures, the potential noise impact arising from the musical events at the Main Stadium during daytime/evening period (i.e. 7 a.m. to 11 p.m.) would comply with the noise criteria in Noise Control Guidelines for Music, Singing and Instrument Performing Activities. Should the future operator plan to implement any music events at the Main Stadium during night-time period (i.e. 11 p.m. to 7 a.m.), the operator is obliged to comply with the requirements under the NCO.

5.12.7 Noise from human activities in public places would arise mainly from crowd dispersal after events. In general, crowd dispersion is not a source of annoyance especially during daytime/evening.

5.12.8 The crowd from the Main Stadium may disperse on the podium level during daytime/evening. Music events held in the Main Stadium may require crowd dispersal in night time (after 11:00 p.m.). The assessment has concluded that human noise during dispersion of crowd associated with a local event of comparable scale and dispersal nature in public places in night time would not cause annoyance to the local residents. However, specific dispersal routes would be designed for the crowd dispersion after 10:30 p.m. It has been recommended that the crowd after leaving the Main Stadium should be directed immediately to the ground level instead of the podium level with a view to minimising the exposed sections of the dispersal routes.

6 WATER QUALITY IMPACT ASSESSMENT

6.1 Introduction

6.1.1 This section on Water Quality Impact Assessment (WQIA) is prepared in response to Section 3.4.6 and Appendix D1 of the EIA Study Brief which specify the requirements of WQIA.

6.1.2 According to EIA Study Brief 3.4.6, the Study Area for WQIA shall include areas within 500 m from the boundary of the Project Site, see **Figure 6-1-1** and Victoria Harbour (Phase 1 and Phase 2) Water Control Zone under Water Pollution Control Ordinance (WPCO), see **Figure 6-1-2** and as follows:

Phase 1 of Victoria Harbour Water Control Zone (WCZ V1) covers:

- Tsuen Wan East and Kwai Chung
- Ma Yau Tong and Kwun Tong

Phase 2 of Victoria Harbour Water Control Zone (WCZ V2) covers:

- Sham Shui Po
- Yau Ma Tei, Tsim Sha Tsui, Mong Kok, Kowloon City and Wong Tai Sin

6.1.3 It is obvious that only Kwun Tong, Kowloon City and Wong Tai Sin needs to be addressed as the Project influence are likely to be affected while that on other areas in WCZ V1 and WCZ V2 are insignificant and excluded in this assessment. Thus, the water bodies in To Kwa Wan Typhoon Shelter (TKWTS) and Kai Tak Approach Channel (KTAC) will be studied.

6.1.4 In general, the WQIA shall follow the requirements as stated in WPCO, Appendix D1 of the Study Brief and Annex 6 (Criteria for Evaluating Water Pollution) and Annex 14 (Guidelines for Assessment of Water Pollution) to the Technical Memorandum (TM) on Environmental Impact Assessment Process. Other standards include:

- Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-DSS) or in short, Technical Memorandum on Effluent Standards;
- Hong Kong Planning Standards and Guidelines (HKPSG);
- Water Supplies Department (WSD) Water Quality Criteria;
- WSD's "Technical Specifications on Grey Water Reuse and Rainwater Harvesting" and
- Practice Note for Professional Persons (ProPECC), Construction Site Drainage (PN 1/94)

6.1.5 This WQIA makes references to relevant WQIA of the following EIA reports:

- Kai Tak Development (No. AEIAR-130/2009) (KTD EIA)
- Dredging Works for Proposed Cruise Terminal at Kai Tak (No. AEIAR-115/2007)
- Tai Po Sewage Treatment Works – Stage V (No. AEIAR-081/2004) (TPSTW EIA)

- Trunk Road T2 (No. AEIAR-174/2013) (T2 EIA)
- Central Kowloon Route (No. AEIAR-171/2013) (CKR EIA)

6.2 Water Quality Objectives

6.2.1 The WPCO provides the statutory framework for the protection and control of water quality in Hong Kong. According to the ordinance and its subsidiary legislation, Hong Kong waters are divided into ten Water Control Zones (WCZs). Corresponding statements of Water Quality Objectives (WQOs) are stipulated for different water regimes (marine waters, inland waters, bathing beaches, secondary contact recreation subzones and fish culture subzones) based on their beneficial uses. The WQOs for WCZ-VH are shown in **Table 6-1**.

Table 6-1 Summary of Water Quality Objectives for Victoria Harbour WCZ

Parameters	Objectives	Sub-Zone
Offensive Odour, Tints	Not to be present	Whole zone
Visible foam, oil scum, litter	Not to be present	Whole zone
Dissolved Oxygen (DO) within 2 m of the seabed	Not less than 2.0 mg/L for 90% of samples	Marine waters
Depth-averaged (DA) DO	Not less than 4.0 mg/L for 90% of samples	Marine waters
pH	To be in the range of 6.5 – 8.5, change due to human activity not to exceed 0.2	Marine waters
Salinity	Change due to human activity not to exceed 10% of ambient	Whole zone
Temperature	Change due to human activity not to exceed 2°C	Whole zone
Suspended solids (SS)	Not to raise the ambient level by 30% caused by human activity	Marine waters
Unionised Ammonia (UIA)	Annual mean not to exceed 0.021 mg/L as unionized form	Whole zone
Nutrients	Shall not cause excessive algal growth	Marine waters
Total Inorganic Nitrogen (TIN)	Annual mean depth-averaged inorganic nitrogen not to exceed 0.4 mg/L	Marine waters
Toxic substances	Should not attain such levels as to produce significant toxic, carcinogenic, mutagenic or teratogenic effects in humans, fish or any other aquatic organisms.	Whole zone
	Human activity should not cause a risk to any beneficial use of the aquatic environment.	Whole zone

Source: Statement of Water Quality Objectives (Victoria Harbour (Phase One, Two and Three) Water Control Zone.).

6.2.2 The HKPSG, Chapter 9 (Environment), provides additional guidelines against water pollution for sensitive uses such as aquaculture and fisheries zones, bathing waters and other contact recreational waters. At present, there is no contact recreational water activities in the study area.

6.2.3 Besides the WQOs set under the WPCO, WSD have also specified a set of water quality criteria for flushing water at seawater intakes shown in **Table 6-2**.

Table 6-2 WSD's Water Quality Criteria for Flushing Water at Sea Water Intakes

Parameter (in mg/L unless otherwise stated)	Target Limit
Colour (HU)	< 20
Turbidity (NTU)	< 10
Threshold Odour Number (odour unit)	< 100
Ammonia Nitrogen (NH_3-N)	< 1
Suspended Solids (SS)	< 10
Dissolved Oxygen (DO)	> 2
5-day Biochemical Oxygen Demand (BOD_5)	< 10
Synthetic Detergents	< 5
E. coli (no./100 mL)	< 20,000

6.2.4 Based on Comprehensive Feasibility Study for Wanchai Development Phase II (CFSWDII) EIA, a SS limit of 40 mg/L has been adopted as the assessment criterion for Admiralty Centre intake and MTRC South intake (Point 9 and Point 8 respectively in Figure 4.3). According to EMSD, there is no specific water quality requirements for the intake of the District Cooling System (DCS) at Kai Tak, and no information on the SS limit is available from other operating cooling water intakes. According to Territory-wide Implementation Study of Water-cooled Air Conditioning Systems in Hong Kong – Executive Summary to Strategic Environmental Assessment, the water quality of influent to the cooling system is not a major concern while the thermal effect and the quantities of residual chemicals and reaction by-products of the effluent is of concern. The effluent quality should have to be dealt with by the cooling system independently.

6.2.5 Besides setting the WQOs, the WPCO controls effluent discharging into any WCZ through a licensing system. The TM-DSS issued under Section 21 of the WPCO, gives guidance on permissible effluent discharges based on the type of receiving waters (foul sewers, storm water drains, inland and coastal waters). The limits control the physical, chemical and microbial quality of effluent.

6.2.6 A practice note for professional persons (ProPECC) was issued by the EPD to provide guidelines for handling and disposal of construction site discharges. The ProPECC PN1/94 "Construction Site Drainage" provides good practice guidelines for dealing with ten types of discharge from a construction site. These include surface runoff, groundwater, boring and drilling water, bentonite slurry, water for testing and sterilisation of water retaining structures and water pipes, wastewater from building construction, acid cleaning, etching and pickling wastewater from site facilities and should be followed as far as possible during construction to minimise the water quality impact due to construction site activities.

6.2.7 Possible indirect impact on subtidal habitat may arise due to water quality deterioration. Hard corals are known to be at particular risk of deleterious impacts from sedimentation through smothering and clogging of their respiratory and feeding apparatus. Similarly, more turbid water may reduce the amount of light reaching beneath the water surface which may also be detrimental to hard corals. With less light, growth rates of hermatypic hard corals (the only type of coral to possess photosynthetic algae called zooanthellae) may be reduced. The effects of increased sediment levels in the water column also extend to other marine groups apart from the corals. For instance, fauna inhabiting soft substrata may also be smothered if sedimentation rates are very high.

6.2.8 The WQO for suspended solids in the Victoria Harbour WCZ states that waste discharges shall not raise the ambient level by 30%. This was adopted in the TPSTW EIA Study as the criterion for assessing the SS impacts on corals in Victoria Harbour.

6.2.9 Literature reviews indicate that lethal responses had not been reported in adult fish at a SS concentration of below 125 mg/L. The AFCD consultancy Study on Fisheries and Marine Ecological Criteria for Impact Assessment provides the guideline values for different parameters for protection of local marine fisheries resources. The guideline values for relevant parameters are given in **Table 6-3** below.

Table 6-3 Assessment Criteria for Local Marine Biota and Fisheries Resources

Parameter	Continuous Concentration (mg/L)	Maximum Concentration (mg/L)	Minimum Concentration (mg/L)
Ammonia, at pH 8.0 (Total ammonia as NH3-N)	0.7	1.2	-
Dissolved Oxygen	5	-	2
Total Suspended Solids	Site Specific	50	-

6.3 Description of Environment

6.3.1 In 2006, the marked improvements in the eastern Victoria Harbour (VM1 and VM2) and moderate improvements in the mid harbour area (VM4 and VM5) since HATS Stage 1 was commissioned were generally sustained. Several monitoring stations in the WCZ are located close to sewage outfalls, including VM5 (Wan Chai East and Wan Chai West Preliminary Treatment Works (PTW) outfall), VM6 (Central PTW outfall), VM4 (North Point PTW outfall) and VM8 (Stonecutters Islands STW – HATS Stage 1 outfall), see **Figure 6-3-1**. The water quality at these stations was inevitably subject to the direct impact of sewage discharge from these outfalls.

6.3.2 According to EPD released water quality monitoring data for Victoria Harbour in 2014, compliance with WQO for TIN in VM1, VM2 and VM4 are 92%, 78% and 81% of saturation respectively. The bottom average DO in VM1, VM2 and VM4 are 77%, 71% and 68% respectively and depth average DO in VM1, VM2 and VM4 are 78%, 76% and 73% respectively. The average *E. coli* count in VM1, VM2 and VM4 are 1454, 5672 and 6109 respectively.

6.3.3 A summary of the published EPD monitoring data (in 2006) collected from the monitoring stations in the Kwun Tong Typhoon Shelter (KTTS) (VT4) and To Kwa Wan Typhoon Shelter (TKWTS) (VT11) is presented in **Table 6-4**. Marine water quality monitoring is conducted by EPD at the typhoon shelters on a monthly basis. Water samples are taken at three water depths, namely, 1 m below water surface, mid-depth and 1 m above sea bed, except where the water depth is less than 6 m, in which case the mid-depth station may be omitted. Locations of the monitoring stations are shown in **Figure 6-3-1**.

Table 6-4 Summary Statistics of 2006 Marine Water Quality at the Kwun Tong and To Kwa Wan Typhoon Shelter

Parameter		Kwun Tong VT4	To Kwa Wan VT11	WPCO WQO (in marine waters)
Temperature (°C)		23.9 (17.5 – 28.8)	23.5 (17.2 – 28.6)	Not more than 2°C in daily temperature range
Salinity (ppt)		29.3 (23.2 – 31.4)	30.5 (21.8 – 32.7)	Not to cause more than 10% change
Dissolved Oxygen (DO) (% saturation)	Depth average	68 (29 – 112)	83 (56 – 115)	Not available
	Bottom	66 (26 – 110)	84 (54 – 117)	Not available
Dissolved Oxygen (DO) (mg/l)	Depth average	4.9 (2.0 – 7.6)	6.0 (3.9 – 7.9)	Not less than 4 mg/L for 90% of the samples
	Bottom	4.7 (1.8 – 7.4)	6.0 (3.7 – 8.0)	Not less than 2 mg/L for 90% of the samples
pH value		7.7 (7.4 – 8.1)	8.0 (7.7 – 8.3)	6.5 – 8.5 (±0.2 from natural range)
Secchi disc (m)		1.4 (1.0 – 2.0)	1.7 (0.9 – 2.5)	Not available
Turbidity (NTU)		12.7 (4.1 – 30.1)	14.8 (9.0 – 22.1)	Not available
Silica (as SiO_2) (mg/l)		1.0 (0.4 – 1.8)	0.7 (0.2 – 1.6)	Not available
Suspended Solids (SS) (mg/l)		2.6 (1.2 – 3.5)	6.7 (2.4 – 20.6)	Not more than 30% increase
5-day Biochemical Oxygen Demand (BOD_5) (mg/l)		2.2 (1.1 – 3.5)	1.0 (0.6 – 1.6)	Not available
Nitrite Nitrogen (NO_2-N) (mg/l)		0.157 (0.082 – 0.227)	0.029 (0.012 – 0.059)	Not available
Nitrate Nitrogen (NO_3-N) (mg/l)		0.34 (0.22 – 0.64)	0.16 (0.05 – 0.42)	Not available

Parameter	Kwun Tong VT4	To Kwa Wan VT11	WPCO WQO (in marine waters)
Ammoniacal Nitrogen (NH_3-N) (mg/l)	0.48 (0.29 – 0.65)	0.12 (0.06 – 0.21)	Not available
Unionised Ammonia (UIA) (mg/l)	0.011 (0.005 – 0.016)	0.004 (0.002 – 0.006)	Not more than 0.021 mg/L for annual mean
Total Inorganic Nitrogen (TIN) (mg/l)	0.97 (0.71 – 1.42)	0.31 (0.13 – 0.54)	Not more than 0.4 mg/L for annual mean
Total Nitrogen (TN) (mg/l)	1.33 (1.02 – 1.82)	0.53 (0.39 – 0.80)	Not available
Ortho-Phosphate (PO_4) (mg/l)	0.214 (0.153 – 0.295)	0.028 (0.007 – 0.050)	Not available
Total Phosphorus (TP) (mg/l)	0.26 (0.20 – 0.36)	0.05 (0.04 – 0.06)	Not available
Chlorophyll-a ($\mu g\ L^{-1}$)	18.2 (1.0 – 35.0)	7.9 (1.0 – 20.5)	Not available
E. coli (cfu per 100 mL)	9,200 (2,800 – 29,000)	1,100 (340 – 4,400)	Not available
Faecal Coliforms (cfu per 100 mL)	22,000 (4,400 – 78,000)	2,600 (860 – 8,300)	Not available

Note: 1. Except as specified, dated presented are depth-averaged data.
2. Data presented are annual arithmetic means except for *E.coli* and faecal coliforms that are geometric means.
3. Data enclosed in brackets indicate ranges.

6.3.4 Due to the embayment form and reduced flushing capacity of the typhoon shelter, marine water within the typhoon shelter is vulnerable to pollution. According to KTD EIA, in 2006, high levels of *E.coli* were recorded at the KTTS and TKWTS indicating faecal contamination. A high level of total inorganic nitrogen (TIN) was also recorded at the KTTS which breached the WQO.

6.3.5 According to T2 EIA, the existing water quality in the Study Area has been monitored for many years as part of the EPD's routine monitoring programme. The EPD's marine water quality monitoring stations within the Victoria Harbour WCZ include VM1, VM2 and VT4 (inside the Kwun Tong Typhoon Shelter), as shown in **Figure 6-3-1**. A summary of the EPD's Routine Water Quality Data for these stations for the years 2010 and 2014 is given in **Table 6-5** below.

6.3.6 These monitoring results show that the water quality of Victoria Harbour, VM1 and VM2 and the of KTTS, VT4 in general meets the Water Quality Objectives for Victoria Harbour and WSD's Water Quality Criteria for sea water intakes.

6.3.7 At the time of drafting this report, it is noted that CEDD will adopt an Interceptive Pumping Scheme to replace the originally proposed 600 m opening located at the former airport runway. This will likely improve the flushing effect and the water quality of KTAC.

Table 6-5 Summary of EPD's Routine Water Quality Data (VM1, VM2 and VT4) for Victoria Harbour WCZ (Kwun Tong Typhoon Shelter) (2010 and 2014)

Parameters	Monitoring Station					
	VM1		VM2		VT4	
	2010	2014	2010	2014	2010	2014
Temperature (°C)	22.8 (16.5-27.3)	22.4 (16.0-29.2)	23.0 (16.5-27.3)	22.9 (16.2-29.1)	23.8 (18.3-28.3)	23.6 (17.1 - 29.0)
Salinity (ppt)	32.0 (29.2-33.6)	32.4 (24.1-34.1)	31.7 (29.1-33.7)	31.8 (24.7-33.2)	29.4 (22.9-31.6)	29.7 (26.8 - 32.0)
Dissolved Oxygen (mg/L)	5.6 (3.3-7.6)	5.7 (2.1-8.3)	5.4 (3.5-6.7)	5.5 (1.2-8.1)	5.2 (2.1-7.5)	5.8 (4.5 - 6.4)
Bottom Dissolved Oxygen (mg/L)	4.8 (1.1-6.3)	5.7 (2.1-8.2)	4.8 (1.2-6.4)	5.2 (1.2-8.1)	5.9 (2.6-8.4)	5.4 (2.8 - 7.0)
SS (mg/L)	4.0 (1.4-8.1)	4.3 (0.8-24)	3.6 (0.9-7.6)	3.0 (1.0-7.0)	5.0 (1.6-16.7)	3.0 (0.9 - 7.3)
BOD5 (mg/L)	0.7 (<0.1-1.2)	0.7 (<0.1-3.2)	0.9 (<0.1-1.6)	1.0 (0.1-3.2)	1.8 (1.5-2.6)	1.5 (0.4 - 2.6)
Unionised NH_3 (mg/L)	0.003 (<0.001-0.010)	0.002 (<0.001-0.005)	0.004 (<0.001-0.011)	0.003 (<0.001-0.008)	0.011 (0.005-0.022)	0.007 (0.002 - 0.011)
TIN (mg/L)	0.20 (0.09-0.32)	0.20 (0.09-0.56)	0.27 (0.10-0.40)	0.28 (0.14-0.51)	1.03 (0.55-1.81)	2.00 (0.89 - 3.90)
Ortho-P (mg/L)	0.020 (0.010-0.036)	0.019 (0.005-0.043)	0.024 (0.011-0.039)	0.025 (0.006-0.05)	0.140 (0.080-0.186)	0.356 (0.183 - 0.703)
Total P (mg/L)	0.03 (0.02-0.06)	0.03 (0.02-0.06)	0.04 (0.02-0.05)	0.04 (0.02-0.07)	0.17 (0.10-0.22)	0.43 (0.24 - 0.87)
Chlorophyll-a (μg/L)	2.8 (0.5-12.2)	3.2 (<0.2-36)	3.3 (0.5-15.4)	3.7 (<0.2-21)	13.9 (1.0-26.7)	9.3 (1.1 - 20.3)
E. coli (cfu/100mL)	710 (180-4400)	520 (120-9700)	2000 (420-17000)	2700 (320-8600)	820 (330-6000)	1600 (150 - 33000)

Note: 1. Data presented are depth averaged (except as specified) and are the annual arithmetic mean except for *E.coli* (geometric mean);
2. Data in brackets indicate ranges;
3. Underlined indicates occurrence of non-compliance with that parameter of WQO.

6.3.8 As reported in the KTD EIA, water quality monitoring in Kai Tak Nullah (KTN), KTAC and KTTS were carried out since 2005/2006. Since then, CEDD have conducted regular water quality monitoring. According to unpublished water quality monitoring data of survey conducted in 2015, significant reduction in water pollutants, including BOD_5 and *E.coli* in KTN compared with 2005/2006 data were observed after the successful implementation of dry weather flow interceptor (DWFI) since mid-2013. Comparison of the pollution loads between 2005/2006 survey adopted under the EIA Study for KTD approved in 2009 and the survey conducted in 2015 are shown in **Table 6-6**.

Table 6-6 Summary of Pollution Load Surveys in 2005/06 and 2015

Location	Survey Event (dry season[1])	Flow (m^3/day)	BOD[2] (kg/day)	*E.coli*[3] (cfu/day)
KTN	2005/06	342,553	7,650	8.13E+15
	2015	309,190	2,509	8.49E+14
	Change	↘10%	↘67%	↘90%

Note:
1. Dry season refers to October to April.
2. BOD denotes biochemical oxygen demand which is the amount of oxygen required for microbial metabolism of organic compounds in water. It reflects the quantity of organic wastes from expedient connections, unsewered areas and other non-point sources such as street washing being discharged into the drainage system.
3. Escherichia *coli (E.coli)* is the most commonly used and internationally accepted indicator on bacterium in water pollution monitoring. The level of *E.coli* indicates the level of faecal contamination of a water body.

6.3.9 Monitoring data on average dissolved oxygen[1] (DO), as summarized in **Table 6-7**, indicates that the water quality at KTAC/KTTS has been substantially improved as reflected from the gradual increase in average DO level in general since 2012. Sampling locations are shown in **Figure 6-3-2**. This indicates that the water quality at KTAC and KTTS has been substantially improved for the past few years.

Table 6-7 Average DO Level at KTAC/KTTS (Unit: mg/l)

Year	KTAC							KTTS
	AC1	AC2	AC3	AC4	AC5	AC6	AC7	KT1
2012	1.7	1.6	2.6	2.1	3.1	2.4	3.7	4.7
2013	2.5	2.7	3.0	3.6	3.5	4.1	4.5	5.7
2014	3.9	3.8	4.1	4.0	4.5	4.4	4.7	5.4

Note: Quarterly monitoring data for 2012 and 2013. Weekly monitoring data for period starting from April 2014.

[1]Dissolved Oxygen (DO) refers to the level of free, non-compound oxygen present in water. It is an important parameter in assessing water quality because of its influence on marine organisms. In general, a higher DO represents a better water quality of the water body.

6.4 Water Quality Sensitive Receivers

6.4.1 According to KTD EIA, the water quality sensitive receivers (WSR) in the Victoria Harbour and its adjacent waters include:

- Kai Tak River / Nullah
- WSD Flushing Water intakes
- Cooling Water Intakes for Kai Tak District Cooling System (KTDCS)
- Typhoon Shelters
- Corals and
- Fish and Culture Zones at nearby water control zone

The water monitoring stations in these water bodies are considered as WSRs.

It is noted that CEDD is carrying out Comprehensive Review on KTD EIA, and there will be changes in KTDCS and its water intakes, however, the review is not yet finalized according to CEDD. As reported in **Section 6.3.7**, CEDD will adopt an Interceptive Pumping Scheme to replace the originally proposed 600 m opening under the former Kai Tak Runway. The existing cooling water intake C29 will be relocated to C29A, and a proposed intake C30 is proposed in KTN as shown in **Figure 6-4-1**.

6.4.2 These WSR is shown in **Figure 6-4-1**. All of these sensitive receivers except Kai Tak River/Nullah are outside the study area, though VT11 and KTDCS are within and in close proximity of TKWTS, and C29A and C30 lie within KTAC and KTN respectively.

6.4.3 As discussed in **Sections 6.3.8** and **6.3.9** above, the water quality of KTN and KTAC have been significantly improved and the sewage from MPSC will not be discharged into KTN and KTAC. It is unlikely that the Project will have any effect on the water quality in KTAC.

6.5 Assessment Methodology

6.5.1 The assessment includes both construction phase and operation phase impacts. The potential water quality impacts due to these phases of the Project will be identified based on the source and nature of effluent generated. Any potential impact, if any, will be assessed.

6.5.2 The construction of the Project would be mainly land-based except for barging of construction material and construction waste. Barging will make use of existing barging facilities being operated by MTR Shatin to Central Link (SCL) Project. MTR informed that the Kai Tak Barging Points have sufficient capacity to handle spoil generated from Government projects, including MPSC. Therefore, the marine environment will not be disturbed as no new marine working platform or reclamation of barging point is required, provided that mitigation measures or good practices as stated in **Section 6.7.1** are followed. It is reasonable to assume that the water quality impact associated with the Project would be caused by on-site construction activities, construction runoff and drainage discharge from the construction site, provided that no discharge is allowed during marine transportation except for permitted dumping. The potential impact from these construction activities was reviewed. Practical water pollution control measures or mitigation proposals would be recommended to ensure that any discharge into the harbour from construction would comply with the WPCO standard.

6.5.3 Water quality impact on operation phase of the Project will also be land-based generated from surface runoff and sewage. As sewage generated from the operation will be discharged into the sewerage system that will be transferred to treatment under the Harbour Area Treatment Scheme (HATS). The potential water quality impact from the land-based operational activities will be reviewed. Practical water pollution control or mitigation proposals were recommended to ensure that any discharge into the harbour from the operational activities would comply with the WPCO standards.

6.6 Identification of Water Quality Impacts

Construction Phase

6.6.1 During construction phase, the marine water activities include marine transportation of construction material, prefabricated items and construction waste material. Other activities will be land based.

Marine Activities

6.6.2 The marine activities would not impose any adverse water quality impact provided that:

- all marine operations shall comply with the current environmental and safety standards, see **Appendix 6A**,
- no discharge into the sea will be allowed during marine transportation,
- any marine dumping will be subject to separate Marine Dumping Permit.

Land Based Construction Activities

6.6.3 The construction of the Project Site will involve the following activities:

- Surface runoff is a potential water quality impact. Prior to commencement of construction, an efficient temporary surface water drainage system shall be designed and constructed to divert surface runoff from upstream catchment away from the site, and surface runoff within the site shall be discharged to the public drainage system, via adequately designed sand/silt removal facilities (such as sand traps, silt traps and sediment basins)
- The general construction works would be primarily land-based but would have the potential to cause water pollution. Various types of construction activities may generate wastewater. These include boring and other geotechnical operations which may involve pumping of groundwater, general cleaning and polishing, wheel washing, dust suppression and utility installation. These types of wastewater other than groundwater from dewatering would contain high concentrations of suspended solids. Impacts could also result from the accumulation of solid and liquid waste such as packaging and construction materials, and sewage effluent from the construction work force involved with the construction. If uncontrolled, these

could lead to deterioration in water quality. Increased nutrient level from contaminated discharges could lead to a number of secondary water quality impacts including localised increase in ammonia and nitrogen concentrations that would stimulate algal growth.

- During a rainstorm, site runoff generated would wash away the soil particles. The runoff is generally characterised by high concentrations of suspended solids. Release of uncontrolled site runoff would increase the SS levels and turbidity in the nearby water environment.
- Windblown dust would be generated from exposed soil surface in the works areas. It is possible that windblown dust would fall directly onto the nearby water bodies when a strong wind occurs. Dispersion of dust within the works areas may increase the SS levels in surface runoff causing a potential impact to the nearby sensitive receivers.

6.6.4 The potential water quality impacts during construction phase of the Project are evaluated as follows:

General Construction Activities

- The effects on water quality from general construction activities are likely to be minimal, provided that site drainage would be well maintained and good construction practices would be observed to ensure that litter, fuels, and solvents are managed, stored and handled properly.
- Based on the Sewerage Manual, Part I, 1995 of the Drainage Services Department (DSD), the sewage production rate for construction workers is estimated at 0.35 m^3 per worker per day. For every 100 construction workers working simultaneously at the construction site, about 35 m^3 of sewage would be generated per day. The sewage should not be allowed to discharge directly into the surrounding water body without treatment. Sufficient chemical toilets should be provided for workers. Temporary sewage tank can be provided by contractor to collect sewage from temporary site toilets and regular clearing of the sewage tank by outsourced contractor can be arranged.

Construction Runoff and Drainage

- Construction runoff and drainage may cause local water quality impacts. Increase in SS arising from the construction site could block the drainage channels and may result in local flooding when heavy rainfall occurs. High concentrations of suspended degradable organic material in marine water could lead to reduction in DO levels in the water column.
- It is important that proper site practice and good site management be followed to prevent runoff with high level of SS from entering the surrounding waters. With the implementation of appropriate measures to control runoff and drainage from the construction site, disturbance of water bodies would be avoided and deterioration in water quality would be minimal. Ground water pumped out of wells, etc for dewatering shall be discharged into storm drains after removal of silt in silt removal facilities. Thus, unacceptable impacts on the water quality are not expected, provided that the recommended measures

described in **Section 6.7.1 – 6.7.10** and ProPECC PN 1/94 in **Appendix 6B** are properly implemented.

<u>Groundwater Seepage during Construction</u>

- There is no substantial earthwork carried out in MPSC site except bulk excavation for hotel basement which will be confined by sheet pile with sufficient penetration below excavation level to provide adequate seepage cut-off. Thus, groundwater contamination is very remote if contaminated groundwater is identified during construction and operation, such impact should be assessed, and also be reduced by mitigation measures discussed in **Section 6.7.4** below.
- De-contamination of this Site have been completed and no contaminated issues are envisaged. However, any discharge / recharge of groundwater generated from this area shall be controlled to avoid any groundwater contamination.
- Most of the foundations are prebored steel H piles found on rock. Preboring will be carried out with temporary casing in soil strata while casing may not be used in rock strata. The fluid used in preboring will be fresh water and there is no groundwater contamination during foundation construction.

Operation Phase

6.6.5 During operation of the Project, all discharged water will be separated into sewer and stormwater system. Rainwater harvesting system shall be adopted for the Project as far as practicable. Rainwater on the top roof which is considered as clean source will be directed to the rainwater harvesting storage tank by gravity. The treatment of harvested rainwater will consist of pre-treatment, filtration and disinfection system. The whole treatment process shall be in compliance with the requirements in Technical Specifications on Grey Water Reuse and Rainwater Harvesting issued by WSD. The use of recycled rainwater including but not be limited to irrigation for the planting area within MPSC site can be regarded as most appropriate usage of recycled rainwater in the development. Only the surface runoff from MPSC may cause water quality impact to the Victoria Harbour as all sewage will be transported to HATS. Any trade effluent discharge is controlled by WPCO and is regulated through WPCO discharge licence about which the wastewater quality should meet TM-DSS before discharging to the communal sewer and then to Stonecutters Island STW for treatment via To Kwa Wan Preliminary Treatment Works (TKWPTW). As explained in **Section 7.5.4**, the average dry weather flow from the Project is 0.046 m^3/sec which is about 1.5% of the capacity of TKWPTW and it is insignificant in Stonecutters Island STW. The impact on TKWPTW and Stonecutters Island STW is insignificant.

6.6.6 The potential water quality impacts during operation phase of the Project are evaluated as follows:

- Normal operation of sports and leisure facilities will generate sewage from spectators which will be discussed in Chapter 7, surface runoff will be discharged to the stormwater drainage system subject to interception of contaminated water. Any contaminated surface water shall be mitigated as stated in **Section 6.7.15**. The stormwater runoff from MPSC will not induce additional flow to the stormwater system as the total runoff will not be increased because the original site is basically impervious. A new stormwater drainage system for MPSC will deliver the stormwater to KTN which is adequately designed and improved to serve Kai Tak Area and effluent from Tolo Harbour Effluent Export Scheme. For the MPSC site of 28.2 ha, peak discharge flow of 1 in 200 year storm based on a rainfall intensity of 100 mm/hr will be 7.8 m^3/sec which is compatible to the Final DIA Report for MPSC (Nov 2009) of 7,500 l/sec, which would not impose hydrological impact to KTN and KTAC.

- The total site coverage and gross floor area of the ancillary/supporting facilities including the hotel, office area for sports-related organization and commercial area are 6,700 m^2 and 89,000 m^2 respectively. They are normal commercial developments not of significant scale that would not impose water quality impact provided that separate sewerage and stormwater systems are properly designed for, with relevant oil interceptors provided.
- The potential water quality impact would be caused by dripping of organics from vehicles in car parking area.
- There will be some level of chemicals/fuels to be stored on site, such as cleaning products, turf maintenance products (fertilizers/pesticides etc.), different type of fuel. Most venues will limit the storage to small essential quantities at any one time and re-stock as necessary. They must be stored in specific and appropriate areas/containers/cabinets within bunded area. Therefore, the risk of accidental spillage is insignificant.
- Routine general cleaning and focused cleaning before and after large scale functions; the potential impacts may be caused by use of detergents in cleaning seats and building facades, and mixing of solids with the stormwater runoff. However, it is not a usual practice as to apply cleansing detergents to cleanse the stadium seats. The general practice is to clean the stadium seats before and after an event or to hose down the washing only on needed basis without using cleansing detergents. Wash water will be either collected for recycling or drained according to the design of the stadium.
- Repair maintenance and renovation works: the potential water quality impact would be caused by mixing of solids with stormwater runoff and possible discharge of liquefied petroleum products for renovation works.
- The maintenance of the turf may involve the application of fertilizers and pesticides which may cause water pollution or groundwater contamination in the case when chemical fertilizers and insecticides are used.

The mitigation measures are discussed in **Section 6.7** below.

6.7 Mitigation Measures for Adverse Environmental Impacts

Construction Phase Impacts

Construction Site Runoff and General Construction Activities

6.7.1 To minimize the potential water quality impacts from construction site runoff and various construction activities, the practices outlined in ProPECC PN 1/94 Construction Site Drainage should be adopted. A copy of the ProPECC PN 1/94 is given in **Appendix 6B**. It is recommended to install perimeter channels in the works areas to intercept runoff from boundary prior to the commencement of any earthwork. To prevent storm runoff from washing across exposed soil surfaces, intercepting channels should be provided. Drainage channels are also required to convey site runoff to sand/silt traps and oil interceptors. Provision of regular cleaning and maintenance can ensure the normal operation of these facilities throughout the construction period. Any practical options for the diversion and realignment of drainage should comply with both engineering and environmental requirements in order to ensure adequate hydraulic capacity of all drains. Minimum distances of 100 m should be maintained between the discharge points of construction site runoff and the existing WSD saltwater intake and EMSD cooling water intake. As no new barging point will be provided and the existing barging facilities being operated by MTR SCL Project will be used, the following good site practices should be continuously be adopted:

- All vessels should be sized so that adequate clearance is maintained between vessels and the seabed in all tide conditions, to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash.
- All hopper barges should be fitted with tight fitting seals to their bottom openings to prevent leakage of material.
- Construction activities should not cause foam, oil, grease, scum, litter or other objectionable matter to be present on the water within the site.
- Loading of barges and hoppers should be controlled to prevent splashing of material into the surrounding water.

Barges or hoppers should not be filled to a level that will cause the overflow of materials or polluted water during loading or transportation.

6.7.2 All wastewater arising from construction site is also subject to the control of WPCO, about which a discharge licence is normally required. However, in this project, all the runoff and wastewater generated from the works areas should be treated so that it satisfies all the standards listed in the TM-DSS. Reuse and recycling of the treated effluent can minimize water consumption and reduce the effluent discharge volume particularly when a concrete batching plant is installed within the site. The beneficial uses of the recycled water may include dust suppression, wheel washing and general cleaning. It is anticipated that the wastewater generated from the works areas would be of small quantity. The Contractor shall follow the effluent monitoring requirements in the discharge license.

6.7.3 The construction programme should be properly planned to minimize soil excavation, if any, in rainy seasons. This prevents soil erosion from exposed soil surfaces. Any exposed soil surfaces should also be properly protected to minimize dust emission. In areas where a large amount of exposed soils exist, earth bunds or sand bags should be provided. Exposed stockpiles should be covered with tarpaulin or impervious sheets at all times. The stockpiles of materials should be placed at locations away from any stream courses so as to avoid releasing materials into the water bodies. Final surfaces of earthworks should be compacted and protected by permanent work. It is suggested that haul roads should be paved with concrete and the temporary access roads protected using crushed stone or gravel, wherever practicable. Wheel washing facilities should be provided at all site exits to ensure that earth, mud and debris would not be carried out of the works areas by vehicles.

6.7.4 Good site practices should be adopted to keep the site dry and tidy, such as clean the rubbish and litter on the construction sites so as to prevent the rubbish and litter from spreading from the site area, provide adequate temporary site drainage and pumping, if necessary, to keep the site dry so as to minimize or completely eliminate groundwater seepage. It is recommended to clean the construction sites on a regular basis.

Sewage from Workforce

6.7.5 The presence of construction workers generates sewage. It is recommended to provide sufficient temporary toilets in the works areas. The toilet facilities should be more than 30 m from any watercourse. A licensed waste collector should be deployed to clean the temporary toilets on a regular basis.

6.7.6 Notices should be posted at conspicuous locations to remind the workers not to discharge any sewage or wastewater into the nearby environment during the construction phase of the Project. Regular environmental audit on the construction site can provide an effective control of any malpractices and can achieve continual improvement of environmental performance on site. It is anticipated that sewage generation during the construction phase of the Project would not cause water pollution problem after undertaking all required measures.

Accidental Spillage of Chemicals

6.7.7 Contractor must register as a chemical waste producer if chemical wastes would be produced from the construction activities. The Waste Disposal Ordinance (Cap 354) and its subsidiary regulations in particular the Waste Disposal (Chemical Waste) (General) Regulation should be observed and complied with for control of chemical wastes.

6.7.8 Any service shop and maintenance facilities should be located on hard standings within a bunded area, and sumps and oil interceptors should be provided. Maintenance of vehicles and equipment involving activities with potential for leakage and spillage should only be undertaken within the areas appropriately equipped to control these discharges.

6.7.9 Relevant mitigation measures for construction phase as stated in **Sections 6.7.1 – 6.7.8** shall apply to repair, maintenance and renovation works.

6.7.10 As explained in **Section 6.6.6**, the chemicals/fuels to be stores on site will be limited to small essential quantities at any one time. Any chemicals that may be carried away by water shall be contained in specific containers and cabinets under shelter and protected from weather. Any liquid chemical or fuel shall be contained in hard standing bunded area similar to those stated in **Sections 6.7.7 – 6.7.9**. The operator shall ensure that only staff trained in the use and handling the specific chemicals for specific tasks are allowed to handle the relevant chemicals. Therefore, the risk of chemical spillage is negligible.

Operational Phase

6.7.11 To minimise the potential water quality impacts from the Project, separate sewerage and stormwater system will be maintained properly. Oil interceptor in car parking area shall be designed and constructed according to Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers, APP-46 (PNAP 124), copy included in **Appendix 6B**. All manholes, sand traps and oil interceptors shall be cleaned and maintained regularly.

6.7.12 Good practice should be adopted to clean the rubbish and litter on the sites so as to prevent rubbish and litter from spreading from the site area. It is recommended to clean the Project Site on a regular basis. Management guidelines shall be provided to the management team practically to separate and remove solids from discharging stormwater system.

6.7.13 As explained in **Section 6.6.6**, it is not a usual practice to apply cleansing detergents to cleanse stadium seats, no specific mitigation measures are required. As explained in **Section 6.6.6**, the chemical/fuels to be stored on site will be limited to small essential quantities at any one time. Any chemicals that may be carried away by water shall be contained in specific containers and cabinets under shelter and protected from weather. Any liquid chemical or fuel shall be contained in hard standing bounded area. The operator shall ensure that only staff that trained in the use and handling the specific chemicals for specific tasks are allowed to handle the relevant chemicals. Therefore, the risk of chemical spillage is negligible.

6.7.14 In the broad approach, mitigation measures to handle potential water quality impacts caused by residual fertilizers and pesticides may include any of the followings:

- Use artificial turf as the default playing surface, subject to design and operation considerations, practically no mitigation measures are required. Natural turf may be occasionally overlaid during major events, e.g. the Rugby Sevens. The duration of the natural turf on the pitch should be minimized, and no pesticides and fertilizers should be used during the period under normal circumstances.
- If natural turf is used as the default playing surface at the Main Stadium or the Public Sports Ground, the use and application of fertilizers and pesticides will follow normal practices in LCSD’s prevailing code of practice and the Pesticides Ordinance (Cap. 133). An intercepting system should be developed for storage of surface water for reuse and a Stormwater Re-use Management Plan should be prepared and implemented, so as to ensure no residual fertilizers and pesticides from the turf surface run-off is discharged.
- Details of the intercepting system and the Stormwater Re-use Management Plan are discussed in the subsequent sections.

Option for water with residual fertilizers and pesticides

6.7.15 Mitigation measures to handle water with residual fertilizers and pesticides are discussed as follows:

- Application of pesticides is neither part of daily routine nor a regular maintenance practice on turf management. It is important only when it is specifically against a particular pest or disease which happens only occasionally on seasonal basis or incident basis. The Leisure and Cultural Services Department (LCSD) has strict control on the use of chemicals according to the prevailing code of practice. The list of pesticides that can be used is based on the registered list of the Pesticide Registration and Control under Agriculture, Fisheries and Conservation Department (AFCD). The stadium management is very strict on the choice of chemicals and the application rate as over dosage of chemicals or their residual effect on the field will be harmful to the fine root system of the turf species and can impact on the appearance of the play field. Application of chemicals, if necessary, will be confined to the approved list and the dosage as well as the frequency and intensity should be well justified according to genuine operational needs. The LCSD has issued horticultural guidelines governing the use of chemicals on pests and disease control, safe use of pesticides as well as storage and handling, application. The subject guidelines have been enforced in all parks and gardens managed by the LCSD which includes the Hong Kong Stadium on turf management. The future management of the MPSC should follow Pesticide Ordinance (Cap 133), Pesticide Regulations (Cap 133A), A Guide to Labeling of Pesticides, and Safety Guidelines for Storage of Pesticides issued by AFCD and the LCSD horticultural guidelines on use of turf management and consult AFCD on pesticides used.
- Fertilizers which are commonly used on turf maintenance are basically slow release. Excessive application or over concentration of fertilizers will burn up the fine root system of the turf species whereas quick release fertilizers will induce rapid runoff and mean wastage. As the fine root system of the turf species is very sensitive about the dosage and type of fertilizers, the application is therefore well controlled according to genuine operational need and should not be too frequent and over applied. Depending on actual needs, application will usually be done once biweekly.
- In order to minimize water quality impact due to deposited pesticides and residual fertilizers on the turf, the dosage of pesticides and fertilizers shall be controlled to limit any residual dosage to less than 10%. Based on irrigation experience from Hong Kong Stadium, the water use for watering the pitch is about 40.5 m^3 in wet season. It is reasonably conservative to assume that any residual fertilizers and washable deposited pesticides will be rinsed away through five cycles of watering, or equivalent raining. Therefore, the 250 m^3 storage water tank is adequate to intercept most of the residual fertilizers and washable deposited pesticides. Volume estimation is included in **Appendix 6C**. In order to ensure a fail-safe system, a second standby tank of 250 m^3 is provided to intercept any traces of residual fertilizer and washable deposited pesticides. The content in these two tanks will be recycled for irrigation. Under normal operation, the residual fertilizer and washable deposited

pesticides are recycled through the first storage tank while any trace chemicals, if any, will also be recycled through the second storage tank. Practically, no residual fertilizer and washable deposited pesticides will be discharged to the stormwater system.

- To cater for incidental rainstorms, a third holding tank of 250 m^3 is provided so that the total capacity of these three tanks will be able to store rainwater collected from a Black Rainstorm Warning, i.e. 70 mm for one hour. Volume estimation is included in **Appendix 6C**. The **Figure 6-7-1** shows the schematic diagram of the proposed system with three water storage/holding tanks.
- According to Section 7.5.2(b) of Stormwater Drainage Manual, DSD (2013), the surface runoff coefficient, c, of flat grassland on sandy soil ranges from 0.05 to 0.15. Assuming c = 0.10, about 10% of the runoff will be discharged into the stormwater drains and about 90% of the surface water will be passed into the sand layer underneath the turf. Out of the 90% underground water, about 85% will be collected by porous drain and 5% are allowed to permeate into the underneath soil strata through a geotextile.
- Thus, the 5% of surface runoff that permeates into ground will carry 0.5% of the chemicals. As shown on the **Figure 6-7-2**, about 13% of the percolated surface water from the Main Stadium will permeate to Victoria Harbour. According to available ground investigation information, the top 10mm soil strata in Kai Tak area are fill composed of compacted silty sand or silty coarse sand. Assuming permeability coefficient K = 10^{-5} m/sec, after Bowles (1988), see **Table 6-8**, the time for seepage water from the Main Stadium football pitch to reach Victoria Harbour is over 10 years. Thus, the 0.5% x 13% = 0.065% chemicals from the Main Stadium may have been absorbed or assimilated by microorganisms in the soil strata. There is practically no chance for the chemicals to reach Victoria Harbour through a natural sand filter of over 100 m long. The seepage flow and flow estimation based on Darcy's Law is summarized in **Figure 6-7-3**. As shown in **Figure 6-7-2**, the seepage path from the Main Stadium to Victoria Harbour is the shortest, other seepage paths are too long to be considered. Similarly, the 5% of surface runoff that permeates into ground will carry 0.5% of the chemicals and most part of the seepage flow from the PSG is surrounded by buildings and Kai Tak Tunnel. Practically, the seepage from PSG will not reach Victoria Harbour or Kai Tak nullah. Furthermore, the PSG seepage is screened by tunnels and building foundation.
- In order to ensure effective operation of the intercepting system, the storage tanks shall be emptied prior to application of fertilizers and pesticides. In general, the intercepted surface water may be recycled by irrigation into the football pitch.
- With mitigation measures described in **Section 6.7**, no significant adverse impact during construction and operation is imposed on the water quality. As The Project Site is in close proximity to Victoria Harbour, which is a sensitive water control zone, the intercepting system is proposed as a precautionary measure to minimize water quality impact.

Table 6-8 Permeability Coefficient

10^{0}	10^{-2}	10^{-5}	10^{-9}	10^{-11}
	Clean gravel GW, GP	Clean gravel and sand mixtures GW, GP SW, SP GM	Sand-silt mixtures SM, SL, SC	Clays

Extract from Table 2-3 Foundation Analysis and Design Fourth Edition, Joseph E. Bowles (1988)

6.7.16 The system of collection and disposal of surface runoff is summarized in the Flow Chart as shown in **Figure 6-7-4**. In order to ensure a fail-safe system, a Stormwater Re-use Management Plan shall be prepared by the operator to ensure that no adverse water quality impact arising from the residual fertilizers and pesticides in the surface run-off from the turf. The proposed content of this Stormwater Re-use Management Plan is included in **Appendix 6D**. This Stormwater Re-use Management Plan shall include the following key elements:

- Healthy use of fertilizers and pesticides, and safe operation of the chemical recycling and disposal.
- Operation and maintenance of water storage/holding tanks.
- Frequency of testing and sampling, and appropriate testing parameters of the residual fertilizer and washable deposited pesticides.
- Action and Limit levels.
- Emergency measures.

In order to encourage healthy use of fertilizers and pesticides, and safe operation of the chemical recycling and disposal, the Stormwater Re-use Management Plan is extended to control the application of fertilizer and pesticide with detailed operation control requirements of the intercepting system so that the application of fertilizer and pesticide are properly controlled and implemented in order to protect the Victoria Harbour WCZ. Time of application of fertilizer and pesticide is essential. Normally, application of fertilizer and pesticide during or right before heavy rainfall is prohibited. In addition, use of more specific, systemic and biodegradable pesticide in low dosage is more preferred. All these may form part of the integrated fertilizer and pesticide management programme to minimize the water quality impact.

6.8 Cumulative Impacts

6.8.1 The assessment of potential cumulative impacts due to related and possibly concurrent project activities and water pollution sources within the assessment area reveals no significant cumulative impact considering both marine based and land based related projects.

6.8.2 The identified relevant water and marine based projects and land based projects are listed in **Table 6-9**.

Table 6-9 Relevant Marine Based and Land Based Projects Related to Water Quality

Project	Project Proponent	Construction Programme	Major Works
Central Kowloon Route (CKR)	Highways Department (HyD)	2017-2022	Temporary reclamation and dredging
Interception and Pumping Scheme	Civil Engineering and Development Department (CEDD)	2017-2020	Additional intake openings
Cross Bay Link (CBL)	CEDD	May 2017 to August 2018	Dredging and filling
Kai Tak River Improvement Works	DSD	2012-2018	Reconstruction and rehabilitation of KTN in stages from Po Kong Village Road to KTAC
KTD	CEDD	2013-2023	Comprehensive development of KT area covering about 328ha at To Kwa Wan, Ma Tau Kok, Kowloon Bay, Kwun Tong and Cha Kwo Ling. It also covers Kowloon Bay and Kwun Tong Typhoon Shelter
Shatin Central Link	MTRC	2010-2019	Tai Wai to Hung Hom section covering Kai Tak and To Kwa Wan Stations and tunnels between these stations.

6.9 Residual Impacts

6.9.1 Residual impacts are considered as net impact after practical implementation of mitigation measures of the proposed project considering the background environmental conditions, and impacts from other relevant, existing, committed and planned projects. As the sewage are transported to Stonecutters Island STW and any contaminated surface runoff are mitigated prior to discharge into the stormwater system, only qualitative assessment of residual impact during construction and operation of MPSC is carried out and quantitative assessment is considered not necessary.

6.9.2 No significant adverse residual impact during construction and operation is envisaged provided that the mitigated measures described in **Section 6.7** are implemented.

6.9.3 The water quality residual impacts from MPSC are insignificant to public health, risk of life, local welfare and environmental resources of the concerned water body. With the implementation of mitigation measures, the residual contaminants in the surface runoff is expected to be insignificant, hence, it is unlikely to cause adverse water quality impact on the nearby water quality sensitive receivers.

6.10 Conclusion

6.10.1 Potential water pollution sources from construction and operation of MPSC have been identified including construction runoff, sewage, possible contamination due to oil and grease, use of fertilizers, pesticides and waste construction materials. Sewage generated during construction and operation will be disposed off-site ultimately to Stonecutters Island STW. Other sources of polluted water will be intercepted for reuse and chemical waste is prohibited from discharging into stormwater system. It can be concluded that there is no significant water quality impact to the sensitive receivers provide that the mitigation measures are implemented during construction and operation phases.

6.10.2 As mitigation measures are required, regular site audit should be carried out to ensure the effectiveness of the mitigation measures.

6.11 Recommendation

6.11.1 In the case when marine transportation is adopted during construction, all marine operations shall comply with the current environmental and safety standards, no discharge into the sea is allowed; and any marine dumping will be subjected to separate Marine Dumping Permit.

6.11.2 All land based construction shall follow ProPECC PN1/94.

6.11.3 The sewerage and stormwater system shall be designed and constructed to separate the sewage and uncontaminated surface runoff completely. Provisions shall be made to collect the contaminated surface runoff such as the use of interception and oil and petrol interceptor.

6.11.4 The Operator shall keep the Project Site in a well maintained and clean condition in order to avoid unexpected discharge of contaminated surface runoff into Victoria Harbour.

6.11.5 The operator shall ensure that cleansing detergents are not used for washing the spectator seats and shall encourage recycling the stormwater for irrigation or flushing use. In the case when natural turf is adopted in the MPSC, the operator shall consider using organic fertilizers and biological pesticides, and provide intercepting system and storage tanks to hold the contaminated surface water for recycling, irrigation or proper discharge if the water quality justifies. The operator shall prepare a Stormwater Re-use Management Plan that includes the management of fertilizers and pesticides following the Pesticide Ordinance, LCSD and AFCD guidelines, safe and proper use and handling of fertilizers and pesticides, the reuse of surface runoff and monitoring and audit requirements. As the management plan would include the use of fertilizers and pesticides, the operator shall consult AFCD and LCSD in preparation of the management plan. The management plan shall include the management and operation of the intercepting system, stating that the storage tanks should be emptied prior to application of pesticides and fertilizers.

7 SEWERAGE AND SEWAGE TREATMENT IMPLICATIONS

7.1 Introduction

7.1.1 This Sewerage and Sewage Treatment Implications (S&STI) is prepared according to Section 3.4.7 and Appendix D2 of the EIA Study Brief No. ESB-274/2014 which specify the requirements for S&STI. The sewage and sewerage assessment follows the criteria and guidelines for evaluating and assessing impacts on the public sewerage, sewage treatment and disposal facilities as stated in section 6.5 in Annex 14 of the Technical Memorandum on Environmental Impact Assessment Process.

7.1.2 As the Project is part of Kai Tak Development (KTD), it is necessary to review the approved EIA Report for KTD in relation to this Project and to identify and determine whether an updated S&STI is required.

7.1.3 The Project is located on the west side of Kai Tak North Apron. It is separated by existing Kai Tak Tunnel and the new road D2. The location plan is shown in **Figure 7-1-1**.

7.1.4 The Project consists of the following buildings:

- Main Stadium
- Public Sports Ground, including ancillary areas such as retail area
- Indoor Sports Centre, including ancillary areas such as retail area
- Hotel block, including ancillary areas such as retail area
- Office block, including ancillary areas such as retail area

7.1.5 The master layout plan of the Project is shown in **Figure 7-1-2**.

7.2 Sewerage Layout

7.2.1 According to EIA of KTD, the sewerage in KTD is separated into two systems, the eastern sewerage collects sewage from the eastern catchment and discharge into Kwun Tong Preliminary Treatment Works (KTPTW) while the sewage from northwest catchment discharges into To Kwa Wan Preliminary Treatment Works (TKWPTW) as shown in **Figure 7-2-1**. The sewage from the Project is part of the northwest catchment that discharges into TKWPTW and ultimately into Stonecutter Island Sewage Treatment Works via deep tunnels.

7.2.2 The Project is a new development in KTD, a new sewerage system will be designed to suit. Six nos. of separate foul water discharge points FDP1 to FDP6 are proposed by the project team of MPSC and agreed with CEDD to discharge the sewer from the Project into the sewerage system in Kai Tak Development as follows,

- A sewer on the north of Kai Tak Tunnel collecting sewage from FDP1 to FDP4 successively for Public Sports Ground and Indoor Sports Centre then joining a 750mm twin pipe leading to Pumping Station PS2 at the junction of Road L6 and Road D2, hereinafter called Sewer No. 1.

- A 600mm sewer collecting sewage from FDP5 for the Main Stadium and a 300mm sewer collecting sewage from FDP6 for Hotel Block and Office Block, both discharge into a 750mm diameter sewer along Road D2 which subsequently discharges into Pumping Station NPS, hereinafter called Sewer No. 2.

CEDD is responsible for implementation of Sewer No. 1 and Sewer No. 2.

7.2.3 The sewerage layout plan is shown in **Figure 7-2-2**.

7.3 Population and Employment Data

7.3.1 The design parameters of the Project are shown in **Table 7-1**.

Table 7-1 Design Parameters of the Project

Use	GFA (m^2)	No. of Hotel Rooms	No. of Seats in Sports Facilities
Main Stadium	-	-	50,000
Public Sports Ground	-	-	7,000
Indoor Sports Centre	-	-	5,400
Hotel Area	16,000	300	-
Office Area	16,000	-	-
Retail Area	57,000	-	-

7.3.2 The population and employment data within the Project are based on employment figures provided by LCSD (prepared in 2014) and HAB (prepared in 2015).

7.3.3 The population in the Project are classified in seven types as follow:

- Spectators in Main Stadium, Public Sports Ground and Indoor Sports Centre
- Permanent employees in Main Stadium, Public Sports Ground and Indoor Sports Centre
- Temporary employees in Main Stadium, Public Sports Ground and Indoor Sports Centre
- Residents in Hotel Area
- Employees in Hotel Area
- Employees in Office Area and Retail Area
- Visitors in Retail Area

7.3.4 The employment figure for Main Stadium in the Project is pro-rated based on the event of Hong Kong Sevens 2014 in Hong Kong Stadium, as advised by LCSD in 2014. There were 21 permanent employees working in Hong Kong Stadium, with capacity of 40,000 seats. Therefore, the proposed rate for the Main Stadium is 21/40,000 for permanent employee. Based on past statistics, about 4,100 temporary employees worked in Hong Kong Stadium, with capacity of 40,000 seats, during the period when Hong Kong Sevens 2014 was held with breakdown as shown in **Appendix 7.1**. Therefore, the rate of 4,100/40,000 for temporary employee working in the Main Stadium is assumed.

7.3.5 The employment figures for Public Sports Ground and Indoor Sports Centre in the Project are estimated by HAB in 2015, based on the employment figures of Tseung Kwan O Sports Ground and Queen Elizabeth Stadium respectively. According to 2015 employment figures of Tseung Kwan O Sports Ground with 5,000 spectators, the permanent and temporary employees are 30 and 250 respectively. Applying these ratios to Public Sports Ground, the permanent and temporary employees will be 40 (7,000 x 30/5,000, round off to the nearest 5) and 350 (7,000 x 250/5,000) respectively. Based on 2015 employment figures of Queen Elizabeth Stadium with 3,500 spectators, the permanent and temporary employees are 35 and 36 respectively. Applying these ratios to the Indoor Sports Centre, the permanent and temporary employees will be 55 (5,400 x 35/3,500, round off to the nearest 5) and 55 (5,400 x 36/3,500, round off to the nearest 5) respectively.

7.3.6 The total population of Retail Area in the Project (including employee and visitor) is estimated based on the GFA of Retail Area in the Project, which is 57,000 m^2. According to Building (Standards of Sanitary Fitments, Plumbing, Drainage works and Latrines) Regulation 5. (5)(a), the total number of persons in any building shall be determined at the rate of one person for every 9m^2 of usable floor area (UFA), i.e. 9 m^2 UFA/person. Assuming normal commercial development with floor area efficiency of 70%, i.e. 1 sq m gross floor area (GFA) is equivalent to 0.7 sq m UFA, the total number of persons in any building shall be determined at the rate of one person for every 13 m^2, i.e. 13 m^2 GFA/person (≈ 9 m^2 UFA/70%). Therefore, the total population of Retail Area in the Project (including employee and visitor) is estimated based on about 4,385 (≈ 57,000/13).

7.3.7 The population of employee in Retail Area in the Project is estimated based on the GFA of Retail Area in the Project, which is 57,000 m^2. Assuming 1 worker/25 m^2 GFA, the population of employee in Retail Area in the Project is 2,280 (= 57,000/25). This assumption is based on the layout and size of individual shops while the total population is governed by the development density. Therefore, the population of visitor in Retail Area in the Project would be 2,105 (= 4,385 – 2,280). Noting that the ratio of employees and visitors may change with different layout and nature of the Retail Area, but the total population remains constant.

7.3.8 The estimated population of the Project is summarized in **Table 7-2**.

Table 7-2 Population Estimation of the Project

Use	Types of Population	Quantities			Rate			Estimated Population	Remarks
		No. of seats in sports facility	GFA (m^2)	No. of Hotel Rooms	Sports facility	Office Area & Retail Area	Hotel Area		
Main Stadium	Spectator	50,000	-	-	-	-	-	50,000	-
	Permanent employee (1)		-	-	21/ 40,000	-	-	30	Estimated by the employment figures of Hong Kong Stadium
	Temporary employee (1)		-	-	4,100/ 40,000	-	-	5,125	
Public Sports Ground	Spectator	7,000	-	-	-	-	-	7,000	-
	Permanent employee (1)		-	-	30/ 5,000	-	-	40	Estimated by HAB in 2015, based on the employment figures of Tseung Kwan O Sports Ground
	Temporary employee (1)		-	-	250/ 5,000	-	-	350	
Indoor Sports Centre	Spectator	5,400	-	-	-	-	-	5,400	-
	Permanent employee (1)		-	-	35/ 3,500	-	-	55	Estimated by HAB in 2015, based on the employment figures of Queen Elizabeth Stadium
	Temporary employee (1)		-	-	36/ 3,500	-	-	55	
Hotel Area	Resident	-	-	300	-	-	2 x 80%	480	Assume 2 people/room with 80% occupancy
	Employee	-			-	-	1	300	Assume 1 worker/ room
Office Block	Employee	-	16,000	-	-	1/20	-	800	Assume 1 worker/ $20m^2$ GFA
Retail Area	Employee	-	57,000	-	-	1/25	-	2,280	Assume 1 worker/ $25m^2$ GFA
	Visitor	-		-	-	-	-	2,105	(57,000/13 – 2,280)
							TOTAL	**74,020**	-

Note: (1) The estimated population is rounded up to the nearest 5 unit.

7.4 Sewage Flow Estimation

7.4.1 As described in **Section 7.3.3**, there are seven types of population in the Project. The unit flow factors are estimated as follow:

<u>Spectators in Main Stadium, Public Sports Ground and Indoor Sports Centre</u>

- Unit flow factor of spectator in Main Stadium, Public Sports Ground and Indoor Sports Centre: According to the Appendix III of the EPD Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning (GESF) (2005), the average daily flushing water consumption is 0.100 m^3/person/day based on total land usual residents of 6.592 million as at mid-2002. Assuming the average hours of spectators in the sports facility is 3 hr/day and taking into account traveling time from home to sports facility, around 4 hr/day of a spectator in average is sports facility related. If the average waking hours of spectators is 16 hr/day, the percentage of sports facility related waking hours is 4/16 x 100 = 25%. Therefore, flushing water consumption of spectators in the sports facilities equals 0.025 m^3/person/day (= 0.100 x 0.25).
- With 15% additional allowance for fresh water basin and cleaning flows and 10% for miscellaneous use for meals, the average sports facility-related water consumption of every spectator equals 0.0316 m^3/person/day approx. (= 0.025 x 1.15 x 1.1)
- Allowing for infiltration, the recommended unit flow factor of spectators for Main Stadium, Public Sports Ground and Indoor Sports Centre is 0.032 m^3/person/day.

<u>Permanent Employees in Main Stadium, Public Sports Ground and Indoor Sports Centre</u>

- Unit flow factor of permanent employee in Main Stadium, Public Sports Ground and Indoor Sports Centre: According to Table T-2 of GESF (2005) from EPD, the unit flow factor of permanent employee in Main Stadium, Public Sports Ground and Indoor Sports Centre is 0.280 m^3/person/day, which is the sum of the unit flow factor of employee, 0.080 m^3/person/day and the unit flow factor of activities, J11 Community, Social & Personal Services / Planning for Future, 0.200 m^3/person/day.

<u>Temporary Employees in Main Stadium, Public Sports Ground and Indoor Sports Centre</u>

- Unit flow factor of temporary employee in Main Stadium, Public Sports Ground and Indoor Sports Centre: According to the Appendix III of GESF (2005) from EPD, the average daily flushing water consumption is 0.100 m^3/person/day based on a total land usual residents of 6.592 million as at mid- 2002, Assuming the average working hours of temporary employee is 8 hr/day and the average waking hour of temporary employees is 16. Therefore, unit flushing water consumption of temporary employee in the sports facilities equals 0.05m^3/person/day. (=0.100 x 8/16)
- With 15% additional allowance for fresh water basin and cleaning flows and 10% for miscellaneous use for meals, the average sports facility-related water consumption of every temporary employee is approx. 0.0633 m^3/person/day (= 0.05 x 1.15 x 1.1).

- Allowing for infiltration, the recommended unit flow factor of temporary employees for Main Stadium, Public Sports Ground and Indoor Sports Centre is 0.064 m^3/person/day.

Residents in Hotel Area

- Unit flow factor of resident in Hotel Block: According to Table T-2 of GESF (2005) from EPD, the unit flow factor of resident in Hotel Block is 0.370 m^3/person/day assuming R3 Private development

Employees in Hotel Area

- Unit flow factor of employee in Hotel Block: According to Table T-2 of GESF (2005) from EPD, the unit flow factor of employee in Hotel Block is 1.580 m^3/person/day, which is the sum of the unit flow factor of employee, 0.080 m^3/person/day and the unit flow factor of activities, J10 Restaurants & Hotels / Planning for Future, 1.500 m^3/person/day.

Employees in Office Area and Retail Area

- Unit flow factor of employee in Office Block and Retail Block: According to Table T-2 of GESF (2005) from EPD, the unit flow factor of employee in Office Area and Retail Area is 0.280 m^3/person/day, which is the sum of the unit flow factor of employee, 0.080 m^3/person/day and the unit flow factor of activities, J4 Wholesale & Retail / Planning for Future, 0.200 m^3/person/day.

Visitors in Retail Area

- Unit flow factor of visitor in Retail Area: According to the Appendix III of GESF (2005) from EPD, with a total land usual residents of 6.592 million as at mid-2002, the average daily flushing water consumption is 0.100 m^3/person/day. Assuming the average hours of visitors in the Retail Area is 1 hr/day and taking into account traveling time from home to Retail Area in the Project, around 2 hr/day of a visitor in average is Retail Area related. If the average waking hours of visitors is 16 hr/day, the percentage of Retail Area related waking hours is 2/16 x 100 = 12.5%. Therefore, flushing water consumption of visitors in Retail Area is 0.0125 m^3/person/day (=0.100 x 0.125).
- With 15% additional allowance for fresh water basin and cleaning flows and 10% for miscellaneous use for meals, the average Retail Area-related water consumption of every visitor is approx. 0.0158 m^3/person/day (= 0.0125 x 1.15 x 1.1)
- Allowing for infiltration, the recommended unit flow factor of visitors for Retail Area in the Project is 0.016 m^3/person/day.
- The unit flow factors adopted in the sewage flow estimation for the Project are summarized in **Table 7-3**.

Table 7-3 Unit Flow Factors Adopted for the Project

Use	Unit (per)	Unit Flow Factors (m^3/person/day)
Main Stadium	Spectator	0.032
	Permanent employee	0.280
	Temporary employee	0.064
Public Sports Ground	Spectator	0.032
	Permanent employee	0.280
	Temporary employee	0.064
Indoor Sports Centre	Spectator	0.032
	Permanent employee	0.280
	Temporary employee	0.064
Hotel Area	Resident	0.370
	Employee	1.580
Office Area	Employee	0.280
Retail Area	Employee	0.280
	Visitor	0.016

7.4.2 Based on the population estimated in **Table 7-2** and the unit flow factor described in **Section 7.4.1**, the estimated sewage flow in the Project is about 3,933.4 m^3/day with breakdown as shown in **Table 7-4**.

Table 7-4 Estimated Sewage Flow from the Project

Use	Types of Population	Estimated Population	Unit Flow Factor (m^3/person/day)	Estimated Flow (m^3/day)
Main Stadium	Spectator	50,000	0.032	1,600.00
	Permanent employee	30	0.280	8.40
	Temporary employee	5,125	0.064	328.00
Public Sports Ground	Spectator	7,000	0.032	224.00
	Permanent employee	40	0.280	11.20
	Temporary employee	350	0.064	22.40
Indoor Sports Centre	Spectator	5,400	0.032	172.80
	Permanent employee	55	0.280	15.40
	Temporary employee	55	0.064	3.52
Hotel Area	Resident	480	0.370	177.60
	Employee	300	1.580	474.00
Office Area	Employee	800	0.280	224.00
Retail Area	Employee	2,280	0.280	638.40
	Visitor	2,105	0.016	33.68
			TOTAL (m^3/day)	**3,933.40**

7.4.3 The estimated average dry weather flow (DWF) of 3,933.40 m^3/day or 0.046 m^3/sec is comparable with the flow of 0.083 m^3/sec reported in Table 4.18 Projected Peak Flow for Year 2031 and Ultimate Scenario in the Infrastructure Review Report (Final) Rev 1 (IRR), see **Appendix 7.2**. Noting that the value reported in IRR includes peaking factor that ranges from 2.48 to 2.50 as shown in IRR Table 4.17, see **Appendix 7.2(i)**. Back analysis shows that the DWF from MPSC cited in IRR is 0.033 m^3/sec, see **Appendix 7.2(ii)**. Comparing the two flow rates, the increase is about 39%. This increase is caused by increase in seating capacity of MPSC since IRR.

7.4.4 The population and sewage flow is expected to be steady upon commissioning of this Project. The estimated projected flow after ten years should be the same.

7.5 Preliminary Sewerage Design

7.5.1 The pipe roughness is specified as an equivalent sand roughness (ks) used by the Colebrook-White equation. For the hydraulic assessment of the new sewers inside KTD, the roughness coefficient to be used in this Preliminary Sewerage Design is 0.6 mm for vitrified clay pipes and 1.5 mm for precast concrete pipes based on CEDD's "Kai Tak Development - Stage 4 Infrastructure at Former North Apron Area Sewerage Design", Contract No. KL/2012/03 which is confirmed in **Appendix 7.4**.

7.5.2 Preliminary estimation of Sewer No. 1 shows that the sewer line is adequate to collect sewage from the Public Sports Ground and Indoor Sports Centre to the PS2, including catchment for the 750 mm twin pipe. Preliminary sewerage calculation is included in **Appendix 7.3**.

7.5.3 Preliminary estimation of Sewer No. 2 shows that the sewer line is adequate to collect sewage from the Main Stadium, Hotel and Office Block to NPS, including the rising mains from PS2 and PS1. Preliminary sewerage calculation is included in **Appendix 7.3**.

7.5.4 The additional sewage from the Project is 3,933.40 m^3/day, or 0.046 m^3/sec will be discharged into TKWPTW and subsequently delivered to Stonecutter Island Sewage Treatment Works via deep tunnels. According to latest estimated figures from IRR, the estimated average dry weather flow (ADWF) for KTD and To Kwa Wan Catchment Area to TKWPTW in both Year 2031 and the ultimate scenario are summarized in **Table 7-5**. The projected peak flow for Year 2031 and ultimate scenario, excluding and including MPSC are summarized in **Table 7-6**, the peaking factor (PF) is based on EPD guideline for contributing population equals calculated average flow divided by 0.27. It gives contributing population of 14,568 that gives PF = 3.5. The projected peak flow from MPSC, based on estimated ADWF of 3,933.40 m^3/sec gives peak flow of 13,767 m^3/day or 0.159 m^3/sec. The total projected peak flow including MPSC at ultimate scenario is 8.71 m^3/sec.

Table 7-5 Average Dry Weather Flows for Year 2031 and Ultimate Scenarios

To Kwa Wan Preliminary Treatment Works	**Projected ADWF (m^3/day)**		**Projected ADWF (Kwun Tong Catchment/To Kwa Wan Catchment+10% Allowance (m^3/day))**	
	Year 2031	Ultimate	Year 2031	Ultimate
Kai Tak Development	27,478	27,478	27,478	27,478
To Kwa Wan Catchment	227,374	238,743	250,111	262,617
Total	254,852	266,221	277,589	290,095

Table 7-6 Projected Peak Flows for Year 2031 and Ultimate Scenarios in To Kwa Wan Preliminary Treatment Works, in m³/sec

	Year 2031	**Ultimate**	**Year 2031**	**Ultimate**	**Remark**
Kai Tak Development	0.79	0.79	0.79	0.79	Peak flow based on IRR
To Kwa Wan Catchments	6.58	6.90	7.19	7.53	
MTR – SCL	0.02	0.02	0.02	0.02	
DWFI (NPS)	0.21	0.21	0.21	0.21	
Total, excluding MPSC	**7.60**	**7.92**	**8.21**	**8.55**	
MPSC	0.16	0.16	0.16	0.16	PF=3.5
Total, including MPSC	**7.76**	**8.08**	**8.37**	**8.71**	

According to IRR, the current design capacity of TKWPTW is 9.32 m^3/sec, there is no adverse impact to TKWPTW as the projected flow is still less than the capacity of TKWPTW. The sewerage impact to Stonecutter Island STW is insignificant.

7.5.5 There is no significant sewerage impact because the sewerage system in the whole KTD including the Project are newly planned, designed and constructed at about the same time. The sewer line connecting MPSC to this sewerage system are relatively short that discharged into pumping stations.

7.6 Conclusion

7.6.1 Based on the above review, no adverse sewerage and sewage impact caused by the Project is anticipated.

7.6.2 No further detailed assessment or Info Work Modelling is required.

8 WASTE MANAGEMENT IMPLICATIONS

8.1 Introduction

8.1.1 This Waste Management Implications (WMI) is according to the Section 3.4.8 and Appendix E1 of EIA Study Brief which specify the requirements of WMI.

8.1.2 The Project is located on the North of Old Kai Tak Runway. The site is dissected by existing Kai Tak Tunnel and the new Road D2. The location plan is shown in **Figure 8-1-1**. the Project consists of the following buildings:

- Main Stadium
- Public Sports Ground, including ancillary areas such as retail area
- Indoor Sports Centre, including ancillary areas such as retail area
- Hotel Block, including ancillary areas such as retail area
- Office Block, including ancillary areas such as retail area

The master layout plan of the Project is shown in **Figure 8-1-2**.

8.1.3 The scope of this study includes identifying the quantity, quality and timing of the waste arising as a result of construction and operational activities of the Project based on the master layout plan is shown in the construction phasing plan, **Figure 2-2** and Project programme as shown in **Appendix 2A**.

8.1.4 This WMI makes references to relevant WMI of the following EIA reports:

- Kai Tak Development (No. AEIAR-130/2009) (KTD EIA)

8.2 Environmental Legislation, Policies, Plans, Standards and Criteria

8.2.1 The criteria and guidelines for assessing waste management implications are set out in Annex 7 and Annex 15 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM), respectively.

8.2.2 The following legislation relates to the handling, treatment and disposal of wastes in the Hong Kong SAR and has been used in assessing potential impacts:

- Waste Disposal Ordinance (Cap. 354)
- Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354C)
- Land (Miscellaneous Provisions) Ordinance (Cap. 28)
- Public Cleansing and Prevention of Nuisances Regulation (Cap. 132BK)
- Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 354N)
- Dumping at Sea Ordinance (Cap. 466)
- Public Dumps, WB TC(W) No. 2/1993
- Management of Dredged/Excavated Sediment, ETWB TC(W) No. 34/2002
- Environmental Management on Construction Sites, ETWB TC(W) 19/2005
- Trip Ticket System for Disposal of Construction and Demolition Materials, DEVB TC(W) No. 6/2010

Waste Management

8.2.3 The Waste Disposal Ordinance (WDO) prohibits the unauthorized disposal of wastes. Construction waste is defined as any substance, matter or thing that is generated from construction work and abandoned, whether or not it has been processed or stockpiled before being abandoned, but does not include any sludge, screenings or matter removed in or generated from any desludging, desilting or dredging works. Under the WDO, wastes can be disposed of only at designated waste disposal facilities.

8.2.4 Under the WDO, the Chemical Waste (General) Regulation (1992) provides regulations for chemical waste control, and administers the possession, storage, collection, transport and disposal of chemical wastes. The Environmental Protection Department (EPD) has also issued a guideline document, the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes (1992), which details how the Contractor should comply with the regulations on chemical wastes.

Dredged Marine Sediment

8.2.5 The Development Bureau Technical Circulation (Works) No. 34/2002 (ETWB TCW No. 34/2002) sets out the procedure for seeking approval to dredge / excavate sediment and the management framework for marine disposal of dredged / excavated sediment. This Technical Circular outlines the requirements to be followed in assessing the classifying the sediment and explains the marine disposal arrangement for the classified material.

Construction and Demolition (C&D) Materials

8.2.6 The current policy related to the disposal of C&D materials is documented in the WB TCW No. 2/93, 'Public Dumps'. All inert C&D materials (or public fills) that are wholly inert, namely public fill, should not be disposed of to landfill, but taken to public filling areas, which usually form part of reclamation schemes. The Land (Miscellaneous Provisions) Ordinance requires that dumping licenses be obtained by individuals or companies who deliver public fill to public filling areas. The Civil Engineering and Development Department (CEDD) issues the licenses under delegated powers from the Director of Lands.

8.2.7 Under the Waste Disposal (Charges for Disposal of Construction Waste) Regulation, enacted in January 2006, construction waste delivered to a landfill for disposal must not contain more than 50% by weight of inert material. Construction waste delivered to a sorting facility for disposal must contain more than 50% by weight of inert material, and construction waste delivered to a public fill reception facility for disposal must consist entirely of inert material. In accordance with the DEVB TCW No. 6/2010 "Trip Ticket System for Disposal of Construction and Demolition Materials", for all contracts that are expected to generate inert C&D materials (e.g. soil, broken rock, broken concrete and building debris etc.) requiring disposal from the site, the Project office shall write to the Public Fill Committee (PFC) through the Secretary of the PFC to request a designated disposal ground for incorporation into the tender documents. For contracts where the estimated amount of non-inert C&D materials (C&D waste) (e.g. timber formwork, other construction debris, packaging waste, etc.) requiring disposal at landfill facilities equal to or exceed $50m^3$, the Project office shall seek confirmation from the Director of Environmental Protection (DEP) as to whether landfill facilities will be available for disposal of such materials.

The DEP will designate landfill facilities, if available, for the contract. Where the estimated amount of non-inert C&D materials (C&D waste) to be generated from the contract is less than 50m^3, the Project office is not required to apply to DEP for designated landfill facilities which is unlikely for this Project. However, the Project office should still specify in the tender documents appropriate landfill facilities (e.g. Outlying Islands Transfer Facilities managed by the EPD, SENT Landfill at Tseung Kwan O, NENT Landfill at Ta Kwu Ling and WENT Landfill at Nim Wan).

8.2.8 Enhancement measures to enhance the management of construction and demolition material, and to minimize its generation at source include:

- Drawing up a Construction and Demolition Material Management Plan (C&DMMP) at the feasibility study or preliminary design stage to minimize C&D material generation and encourage proper management of such material;
- Vetting of the C&DMMP prior to upgrading of the Project to Category A in the Public Works Programme;
- Providing the contractor with information from the C&DMMP in order to facilitate him in the preparation of the Waste Management Plan (WMP) and to minimize C&D materials generation during construction.

8.2.9 Projects generating C&D materials less than 50,000m^3 or importing fill material less than 50,000m^3 are exempted from the C&DMMP. The ETWB TCW No. 19/2005 “Environmental Management on Construction Sites” includes procedures on waste management requiring contractors to reduce the C&D materials to be disposed of during the course of construction. Under ETWB TCW No. 19/2005, the contractor is required to prepare and implement and Environmental Management Plan (EMP) and the WMP becomes part of the EMP. Besides, DEVB TCW No. 6/2010 “Trip Ticket System for Disposal of Construction and Demolition Materials” promulgates the latest trip ticket system for public works contracts including capital works contracts, term contracts and design and build contracts, where C&D materials including waste generated on site require disposal.

8.3 Assessment Methodology

Construction Impacts

8.3.1 Based on Master Layout Plan, a method statement for construction and construction programme is drafted as shown in **Section 2.6**. The key activities include

- General Preliminaries, such as hoarding access roads, temporary utilities, site office and plant set up.
- Site formation works, involving site levelling, drainage and permanent access road and utilities, and formation of access ramps.
- Foundation, including piled foundations, pre-boring, pile testing, shallow foundation and pile cap construction with excavation and lateral supports.
- Superstructure works.
- Finishes, such as building façade, stadium covers, signage etc.
- Building services and supporting M&E works.

- External works such as hard and soft landscaping, pavement, lighting and road sign and other street furniture.
- General site clearance.

8.3.2 Based on the method statement for construction and the construction programme, a phasing plan is developed as shown in **Figure 2-2**. The types of construction waste and C&D materials will be identified. The quantity, quality and timing of construction waste will be estimated accordingly, taking into consideration of alternative design schemes and construction methods, aiming at minimizing the generation of construction waste.

8.3.3 After considering the opportunities for reducing waste generation and maximizing re-use, the types and quantities of waste required to be disposal of as a consequence shall be estimated and the disposal methods / options of each type of wastes shall be analyzed.

8.3.4 Based on the selected option for disposal of both inert C&D materials (or public fills) and non-inert C&D materials (or C&D waste), some designated landfill site and public filling areas will have to be identified. Preliminary construction traffic routes are proposed taking into consideration of feasible land routes and sea routes by barging and balancing the cut and fill in order to minimize the generation of inert C&D materials (or public fills) and maximize the use of inert C&D materials (or public fills) for other construction works.

8.3.5 The route for construction traffic from the Project Site to the barging point via the existing construction route in KTD prior to construction of Road D2 and D3 is shown in **Figure 8-3-1**. Assuming that Road D2 or D3 will be completed by Year 2021, but without Central Kowloon Route (CKR), this traffic route will not be available during the later stage of the Project construction. The construction route will make use of the alignment of CKR as shown in **Figure 8-3-2**. If CKR alignment is not available, construction traffic has to pass through the Metro Park. It is envisaged that the construction traffic at the later stage of construction will be greatly reduced as all foundation works, earth works and structural works should have been substantially completed. The construction traffic mainly serves the M&E plant delivery, decorative material and disposal of packaging material and other construction wastes. The frequency of using the barging route will be substantially reduced.

8.3.6 The depth of basement excavation is compared with the available ground investigation borelogs in order to assess if sediment removal from excavation is required.

Operation Phase Impacts

8.3.7 Based on the Master Layout Plan, various operational activities will be identified. The major activities that generate waste include:

- Main Stadium: sports events, performance events, food and beverage, cleaning, repair, maintenance and renovation.
- Public Sports Ground: sports events, public activities, food and beverage, cleaning, repair, maintenance and renovation.
- Indoor Sports Centre: sports events, retails activities, training classes, sports

supporting activities, such as food and beverage, cleaning, repair, maintenance and renovation.

- Office block: office activities, food and beverage, cleaning, repair, maintenance and renovation.
- Hotel block: guest accommodation, food and beverage, amenities, retail and hopping facilities, back of house activities, such as laundry, cleaning, repair, maintenance and renovation.
- Transport facilities such as road and carpark cleaning, crowd control activities, repair and maintenance.
- Outdoor activities such as planting, irrigation, cleaning, repair and maintenance.

8.3.8 These wastes generated are classified as domestic and commercial solid waste referred to in Appendix 1 of Monitoring Solid Waste in Hong Kong – Waste Statistics for 2014.

Development Parameters

8.3.9 The development parameters and population of the Project are summarized in **Table 8-1**.

- This GFA schedule is used to develop the population which will be used for assessment of waste for operation phase. The area for assessment of construction waste is further elaborated in **Section 8.4.2**.

Table 8-1 Development Parameters and Population Estimation of the Project

Area	Use	Population			Quantities			Rate			Remarks
		Type	**Estimation**	**Sub-total**	**No. of seats in sports facility**	**GFA (m^2)**	**No. of Hotel Rooms**	**Sports facility**	**Office Area & Retail Area**	**Hotel Area**	
Main Stadium	Sports facilities	Spectator	50,000		50,000	-	-	-	-	-	-
		Permanent employee (1)	30			-	-	21/ 40,000	-	-	Population pro-rated from Hong Kong Stadium
		Temporary employee (1)	5,125			-	-	4,100/ 40,000	-	-	-
		Subtotal		55,155							
Public Sports Ground	Sports facilities	Spectator	7,000		7,000	-	-	-	-	-	-
		Permanent employee (1)	55			-	-	21/ 40,000	-	-	Population pro-rated from Tseung Kwan O
		Temporary employee (1)	475			-	-	4,100/ 40,000	-	-	-
		Subtotal		7,530							
Indoor Sports Centre	Sports facilities	Spectator	5,400		5,400	-	-	-	-	-	-
		Permanent employee (1)	55			-	-	21/ 40,000	-	-	Population pro-rated from Queen Elizabeth Stadium
		Temporary employee (1)	55			-	-	4,100/ 40,000	-	-	-
		Subtotal		5,510							
Hotel Area	Residential	Resident	480		-	-	300	-	-	2 x 80%	Assume 2 people/room with 80% occupancy
		Employee	300		-			-	-	1	Assume 1 worker/ room
		Subtotal		780							
Office Area	Commercial	Employee	800		-	16,000	-	-	1/20	-	Assume 1 worker/ $20m^2$ GFA
		Subtotal		800							
Retail Area	Commercial	Employee	2,280		-	57,000	-	-	1/25	-	Assume 1 worker/ $25m^2$ GFA
		Visitor	2,105		-			-	-	-	(57,000/13 – 2,280)
		Subtotal		4,385							
			TOTAL	74,160							

Note: (1) The estimated population is rounded up to the nearest 5 unit.

8.4 Identification of Key Environmental Impacts

Construction Phase

8.4.1 The construction works of the subject development mainly include site formation, underground utility foundation work, basement construction and superstructure construction. The estimated period for the whole construction is 56 months.

8.4.2 According to preliminary civil and structural engineering design and based on total site area of 283,559 m^2, the estimated quantities of C&D materials generated from this development is 657,519 m^3, including bulking factor of 1.9 for building debris and 1.2 for soil, or 820,719 tonnes with breakdown of waste estimation as shown in **Table 8-2** to **8-5**.

Table 8-2 Breakdown of Covered Area (Building Footprint) in m²

Item	Site Area	Building Footprint (m²)			Remark
		Gross Area	Deduction	Net Area	
1	Main Stadium				
1.1	Stadium	49,084			
1.2	Field Area in Stadium		12,960		Non building area
1.3	Net Area in Stadium			36,124	
2	Public Sport Ground				
2.1	Sport ground	30,459			
2.2	Field Area in Public Sport Ground		11,393		Non building area
2.3	Net Area in Public Sport Ground			19,066	
3	Indoor Sports Centre	34,774		34,774	
4	Hotel	2,188		2,188	
5	Office cum basement				Includes 3,100 m² basement
5.1	Office	3,532		3,532	
5.2	Basement				3100 m²
	Sub-total	120037		95,684	
6	Podium Deck	109,639		109,639	
Total Building Footprint		**229,676**		**205,323**	

Table 8-3 Estimated Quantities of Inert C&D materials

Item	Description	Area (Refer to Table 8-2)	Depth (m)	Percentage Site Coverage (%)	Volume (m^3)	Bulk Factor	Factored Volume (m^3)	Total* (T)
		(a)	(b)	(c)	(d) = (a)*(b)*(c)	(e)	(f) = (d)*(e)	(g) = (f)*1.3
1	Site clearance (including demolition work & RC slab 300mm)	283,559	0.3	100%	85,068	1.9	161,629	210,117
2	Site formation (including open space 400 mm soil)	283,559	0.4	100%	113,424	1.2	136,108	176,941
3	Excavation for building sub-structure (piling + pilecap + trenches)	95,684	2.0	40%	76,547	1.2	91,857	119,414
4	Excavation for podium deck (including piling + utilities)	109,639	1.5	40%	65,783	1.2	78,940	102,622
5	Excavation for sub-structure above pile cap (ave.depth (m))	205,323	1.0	40%	82,129	1.2	98,555	128,122
6	Excavation of Basement	3,100	6.0	100%	18,600	1.2	22,320	29,016
7	Total excavated soil/concrete materials				441,551		**589,409**	**766,231**

*Density = 1,300 kg/m^3

Inert C&D materials include normal excavated soil, rock, sand, demolished concrete rubble, brick, tile, masonry, asphalt, etc.

Table 8-4 Estimated Quantities of Non-inert C&D Materials

Item	Description	CFA (m^2)	Total CFA (m^2)	Tonne/ CFA (T/m^2)	Weight (T)	Volume * (m^3)
		(a)	(b)	(c)	(d) = (b)*(c)	(e) = (d)/0.8
1	Main Stadium		112,093	0.07	7,847	9,808
2	Public sports ground					
2.1	Stadium	22,033				
2.2	Retail	2,968				
2.3	Sub-total		25,001	0.07	1,750	2,188
3	Indoor Sports Arena					
3.1	Sports ground	122,811				
3.2	Retail	48,351				
3.3	Sub-total		171,162	0.18	30,809	38,511
4	Hotel block					
4.1	Hotel	16,837				
4.2	Retail	2,065				
4.3	Sub-total		18,902	0.13	2,457	3,072
5	Office cum Basement	18,780	26,112	0.09	2,350	2,938
6	Retail	7,332				
7	Open Space		160,000	0.01	1,600	2,000
8	Podium deck		109,639	0.07	7,675	9,593
	Total				**54,488**	**68,110**

*Assumed density: 800 kg/m^3

Remarks: Advised by the Quantity Surveyor in Sept 15

Non-inert C&D materials include Timber formwork, other construction debris, packaging waste, etc.

Table 8-5 Estimated Quantities of C&D Materials Generated

Total C&D materials	657,519 m^3		820,719 tonnes	
	(m^3)	% of total volume	(tonnes)	% of total weight
Portion of C&D materials to be reused on site	141,945	21%	184,528	22%
Portion of inert C&D materials (public fill) be disposed offsite	447,464	69%	581,703	71%
Non-inert C&D materials (C&D Waste) to be disposed to Landfill	68,110	10%	54,488	7%

Total volume of C&D Materials	= 589,409 + 68,110	= 657,519	m^3
Total weight of C&D Materials	= 766,231 + 54,488	= 820,719	tonnes

8.4.3 The estimated C&D materials are generated in line with the construction programme as shown in **Table 8-6**.

Table 8-6 Annual Disposal of C&D Materials During Construction

Year	Inert C&D materials (or public fills) (m^3) to be disposed of	Non-inert C&D materials (or C&D waste) (m^3) to be disposed of	Total (m^3)
2018	178,986	-	178,986
2019	178,986	6,811	185,797
2020	44,746	27,244	71,990
2021	35,797	30,650	66,447
2022	8,949	3,405	12,354
Total	447,464	68,110	515,574

8.4.4 The site of the public fill should be identified prior to preparing the Waste Management Plan (WMP). All construction waste should be reused/recycled whenever possible.

8.4.5 The recommended construction waste management strategy is to segregate C&D materials from construction waste. Around 70% of inert C&D materials shall be disposed of at public fill area.

8.4.6 According to the basement layout as shown in **Figure 8-4-1**, the basement formation level is at -1.0 mPD, the bottom of excavation will be -1.5 mPD, allowing for structures below ground, or depth of 6.5 m below existing ground level. According to available ground investigation information as shown in **Figures 8-4-2** and **8-4-3**, the top level of marine deposits at borehole no. BH18, see **Figure 8-4-2**, is 8 m. Therefore, no marine sediments will be excavated. According to BH18, the marine deposits are silty fine to coarse sand which may be used to backfill on site in the case when such soil strata is excavated. However, the chance of encountering marine sediment is very remote as the basement location is on the downstream side of BH18. Though no marine sediment excavation is required, in the case when dredging/excavation of sediment is found required, the Project Proponent is required to observe the requirements of ETWB TC(W) 34/2002 and make submissions to the DASO Authority and Marine Fill committee for consideration prior to starting dredging/excavation if dredging/excavation is found inevitable after exhausting all possible avenues.

General Refuse

8.4.7 Throughout construction, the workforce would generate refuse comprising food scraps, waste paper, empty containers, etc. Escape of such refuse from the site should not be allowed to occur.

8.4.8 Effective collection and removal of site wastes will be required to prevent waste materials being blown around by wind, flushed or leached into the aquatic environment, and to prevent odour nuisance. The work sites may also attract pests and vermin if the waste storage area is not well maintained and cleaned regularly. Disposal of refuse must be at approved waste transfer or disposal facilities. With the implementation of good waste management practices at the site, adverse environmental impacts would not be expected to arise from the storage, handling and transportation of refuse.

Bentonite Slurry

8.4.9 Bentonite slurry may be used, depending on the construction method proposed by the Contractor, during pre-boring of piling works. It was estimated that approximately 3,000 m^3 of used bentonite slurry may require off-site disposal.

Chemical Waste

8.4.10 The maintenance and servicing of construction plant and equipment may possibly generate some chemical wastes, for instance, cleaning fluids, solvents, lubrication oil and fuel. Maintenance of vehicles may also involve the use of a variety of chemicals, oil and lubricants.

8.4.11 Chemical wastes arising during the construction phase may pose environmental, health and safety hazards if not stored and disposed of in an appropriate manner as stipulated in the Waste Disposal (Chemical Waste) (General) Regulations. The potential hazards include:

- Toxic effects on the workforce.
- Adverse impacts on water quality and aquatic biota from spills.
- Fire hazards.

8.4.12 Materials classified as chemical wastes will require special handling and storage arrangements before removal for appropriate treatment at the Chemical Waste Treatment Centre at Tsing Yi. Wherever possible opportunities should be taken to reuse and recycle materials. Mitigation and control requirements for chemical wastes are detailed in **Section 8.5**. Provided that the handling, storage and disposal of chemical wastes are in accordance with these requirements, adverse environmental impacts are not expected to result.

Uncertainties in Prediction & Evaluation of Environmental Impacts

8.4.13 It is difficult to quantify the amount of general refuse and chemical waste that will arise from the construction activities since it would be highly dependent on the Contractor's on-site maintenance requirements and the number of plant utilised. However, as a worst case, it is estimated that a factor of 0.65 kg per worker per day of general refuse will be generated. The total quantity of waste generated would thus be estimated 275.25 kg per day, assuming the size of the work force would be a maximum of 145 resident site staff (RSS) and 280 construction workers. Also it is anticipated that the quantity of chemical waste, such as lubricating oil and solvent produced from plant maintenance, would be small and in the order of a few cubic metres (i.e.< 5 m^3) in total over the construction period. The amount of chemical waste to be generated would be quantified in the site Waste Management Plan to be prepared by the Contractor.

8.4.14 The construction of the proposed works would require the preparation of a Waste Management Plan (WMP) prior to the commencement of the construction works.

Operation Phase

8.4.15 According to Monitoring Solid Waste in Hong Kong, Statistics for Hong Kong 2014 (Solid Waste 2014). Municipal wastes include Domestic Waste, Commercial Waste and Industrial Waste. The solid waste generated from the Project consists of domestic waste and commercial wastes but not industrial waste. All activities referred to in **Section 8.3.7** generate both domestic and commercial wastes.

8.4.16 The quantities of waste are estimated based on Solid Waste 2014, the average waste generation rates are as follow:

- Domestic waste 0.89kg / pax / day
- Commercial waste 0.35kg / pax / day
- Industrial waste 0.11kg / pax / day

8.4.17 These waste generation rates are based on total waste per capita. Only the hotel residence in the Project Site will likely generate 100% of the domestic waste and all occupants not within sports facilities will likely generate 100% of commercial waste. Other occupants will likely generate a portion of the daily waste within the Project Site while the remaining portion will be generated at their normal place of residence or other working areas outside the Project Site. Thus, weighting factors are assigned to various occupants based on the time spent in the Project as follow:

Table 8-7 Waste Generation Rates of Occupants

Item	Area	Personnel	Domestic waste: Avg. waste generation rate (kg/pax/day)	Domestic waste: Weighting factor (%)	Domestic waste: Adjusted rate (kg/pax/day)	Commercial waste: Avg. waste generation rate (kg/pax/day)	Commercial waste: Weighting factor (%)	Commercial waste: Adjusted rate (kg/pax/day)
1	Sports facilities	Spectator	0.89	40%	0.356	0.35	25%	0.088
		Permanent employee		60%	0.534		25%	0.088
		Part time employee		40%	0.356		25%	0.088
2	Hotel	Guests		100%	0.890		100%	0.350
		Permanent employee		60%	0.534		100%	0.350
3	Office	Permanent employee		60%	0.534		100%	0.350
4	Retail	Permanent employee		60%	0.534		100%	0.350
		Customers		40%	0.356		100%	0.350

8.4.18 Based on the estimated population waste generation rates and weighing factors, the total domestic waste generated during full operation and at full house sports events, about 35 tpd of municipal solid waste consisting of 27 tpd of Domestic Solid Waste and 8 tpd Commercial Solid Waste will be generated in the Project Site. The breakdown of solid waste generated is shown in **Table 8-8**.

Table 8-8 Breakdown of Solid Waste Generated during Operation with Full House Sports Events

Item	Area	Population		Waste Generation								
				Domestic			Commercial			Municipal		
		Type	Estimation(1)	Rate(2) (kg/pax/day)	Waste (tpd)	Sub-total (tpd)	Rate(2) (kg/pax/day)	Waste (tpd)	Sub-total (tpd)	Waste (tpd)	Sub-total (tpd)
1	Main Stadium	Spectator	50,000	0.356	17.800		0.0875	4.375		22.175	
		Permanent employee	30	0.534	0.016		0.0875	0.003		0.019	
		Temporary employee	5,125	0.356	1.825		0.0875	0.448		2.273	
						19.641			4.826		24.467
2	Public Sports Ground	Spectator	7,000	0.356	2.492		0.0875	0.613		3.105	
		Permanent employee	55	0.534	0.029		0.0875	0.005		0.034	
		Temporary employee	475	0.356	0.169		0.0875	0.042		0.211	
						2.690			0.659		3.349
3	Indoor Sports Centre	Spectator	5,400	0.356	1.922		0.0875	0.473		2.395	
		Permanent employee	55	0.534	0.029		0.0875	0.005		0.034	
		Temporary employee	55	0.356	0.020		0.0875	0.005		0.024	
						1.971			0.482		2.453
4	Hotel	Spectator	480	0.89	0.427		0.35	0.168		0.595	
		Permanent employee	300	0.534	0.160		0.35	0.105		0.265	
						0.587			0.273		0.860
5	Office Area	Employee	800	0.534	0.427		0.35	0.280		0.707	
						0.427			0.280		0.707
6	Retail Area	Employee	2,280	0.534	1.218		0.35	0.798		2.016	
		visitor	2,105	0.356	0.749		0.35	0.737		1.486	
						1.967			1.535		3.502
	Total					**27.284**			**8.055**		**35.339**

Note: (1) Population estimation from **Table 8-1**.

(2) Waste generation rate from **Table 8-7.**

8.5 Mitigation Measures of Environmental Impacts

Construction Phase

8.5.1 In order to minimize construction waste, precast or prefabrication construction shall be adopted as far as applicable. Inert C&D materials (or public fills) will be used to form the ramps and other filling area as far as civil engineering design permits.

8.5.2 The inert C&D materials that can be reused/recycled on site amounting to 141,945 m^3, see **Table 8-5**, while 447,464m^3 will be transported to the public fill area by barge through trucks to the barging point. Based on the present construction programme and according to CEDD Public Fill Management, reclamation works for Tung Chung New Town Extension (East) can be considered as alternative disposal outlet for the inert C&D materials (or public fills). If the designated public fill area cannot accommodate these materials, the surplus materials may be transported to Mainland China through Tuen Mun Area 38, which is a fill bank for temporary stockpiling of surplus fill materials. The surplus fill will be reused beneficially in reclamation projects in Mainland China. A detailed C&DMMP to minimize C&D material generation and encourage proper management of such material will be submitted to the Public Fill Committee for approval as stated in **Section 8.2.8**.

8.5.3 In order to minimize the non-inert C&D waste material during construction, the Contractor have to prepare a waste management plan to encourage material recycling and waste minimization. The non-inert C&D waste materials shall be disposed of at the landfill. The waste materials amounting to 68,110 m^3, see **Table 8-6**, will be transported by barge similar to inert C&D materials (public fills).

8.5.4 It is assumed a truck's load capacity is approximately 15 tonnes ($\approx$ 8 m^3). The maximum number of trucks per year required are as follow:

- Public fill – 178,986/8 = 22,373 truck load
- Landfill – 6,811/8 = 851 truck load

Total = 23,224 truck load

At peak disposal, the monthly truck load is 1,935 (23,224/12) and the daily truck load is about 75 (1,935/26).

8.5.5 Therefore, the entire construction period of 56 months require 64,447 trucks to dispose 515,574 m^3 C&D materials.

8.5.6 The construction trucks will follow the route as shown in **Figure 8-3-1** or **Figure 8-3-2** to the barging point depending on the schedule of the Project construction as shown in **Appendix 2A** and availability of roads D2 and D3. The hauling of C&D materials shall follow established environmental mitigation measures as stated in Practice Note for Registered Contractors No. 17 "Control of Environmental Nuisance from Construction Sites" issued by the Buildings Department as shown in **Appendix 8A** covering mitigation measures and good construction practice to avoid construction nuisance for haulage within and outside MPSC site, and in public roads and transfer facilities.

General Refuse

8.5.7 General refuse should be stored in enclosed bins or compaction units separate from C&D materials. A reputable waste collector should be employed by the contractor to remove general refuse from the site, separately from C&D materials. An enclosed and covered area is preferred to reduce the occurrence of 'wind blown' light material.

Bentonite Slurry

8.5.8 Bentonite slurries used in construction works should be reconditioned and reused wherever practicable. The storage silos shall be bunded. Position bentonite storage silos and supply lines shall be placed as far as possible from surface water drains, watercourses or sea. The areas where bentonite is mixed shall be surrounded with a small wall or contain them within a bund and ensure it is contained within working area and does not enter any watercourses, surface water drains or sea. Record of the amount of bentonite used shall be kept for checking in case of quantities of bentonite used is larger than anticipated it is possible that these materials are escaping. Residual used bentonite slurry should be disposed of from the site as soon as possible as stipulated in Clause 8.62 of the General Specification for Civil Engineering Works which states "Bentonite slurry which will not be reused shall be disposed of from the Site as soon as possible." Residual used dewatered bentonite slurry should be disposed to a public filling area and liquid bentonite slurry if mixed with inert fill material should be disposed to a public filling area.

Chemical Wastes

8.5.9 If chemical wastes were to be produced at the construction site, the Contractor would be required to register with the EPD as a Chemical Waste Producer, and to follow the guidelines stated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. Good quality containers compatible with the chemical wastes should be used, and incompatible chemicals should be stored separately. Appropriate labels should be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the waste such as explosive, flammable, oxidizing, irritant, toxic, harmful, corrosive, etc. The Contractor shall use a licensed collector to transport the chemical wastes. The licensed collector shall deliver the waste to the Chemical Waste Treatment Centre at Tsing Yi, or other licensed facility, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

Operation Phase

8.5.10 According to **Section 8.4.17**, the daily waste generation after full house sports events is about 35 tpd. This quantities of waste may be further reduced by introduction of the following means:

- Minimize unnecessary waste generation by means of promotion materials, such as wider use of information technology and announcements;
- Encourage spectators to bring along personal containers for food and drinks and
- Sufficient recycling containers will be provided at suitable locations to encourage recycling of such waste aluminium cans, plastics and waste paper.

8.5.11 There will still be solid waste to be disposed of after the said waste reduction measures. The refuse will be disposed at approved waste transfer or disposal facilities by refuse collection vehicle. However, the quantities of solid waste to be disposed of is about 35 tpd. Assuming current waste vehicles that can handle 9 ton per load or 240 to 660 litre plastic bins, the envisaged number of truck load is less than four which will not impose significant impact to both land transportation and waste disposal facilities.

8.5.12 In most cases the solid wastes generated from sports or other events have to be stored and waste collection and transference can only be carried out after the vacation of the sports facilities and crowd dispersal. Adequate solid waste storage facilities shall be provided in the Project Site. For provision of waste storage facilities, reference should be made to Practice Notes for Authorized Persons/Registered Structural Engineers/Registered Geotechnical Engineers APP-35 (PNAP No. 98).

8.6 Recommendation

8.6.1 Precast and prefabricated construction shall be adopted as far as practicable. Reuse and recycle of construction waste should be implemented as much as possible and construction and operation waste should be minimized during the design, construction and operation phases. The Project Proponent should incorporate appropriate contract provisions to arrange propose re-use of excavated materials in their site clearance and site formation and excavation work sites as stated in **Section 8.5.3**.

8.6.2 The Contractor should establish a C&DMMP and submit the Plan to the Public Fill Committee for approval.

8.6.3 Implementation of mitigation measures shall be monitored as specified in the Environmental Monitoring and Audit Manual.

9 LAND CONTAMINATION ASSESSMENT

9.1 Introduction

9.1.1 According to EIA Study Brief Section 3.4.9 and Appendix E2, the environmental impact due to land contamination within and at the vicinity of the Study Area, which is shown in **Figure 9-1,** shall be assessed. As land contamination impact assessments (LCIA) were carried out and reported in previously approved EIA reports, this land contamination impact study has reviewed and updated the previous LCIA. This follows from the requirement of the Study Brief that the approved EIA Report for KTD in relation to this Project shall be reviewed and shall identify and determine whether an updated S&STI is required as the Project is part of Kai Tak Development (KTD).

9.1.2 The Study Area, occupying an area of approximately 28.2 hectares, lies within the footprint of the former Kai Tak Airport and is dissected by Road D2. In accordance with the Study Brief, it will comprise a Main Stadium, a Public Sports Ground, an Indoor Sports Centre and other ancillary and supporting facilities such as car parking spaces, hotel, office area for sports-related organizations and a commercial area.

9.1.3 This land contamination impact study reviews relevant findings of LCIA in the approved EIA reports, including:

- EIA Report for Kai Tak Airport North Apron Decommissioning (NAKTA) (Application No.: EIA-003/1998)
- EIA Report for Comprehensive Feasibility Study for the Revised Scheme of South East Kowloon Development (SEKDCFS) (Application No.: EIA-059/2001)
- EIA Report for Kai Tak Development (KTD) (Application No.: EIA-157/2008)

9.1.4 An updated land contamination impact assessment has been performed, following the criteria and guidelines for evaluating and assessing the land contamination impact as stated in Sections 3.1 and 3.2 of Annex 19 of the Technical Memorandum (TM) of Environmental Impact Assessment Ordinance (EIAO).

9.2 Methodology

9.2.1 In this Study, land contamination assessment in the NAKTA Decommissioning EIA (Application No.: EIA-003/1998), SEKDCFS EIA (Application No.: EIA-059/2001) and KTD EIA (Application No.: EIA-157/2008) were reviewed in accordance with the EIA Study Brief (ESB-274/2014). Additional information was also obtained through desktop review to further update the findings.

9.3 Land Uses

9.3.1 The MPSC Site is part of the previous Kai Tak Airport which was formed by reclamation. Kai Tak Airport served as international airport of Hong Kong from 1925 until 1998. The aerial photographs of Kai Tak Airport are shown in **Figures 12-3-2, 12-3-3** and **12-3-4**. The international airport moved to Chek Lap Kok in 1998.

9.3.2 Since the closure of the international airport in 1998, there have been various temporary uses housed in Kai Tak Area, such as Temporary Government Offices, temporary storage and tests for recycled aggregates, temporary recreation facilities and temporary car parks and temporary storage. Subsequently, the Cruise Terminal and public housing estates were developed. However, the MPSC Site was mainly used as temporary car park. Panoramic view of former Kai Tak Airport Site (2010) is shown in **Photo No. 9-3-1** and aerial photo of the MPSC Site taken in 2013 is shown in **Photo No. 9-3-2**.

9.3.3 Recently, the MPSC Site and the surrounding area are used as temporary car park, construction storage and construction sites. A recent aerial photograph is shown in **Photo No. 9-3-3**.

9.4 Review of Previous EIA Studies

9.4.1 The NAKTA Decommissioning EIA (Application No.: EIA-003/1998) was completed in April 1998 and approved under the EIAO in September 1998. The land contamination impact assessment of the NAKTA Decommissioning EIA covered the North Apron of the former Kai Tak Airport (NAKTA) and the vicinity of the NAKTA area, see **Appendix 9A** and **Figure 9-2**. Review of the Kai Tak Airport site history was done by Maunsell Consultants Asia Ltd. in 1996 including records of historical leakage from the hydrant fuel system within the airport apron provided by Oil Companies Tank Farm (OCTF). The land uses with potential land contamination impact were identified.

9.4.2 A detailed site investigation within the Kai Tak Airport had been undertaken by Maunsell Consultants Asia Ltd. in 1997 to ascertain the nature, scale and extent of possible ground contamination resulted from known leaks of aviation fuels. The investigation was carried out in two phases and results of the investigations indicated that remediation is required at some areas within NAKTA including the Project Area, see **Appendix 9B** and **Figure 9-3**.

9.4.3 An Environmental Permit was obtained for Kai Tak Airport North Apron Decommissioning. The identified contaminated areas at the NAKTA had been cleaned up during the period from 1998 to 2007 in accordance with the Environmental Permit conditions. The permit holder, Territory Development Department (now Civil Engineering and Development Department), had implemented and completed all necessary works for decommissioning accordingly.

9.4.4 The SEKDCFS EIA (Application No.: EIA-059/2001) was completed in July 2001 and approved under the EIAO in September 2001. The SEKDCFS EIA reviewed two relevant studies namely

- EIA for the South East Kowloon Development Feasibility Study (SEKDFS)
- The NAKTA Decommissioning EIA, providing the background information for assessment of land contamination impact under the EIA study.

9.4.5 The SEKDFS Final EIA Report was completed in November 1998 and was administratively endorsed by the Environmental Study Management Group of SEKDFS. However, the application for approval of the SEKDFS Final EIA Report under the EIA Ordinance was withdrawn on 17 March 1999 before public inspection of the report. The SEKDFS Final EIA Report is therefore not in the EIA Ordinance Register, however, it is reviewed under SEKDCFS EIA.

9.4.6 According to the SEKDCFS EIA, SEKDFS EIA reviewed and assessed the land contamination impacts of an area larger than and including the entire assessment area, covering the former Kai Tak Airport and the urban area in Kowloon City, Ma Tau Wai, Ma Tau Kok and Hunghom. The land contamination impact assessment was started with preliminary investigation by site visits, questionnaire survey and information review. A site investigation (SI) was carried out in February 1997 to obtain and review the general baseline conditions for future development. These urban areas as a whole did not have any major contamination problem, however, there were existing specific hotspots which might arouse potential land contamination concerns. These hotspots are outside the Project Area and lie within the urban area in Kowloon City, Ma Tau Wai, Ma Tau Kok and Hunghom. Potentially contaminative land uses in the urban areas in the close proximity to the Project Area included only the Electrical and Mechanical Services Department (EMSD) workshops at Sung Wong Toi Road, which are outside the Study Area as shown in **Figure 9-4**. The SEKDCFS EIA Report recommended focused land contamination assessment for local industries or installations should be carried out on a case by case basis where redevelopment is proposed.

9.4.7 The KTD EIA Report (Application No.: EIA-157/2008) was completed in October 2008 and approved under the EIAO in March 2009. This EIA has reviewed three previous relevant studies, namely NAKTA Decommissioning EIA, SEKDCFS EIA and EIA on Decommissioning of the former Kai Tak Airport other than the North Apron (KTA Decommissioning EIA) to provide background information for assessment of land contamination impacts under this EIA study. The KTD EIA has also assessed the potential land contamination concern for the construction of new distributor roads, sewage pumping station and decommissioning of the remaining parts of the former Kai Tak Airport. Based on the findings of this EIA, the contaminated areas at the NAKTA including the areas of this Project have been cleaned up during the period from 1998 to 2007 in accordance with the Environmental Permit conditions of NAKTA EIA. There would not be further concerns over the historical contamination from the former Kai Tak Airport.

9.4.8 The KTD EIA had also updated the conditions of the urban areas outside the former Kai Tak Airport based on SEKDCFS EIA Study and the EMSD workshops at Sung Wong Toi Road was identified as a potential contaminative land use requiring land contamination investigation and the remediation works (if any) has to be undertaken by the occupant of the workshop.

9.4.9 A summary of site investigation findings reviewed in the above three EIA reports and the relevant Contamination Assessment Plan (CAP), Contamination Assessment Report and/or Remediation Action Plan (CAR/RAP) is given in **Table 9-1**.

Table 9-1 Summary of Findings in Relevant EIA Reports

Relevant EIA	Site Investigation Findings	Date of Approval
NAKTA Decommissioning EIA		
NAKTA Decommissioning EIA	• 195 boreholes and 77 groundwater wells were installed for soil and groundwater contamination assessment. • Land Contamination hotspots were identified. Elevated levels of methane and anaerobic conditions were found in some areas. • The identified contaminated areas at the NAKTA had been cleaned up during the period from 1998 to 2007 in accordance with the Environmental Permit conditions.	September 1998 Application No.: EIA-003/1998
CAP, CAP/RAP for South East Kowloon Development Infrastructure at North Apron Area of Kai Tak Airport	• Accessed areas within NAKTA which were not covered in NAKTA decommissioning project due to accessibility issue. • 134 boreholes were constructed for the purpose of land contamination assessment. • Remediation were found to be necessary at 15 borehole locations with soil samples contaminated with metals, Benzo(a)pyrene and Total Petroleum Hydrocarbons (TPH) exceeding Dutch B/C levels. Findings from groundwater risk assessment indicated that the risk level associated with groundwater during construction was acceptable and no remediation for groundwater would be necessary. Free product, identified at one of the groundwater sampling wells, however, required remediation. • Solidification / stabilization and biopiling were recommended as the remediation method for metal contaminated soil and organic contaminated soil respectively whereas free product recovery was recommended for groundwater remediation.	CAP: June 2003 CAR/RAP: October 2005
Remediation Report for South East Kowloon Development Infrastructure at North Apron Area of Kai Tak Airport	• The Remediation works were conducted according to the CAR/RAP of *South East Kowloon Development Infrastructure at North Apron Area of Kai Tak Airport* under Contract No. KL39/03 approved by EPD in 2005. • Free product found in the groundwater monitoring well was manually skimmed off. For soil remediation, cement solidification / stabilization (CSS) was implemented for heavy metal contaminated soil and biopiling was operated for organic contaminated soil as proposed in the	August 2007

Relevant EIA	Site Investigation Findings	Date of Approval
	approved CAR/RAP. The remediation works were conducted in the period from December 2005 to March 2007.	
SEKDCFS EIA		
SEKDCFS EIA	● Reviewed SEKDFS EIA (not in the EIA Ordinance Register) and NAKTA Decommissioning EIA. ● Identified potential contamination hotspots both within and outside former Kai Tak Airport. Area outside former Kai Tak Airport includes urban area in Kowloon City, Ma Tau Wai, Ma Tau Kok and Hunghom. The potential hotspots within the Project Site were referred to in NAKTA Decommissioning EIA.	September 2001 Application No.: EIA-059/2001
KTD EIA		
KTD EIA	● Reviewed and assessed the implications of land contamination associated with the former Kai Tak Airport. ● Assessed the potential land contamination concern for the construction of new distributor roads, sewage pumping station and decommissioning of the remaining parts of the former Kai Tak Airport. ● Updated the conditions of the urban areas outside the former Kai Tak Airport. ● Identified the EMSD workshops at Sung Wong Toi Road as a potential contaminative land use.	March 2009 Application No.: EIA-157/2008

9.5 Potential Contaminative Land Uses

9.5.1 According to the Project development plan as shown in **Figure 9-1**, the proposed development includes the following:

- Main Stadium
- Public Sports Ground
- Indoor Sports Centre
- Hotel Block
- Office Block
- Retail Area

9.5.2 There will not be any potential contaminative land uses within the Study Area.

9.5.3 Potentially contaminative land uses in the urban areas in the proximity to the Project area included only the EMSD workshops at Sung Wong Toi Road. The finding is provided in **Table 9-2** below and as shown in **Figure 9-4**.

Table 9-2 Information on the EMSD Workshops at Sung Wong Toi Road (Extracted from KTD EIA)

Potentially Contaminative Uses	Location	General Information	Possible/Potential Sources of Contamination
EMSD Sung Wong Toi Vehicle Repair and Maintenance Workshop	Sung Wong Toi Road	• Activities: government vehicle repairing and maintenance; and • Long history of operation	• A large underground waste oil tank and a diesel storage tank were identified; • Battery cell, flammable liquid, oil sludge, acidic/alkaline electrolytes, solvents, mineral/lube oil, refrigerants, paints, heavy metal compounds, paints and scrap metal have been used, stored or generated; and • Waste disposal and oil & fuel storage generally follows government environmental requirements at present.

9.5.4 The potential contamination should be dealt with by the relevant operator, i.e. EMSD separately. According to EMSD, decontamination works was completed in September 2012, except for one bore hole which could not be completed due to obstructions by underground utilities and building structures. Decontamination and remedial works of the remained borehole is included in the scope of the demolition programme.

9.6 Impact Assessment

9.6.1 In accordance with the findings of the EIA reports reviewed, the contaminated areas at the NAKTA including the area of the Project have been cleaned up during the period from 1998 to 2007 according to Environmental Permit (EP-007/1998) conditions. There would not be further concerns over the historical contamination from the former Kai Tak Airport.

9.6.2 For areas in the proximity to the Project Site referred to in South East Kowloon, the EMSD Sung Wong Toi Vehicle Repair and Maintenance Workshop located at about 50 metres away from the Project Area is identified as a potential contamination source. A land contamination assessment will be undertaken by EMSD according to the approved KTD EIA Report. Based on the EIA studies reviewed, the potential contaminative sources identified in the urban area would not have a major contamination problem and there might only be potential land contamination concern at specific hotspots, therefore, the impact of land contamination aroused from EMSD workshop on the Project is also considered to be unlikely.

9.6.3 According to Site Contamination Assessment Report of Agreement No. 9AT 034 – Provision of Consultancy Services to facilitate the preparation of the Technical Feasibility Statement and carry out related studies for the Multi-purpose Stadium Complex at Kai Tak Kowloon City District (AECOM 2010), some temporary industrial activities, including a concrete batching plant, an electrical substation and a metal pieces and construction materials collection point, were found at the southwestern portion of the Project Area during site inspection undertaken on 11 August 2009 by AECOM. The locations of potential contaminated site identified within/at close proximity to the Project Area is shown in **Figure 9-5**. The soil contamination implications are discussed as follow:

- A typical concrete batching plant consists of associated structures and facilities to handle cement, sand, aggregate, water and ice for supply of concrete. Concrete batching plant is a construction material manufacturing plant, instead of chemical manufacturing/processing plant. A typical concrete batching plant is shown in Appendix A to PNAP255 (APP-120), included in **Appendix 9C**. In general, all water within the concrete batching plants are recycled. Normally concrete batching plants would not cause any land contamination.
- For the metal pieces and construction materials collection point in the Project Site, it is a place of collecting metal pieces and construction materials, instead of metal workshops. The collected metal and steel reinforcement are normally delivered to other factories for recycling. Therefore, no soil contamination is expected in the Project Site.
- For the electric substation in the Project Site, most of the equipment such as switchgear, LV board, cable, metering and panel, are no potential land contamination. Those oil filled transformers are confined with metal casing. According to Code of Practice No. 101 for Distribution Substation Design issued by CLP Power Hong Kong Limited, see **Appendix 9D**. All substations on ground level are 150mm above the outside ground level. Both the floor slab and cable trench are concrete paved thus potential contamination of soil under the substation is unlikely to be happen.
- According to the latest records from EPD, there was no spillage/leakage record in the past within the concerned areas. Based on the findings of site observation done by AECOM, the concerned areas were observed to be concrete paved in general without apparent stains observed. Therefore, no soil contamination is expected in the Project Site.

9.6.4 According to information provided by ArchSD, the site was separated into the following uses since 2010:

- Open carpark,
- Works Area for CEDD, and
- Concrete paved area.

The aerial photographs of MPSC Site as in 2013 and 2014/15 are shown in **Photo No. 9-3-2** and **9-3-3** respectively.

9.6.5 There should not be any soil contamination caused by these uses.

9.7 Summary of Findings

9.7.1 Potential land contamination impacts associated with the construction of the Project at the north apron of the former Kai Tak Airport have been assessed, and no potential contamination are expected as the Project includes only sports facilities, hotel, office and retail area.

9.7.2 No historical contamination concern from the former Kai Tak Airport was identified within the Project Area since the completion of clean up remediation works at NAKTA. Findings from previous studies indicated that some temporary industrial activities were found at the southwestern portion of the Project Area including a concrete batching plant, an electrical substation and a metal pieces and construction materials collection point. As explained in **Section 9.6.3**, the concrete batching plant and the metal pieces and construction materials collection point will not cause any soil contamination. The electrical substation was found on concrete paved area in general without apparent stains observed during site inspection done by AECOM, and no oil spillage was recorded by EPD, thus no soil contamination would be caused by such use. Therefore, no soil contamination is expected in the Project Site.

9.7.3 For potential contaminative sources identified close to the Project Site in South East Kowloon, namely the EMSD Sung Wong Toi Vehicle and Maintenance Workshop, a land contamination assessment will be undertaken by EMSD according to the approved KTD EIA Report. As these facilities are outside the Project Site, no land contamination impacts to the Project is expected.

9.7.4 For the areas outside the Project Site in Kai Tak Development, findings from previous studies indicated that the urban area as a whole did not have a major contamination problem except for a few specific hotspots which lie in urban areas in Kowloon City, Ma Tau Wai, Ma Tau Kok and Hunghom. As precautionary measure to minimize any potential environmental impacts associated with these potential land contaminations, it has been recommended that the current occupant(s) or future developer(s) of those identified hotspots should carry out detailed land contamination investigations prior to any redevelopment. If land contamination is confirmed, proper remedial measures should be formulated and implemented prior to the redevelopment of the respective site.

9.8 Conclusion

9.8.1 The potential environmental issues associated with land contamination together with its implication to the Project have been reviewed and assessed. There are no potential contaminative uses in the proposed Project development.

9.8.2 The assessments of land contamination for the former Kai Tak Airport have been completed in the relevant approved EIA Reports. Land contamination identified in the North Apron had been cleaned up already.

9.8.3 Based on the reviewed findings from the previous EIA studies, potentially contaminative land uses in the urban areas in the proximity to the Project Area included only the EMSD Sung Wong Toi Vehicle and Maintenance Workshop. A land contamination assessment will be undertaken by EMSD according to the approved KTD EIA Report. As these facilities are outside the project Site, no land contamination impacts to the Project are expected.

9.8.4 Urban area outside the Project site was found not having any major contamination problem but for specific hotspots which lie in urban areas in Kowloon City, Ma Tau Wai, Ma Tau Kok and Hunghom, which might be of potential contamination concerns.

9.8.5 Based on the reviewed findings, some temporary industrial activities were found at the southwestern portion of the Project Area including a concrete batching plant, an electrical substation and a metal pieces and construction materials collection point. These uses were observed to be concrete paved in general without apparent stains observed during site inspection undertaken by AECOM. No spillage leakage record in the past within the concerned area occurred according to the latest records from EPD.

9.8.6 No further investigation on land contamination within Project Site is necessary.

10 TERRESTRIAL ECOLOGICAL IMPACT ASSESSMENT

10.1 Introduction

10.1.1 This Chapter presents the terrestrial ecological baseline condition within and in the vicinity of Kai Tak Area through literature review and surveys. Potential construction and operational impacts on terrestrial ecology caused by this Project have been identified and evaluated. Mitigation measures have been proposed to minimize potential impacts where necessary.

10.2 Relevant Legislations, Standards & Guidelines

10.2.1 Reference has been made to criteria in the Technical Memorandum on Environmental Impact Assessment Process of the Environmental Impact Assessment Ordinance (Cap. 499) (EIAO TM) for evaluating ecological impacts, i.e.:

- Annex 8 stipulates criteria for evaluating ecological impacts
- Annex 16 sets out the general approach and methodology for the assessment of ecological impacts arising from a project or proposal.

10.2.2 The following EIAO guidance notes detail temporal considerations in arranging surveys, survey methodology at different habitat types, data collection and requirement of impact assessment:

- GN 6/2010 "Some Observations on Ecological Assessment from the Environmental Impact Assessment Ordinance Perspective"
- GN 7/2010 "Ecological Baseline Survey for Ecological Assessment"
- GN 10/2010 "Methodologies for Terrestrial and Freshwater Ecological Baseline Surveys"

10.2.3 Other Hong Kong ordinances and guidelines relevant to this study for reference include:

- Forests and Countryside Ordinance (Cap. 96) and its subsidiary legislation in the Forestry Regulations, which prohibit destructive activities in the forest and trading or keeping of rare plants;
- Wild Animals Protection Ordinance (Cap. 170), which protects wild mammals, avifauna, reptiles, amphibians and insects under column 2 from hunting, possession, trading and disturbance;
- Country Parks Ordinance (Cap. 208), which designates, controls and manages country parks and special areas;
- Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586), which regulates trading and possession of endangered species in response to Convention on the International Trade in Endangered Species of

Wild Fauna and Flora (CITES);

- Town Planning Ordinance (Cap. 131), which stipulates the planning use of an area. Land uses related to this chapter are country parks, conservation areas, green belts, coastal protection areas, sites of special scientific interest and other specified uses that promote conservation or protection of the environment;

- Hong Kong Planning Standard and Guidelines (Chapter 10), which provides principles of conservation, policies to identify and conserve natural landscape and habitats through legislation and administrative controls and planning.

10.2.4 This assessment made also reference to the following international conventions where appropriate:

- Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES);

- IUCN Red List;

- United Nations Conventions on Biological Diversity (1992).

10.3 Study Area & Site of Conservation Importance

10.3.1 The Study Area for this terrestrial ecological impact assessment covers 500 m radius of the proposed Project, as shown in **Figure 10-1**.

10.3.2 In the Study Area, there is no recognized site of conservation importance as defined in Annex 16 of the EIAO-TM.

10.4 Literature Review

10.4.1 Baseline ecological information had been obtained through collection and review of past findings of relevant studies/surveys regarding ecological characters of the assessment area. Examples of published references, other environmental studies carried out in vicinity of the Project Site and referenced websites include:

- Aerial photos

- Websites managed by AFCD, e.g. Hong Kong Biodiversity Database & Hong Kong Herbarium

- AFCD Newsletters

- Approved Kai Tak (KPA 22) Outline Zoning Plan (Plan No. S/K22/4)

- Approved Ma Tau Kok (KPA 10) Outline Zoning Plan (Plan No. S/K10/20)

- Approved Wang Tau Hom & Tung Tau (KPA 8) Outline Zoning Plan (Plan No. S/K8/21)

- Books and reports by Hong Kong Bird Watching Society, e.g. the Avifauna in Hong Kong
- Past EIA studies, e.g. Comprehensive Feasibility Study for the Revised Scheme of South East Kowloon Development (Arup 2001); Kai Tak Development (Maunsell 2008); Shatin to Central Link – Stabling Sidings at Hung Hom Freight Yard (Arup 2011a); & Shatin to Central Link – Tai Wai to Hung Hom Section (Arup 2011b)
- Porcupine! by the University of Hong Kong
- Other related field books

Habitat & Vegetation

10.4.2 According to Arup (2001), 3 habitats (Urbanised Area, Planted Grass Area and Amenity Planting Area) were recorded in the Study Area. However, according to Maunsell (2008), 4 different habitats – Developed Area, Wasteland, Watercourse and Artificial Coastline – were recorded in the Study Area.

10.4.3 The Wasteland area comprised mainly construction sites and vacant lands and occupied most of the area of the former Kai Tak Airport (Maunsell 2008). This habitat was dominated by ruderal species, such as *Casuarina equisetifolia*, *Celtis sinensis*, *Lantana camara* and *Neyraudia reynaudiana*.

10.4.4 The Developed Area consisted of temporary parking areas and urban residential/industrial buildings at the periphery of and at the vicinity of the former Kai Tak Airport respectively (Maunsell 2008). Trees and vegetation found were mostly located in amenity planting areas (e.g. roadside and parks). The most common species in this habitat included *Aleurites moluccana*, *Bauhinia* x *blakeana* and *Bombax ceiba*. All plant species recorded are common and widespread in Hong Kong (Maunsell 2008).

10.4.5 Only 1 watercourse, the Kai Tak Nullah, was recorded within/near the Study Area (Maunsell 2008). It is an artificial concrete-lined nullah for drainage purpose. Very limited riparian vegetation was recorded in this habitat. Only common vegetation species such as *Leucaena leucocephala* and *Bidens alba* were found in this habitat (Maunsell 2008).

10.4.6 Vertical seawall, and man-made rock/boulder slopes composed the Artificial Coastline within/near the Study Area (Maunsell 2008). Only scattered trees and shrubs were found. All species recorded (e.g. *Ficus microcarpa* and *F. virens*) are common in Hong Kong (Maunsell 2008).

10.4.7 Two recent studies carried out by Arup (2011a; 2011b) recorded 4 habitats – Urban/Residential Area, Temporary At-Grade Work Sites, Channelised Watercourse and Plantation – in the Study Area. Although habitat classification differed between Arup (2011a; 2011b) and Maunsell (2008), both nature of habitats, habitat distribution and vegetation composition were similar.

10.4.8 No rare or protected plant species was found within/near the Study Area (Maunsell 2008; Arup 2011a; Arup 2011b).

Mammals

10.4.9 According to Arup (2001; 2011a; 2011b) and Maunsell (2008), no terrestrial mammal individual or burrows of mammal species was recorded within/near the Study Area.

10.4.10 According to Shek (2006), besides the Brown Rat (*Rattus norvegicus*) and Roof Rat (*R. rattus*) that are distributed in urban areas throughout Hong Kong, only Short-nosed Fruit Bat (*Cynopterus sphinx*) was recorded near the Study Area. Although Short-nosed Fruit Bat is very common in Hong Kong, it is protected under the Wild Animals Protection Ordinance (Cap. 170) (AFCD 2014a).

Avifauna

10.4.11 In Hong Kong, all wild birds are protected under the Wild Animals Protection Ordinance (Cap. 170).

10.4.12 According to Arup (2011a), 13 avifauna species were recorded from the vicinity of the proposed Kai Tak Station, which is within the Study Area of this Project. In which, 2 species, Little Ringed Plover (*Charadrius dubius*) and Little Egret (*Egretta garzetta*), were with conservation importance. Their conservation statuses were summarized in **Table 10-1**.

10.4.13 In addition, Arup (2011b) recorded 39 species around Kai Tak Runway which is within/near the Study Area of this Project. In which, 17 species were of conservation interest, while 7 of them (Great Egret *Ardea alba*, Grey Heron *Ardea cinerea*, Eastern Cattle Egret *Bubulcus coromandus*, Little Ringed Plover *Charadrius dubius*, Zitting Cisticola *Cisticola juncidis*, Little Egret *Egretta garzetta* and Black-crowned Night Heron *Nycticorax nycticorax*) were recorded within the Study Area of this Project. Their conservation statuses were summarized in **Table 10-1**.

10.4.14 According to Maunsell (2008), 36 avifauna species were recorded within/near the Study Area, while 9 of them were with conservation importance. Out of the 9 species with conservation importance, only 6 of them – Great Egret (*Ardea alba*), Grey Heron (*Ardea cinerea*), Chinese Pond Heron (*Ardeola bacchus*), Little Egret (*Egretta garzetta*), Black Kite (*Milvus migrans*) and Great Cormorant (*Phalacrocorax carbo*) – were recorded within the Study Area (Maunsell 2008). Their conservation statuses were summarized in **Table 10-1**.

10.4.15 Injured Saker Falcon (*Falco cherrug*) was rescued from Kai Tak (Ades et al. 2004).

10.4.16 According to a breeding bird survey conducted by the Hong Kong Bird Watching Society (Carey et al. 2001), 13 bird species were recorded to breed within/near the Study Area. In which, 4 species – Oriental Skylark (*Alauda gulgula*), Bonelli's Eagle (*Aquila fasciata*), Peregrine Falcon (*Falco peregrinus*) and Black Kite (*Milvus migrans*) – are species with conservation importance (AFCD 2014a). Their conservation statuses were summarized in **Table 10-1**.

10.4.17 According to Arup (2001), 38 avifauna species were recorded within/near the Study Area. In which, 15 species – Red-throated Pipit (*Anthus cervinus*), Great Egret (*Ardea alba*), Grey Heron (*Ardea cinerea*), Chinese Pond Heron (*Ardeola bacchus*), Eastern Cattle Egret (*Bubulcus coromandus*), Little Ringed Plover (*Charadrius dubius*), Oriental Plover (*Charadrius veredus*), Zitting Cisticola (*Cisticola juncidis*), Collared Crow (*Corvus torquatus*), Japanese Quail (*Coturnix japonica*), Little Egret (*Egretta garzetta*), Intermediate Egret (*Egretta intermedia*), Common Kestrel (*Falco tinnunculus*), Black Kite (*Milvus migrans*) and Great Cormorant (*Phalacrocorax carbo*) – were with conservation importance (AFCD 2014a). Their conservation statuses were summarized in **Table 10-1**.

10.4.18 In the 70 species recorded in past studies (Arup 2001; Carey et al. 2001; Ades et al. 2004; Maunsell 2008; Arup 2011a; Arup 2011b), Oriental Skylark (*Alauda gulgula*), Bonelli's Eagle (*Aquila fasciata*), Japanese Quail (*Coturnix japonica*) and Peregrine Falcon (*Falco peregrinus*) are scare, while Common Myna (*Acridotheres tristis*), Long-toed Stint (*Calidris subminuta*), Collared Crow (*Corvus torquatus*), White-bellied Sea Eagle (*Haliaeetus leucogaster*) and Broad-billed Sandpiper (*Limicola falcinellus*) are uncommon in Hong Kong (AFCD 2014a). Beside Eurasian Hoopoe (*Upupa epops*) and Saker Falcon (*Falco cherrug*) are occasional visitor, other species recorded are either common or abundant in Hong Kong (AFCD 2014a).

Table 10-1 Conservation Statuses of Birds with Conservation Importance Recorded within/near the Study Area in Past Studies (Arup 2001; Carey et al. 2001; Ades et al. 2004; Maunsell 2008; Arup 2011a; Arup 2011b; AFCD 2014a; IUCN 2014)

Common Name (Species Name)	Conservation Status
Oriental Skylark (*Alauda gulgula*)	1. Listed as "Local Concern" by Fellowes et al. (2002)
Red-throated Pipit (*Anthus cervinus*)	1. Listed as "Local Concern" by Fellowes et al. (2002)
Bonelli's Eagle (*Aquila fasciata*)	1. Protected under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586); 2. Listed as "Rare" in the China Red Data Book Status; 3. Listed as "Regional Concern" by Fellowes et al. (2002)
Great Egret (*Ardea alba*)	1. Listed as "Regional Concern" by Fellowes et al. (2002)
Grey Heron (*Ardea cinerea*)	1. Listed as "Potential Regional Concern" by Fellowes et al. (2002)
Chinese Pond Heron (*Ardeola bacchus*)	1. Listed as "Regional Concern" by Fellowes et al. (2002)

Common Name (Species Name)	Conservation Status
Eastern Cattle Egret (*Bubulcus coromandus*)	1. Listed as "Local Concern" by Fellowes et al. (2002)
Little Ringed Plover (*Charadrius dubius*)	1. Listed as "Local Concern" by Fellowes et al. (2002)
Oriental Plover (*Charadrius veredus*)	1. Listed as "Local Concern" by Fellowes et al. (2002)
Zitting Cisticola (*Cisticola juncidis*)	1. Listed as "Local Concern" by Fellowes et al. (2002)
Collared Crow (*Corvus torquatus*)	1. Listed as "Local Concern" by Fellowes et al. (2002) 2. Listed as "Near threatened" in IUCN Red List
Japanese Quail (*Coturnix japonica*)	1. Listed as "Local Concern" by Fellowes et al. (2002) 2. Listed as "Near threatened" in IUCN Red List
Little Egret (*Egretta garzetta*)	1. Listed as "Regional Concern" by Fellowes et al. (2002)
Intermediate Egret (*Egretta intermedia*)	1. Listed as "Regional Concern" by Fellowes et al. (2002)
Saker Falcon (*Falco cherrug*)	1. Listed as "Endangered" in IUCN Red List
Peregrine Falcon (*Falco peregrinus*)	1. Protected under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586); 2. Listed as "Local Concern" by Fellowes et al. (2002)
Common Kestrel (*Falco tinnunculus*)	1. Protected under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586)
Black Kite (*Milvus migrans*)	1. Protected under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586); 2. Listed as "Regional Concern" by Fellowes et al. (2002)
Black-crowned Night Heron (*Nycticorax nycticorax*)	1. Listed as "Local Concern" by Fellowes et al. (2002)
Great Cormorant (*Phalacrocorax carbo*)	1. Listed as "Potential Regional Concern" by Fellowes et al. (2002)
*All birds are protected under the Wild Animals Protection Ordinance (Cap. 170). ** Species listed as "Least Concern" by IUCN Red List were not included.	

Herpetofauna

10.4.19 According to Arup (2011b), a dead snake Checkered Keelback (*Xenochrophis piscator*) was recorded around Kai Tak Runway. Nevertheless, this species is common and widespread in Hong Kong, and has no conservation importance.

10.4.20 According to Arup (2011a) and Chan et al. (2005), no amphibian species was recorded within/near the Study Area.

10.4.21 According to Maunsell (2008), no individual of herpetofauna was recorded within/near the Study Area. In addition, no sign of reptile breeding or breeding habitat was recorded.

10.4.22 According to Arup (2001), although no amphibian species was recorded within/near the Study Area, 2 reptiles – Red-eared Slider (*Trachemys scripta*) and Chinese Skink (*Plestiodon chinensis*) – were recorded within/near the Study Area. Both species are widespread in Hong Kong, and have no conservation importance (AFCD 2014a).

Butterflies and Odonates

10.4.23 According to Arup (2011a; 2011b), 1 butterfly and 1 odonate species were recorded near the proposed Kai Tak Station. Both species recorded are either abundant or common, and widely distributed in Hong Kong (AFCD 2014a). No species with conservation importance was recorded.

10.4.24 Arup (2011b) also recorded 2 butterfly species around the Kai Tak Runway. Both species are very common and widely distributed in Hong Kong. None of them has conservation importance.

10.4.25 According to Maunsell (2008), 5 butterfly and 6 odonate species were recorded within/near the Study Area. All butterfly and odonate species recorded are either abundant or common, and widely distributed in Hong Kong (AFCD 2014a). No species with conservation importance was recorded.

10.4.26 According to Arup (2001), 1 butterfly and 1 odonate species were recorded within/near the Study Area. Both species recorded are either very common or abundant, and widely distributed in Hong Kong (AFCD 2014a). No species with conservation importance was recorded.

10.5 Methodology for Terrestrial Surveys

10.5.1 Comparing findings in past studies and recent site visits conducted during this EIA Study, there was no major change in habitat types and their coverage. The Site and its immediate surroundings in Kai Tak area are comprised of construction sites and abandoned grounds. Further away from the old airport is developed land of residential and industrial uses. Therefore, terrestrial surveys were conducted to verify the previous findings and to update the baseline conditions.

10.5.2 In September 2014, February, March and August 2015, terrestrial surveys had been carried out at representative habitats that are likely to be affected by this Project.

Surveys had been conducted according to the Environmental Impact Assessment Ordinance, Cap. 499, GN No. 10/2010 Methodologies for Terrestrial and Freshwater Ecological Baseline Surveys. The survey area covered the area within 500m boundary from the proposed Project Site. An ecological survey plan showing survey transect and point count locations is presented in **Figure 10-1**. The survey route covered most areas within the Study Area, in particular the Project Site.

Habitat Survey

10.5.3 Aerial photos of the Project Site and its surrounding have been interpreted to identify habitat types found within the Study Area. This was verified and updated by ground-truthing.

Vegetation Survey

10.5.4 Vegetation surveys had been conducted to identify key vegetation communities and dominant species within the Project Site. These were followed by plant species surveys which recorded plant species found in different habitats within the Study Area. Surveys covered the transect (see **Figure 10-1**) and areas nearby. A pair of binoculars was used to aid observation where the area is inaccessible. Any rare, protected and threatened plant species and other species of conservation importance had been identified with their location marked.

Terrestrial Mammal Survey

10.5.5 Terrestrial mammals had been actively searched along transect and identified by direct observation. Any traits observed, such as dung, feeding signs, footprints, burrows and dens were recorded, and tracks that were left by mammals were identified as far as possible.

Avifauna Survey

10.5.6 Transect survey and point count were adopted to record bird species in early morning when avifauna are most active. For point count, counts had been made within fixed time period (around 5 minutes) using a pair of binoculars. Any bird presented within observable distance along transect and from counting point were recorded and identified. Identification was also made from bird calls. In addition, any feeding, nesting and breeding behaviours were noted.

Herpetofauna Survey

10.5.7 Active searching had been carried out to look for amphibians and reptiles during day-time along the transect. Potential breeding ground and microhabitats, such as pools, water channels, crevices and fallen leaves, had been searched. Any eggs and tadpoles found were also recorded. Mating calls of frogs and toads were assisted in species identification as well.

Butterflies and Odonates Survey

10.5.8 Butterflies and odonates surveys had been conducted during daytime and under fine weather when these insects are active. Transect survey and point count had been carried out. For point count, counts had been made within fixed time period (around 5 minutes). Any butterflies and odonates observed along transect and from counting point were counted and identified by naked eyes. A pair of binoculars had been used for assisting counting and species identification when necessary.

Freshwater Survey

10.5.9 Freshwater wildlife (active swimming fishes and crustaceans) in Kai Tak Nullah were observed by direct sighting and by the aid with a pair of 8x binoculars.

10.6 Survey Results – Habitats & Vegetation

Habitats

10.6.1 Within the Study Area, terrestrial habitats identified included construction sites, developed area, abandoned area, watercourse and artificial coastline. A map showing the distribution of habitats in the Study Area was presented in **Figure 10-2,** while representative photos of habitats were presented in **Appendix 10.1**.

<u>Construction Sites</u>

10.6.2 The dominant habitat is Construction Sites at the former Kai Tak Airport. Most land were excavated and exposed. Some area was used for stockpiling and material storage. Operation of powered mechanical equipment is common in this area. Patches of plant nursery were located, in which plants were usually in poor condition. Remnant trees were few and vegetation found in this habitat were mostly small weeds growing on the edge. Examples included *Macaranga tanarius* var. *tomentosa*, and *Kalanchoe tubiflora*.

10.6.3 1 avifauna species with conservation importance was recorded in Construction Sites. 1 uncommon avifauna species was also recorded in this habitat.

<u>Developed Area</u>

10.6.4 The area adjacent to the former Kai Tak Airport was dominated by Developed Area. Developed Area consisted of urban area with residential/industrial buildings, greening areas/parks and temporary parking areas, which are utilized by human continuously. Trees and vegetation found in this habitat were mostly cultivated for amenity purpose in greening areas/parks. Species that were commonly found included *Bauhinia* x *blakeana, Ixora chinensis* and *Loropetalum chinense*.

10.6.5 4 avifauna species with conservation importance were recorded in Developed Area. No uncommon or rare species was found in this habitat.

Abandoned Area

10.6.6 Several pieces of Abandoned Area were found in the former Kai Tak Airport. This habitat was disturbed by human, but has been abandoned for a period of time. Vegetation found in this habitat was mostly ruderal species, including *Bidens alba* and *Neyraudia reynaudiana*.

10.6.7 3 avifauna species with conservation importance were recorded in Abandoned Area. No uncommon or rare species was found in this habitat.

Watercourse

10.6.8 Kai Tak Nullah is the only watercourse found within the Study Area. It is an artificial concreted channel for drainage purpose. Its smooth bank surface allowed limited and scattered trees and vegetation growth (e.g. *Ficus microcarpa* and *Leucaena leucocephala*). A number of construction activities (e.g. reclamation, diversion) were in progress in and near the Nullah.

10.6.9 5 avifauna species with conservation importance were recorded in Watercourse. No uncommon or rare species was found in this habitat.

Artificial Coastline

10.6.10 All coastlines found in the Study Area were artificial. They were either vertical seawall or man-made sloping seawall constructed of armour rocks. Only limited and scattered trees and vegetation (e.g. *Celtis sinensis, Melia azedarach* and *Neyraudia reynaudiana*) were found.

10.6.11 7 avifauna species with conservation importance were recorded in Artificial Coastline. In which, Collared Crow is uncommon in Hong Kong. No other uncommon or rare species was found in this habitat.

The Project Site

10.6.12 The Site covered about 28 ha in the former Kai Tak Airport, which is comprised of Construction Sites (16.1 ha or 57%), Abandoned Area (6.9 ha or 24%) and Developed Area (i.e. temporary parking areas, 5.0 ha or 19%). Trees and vegetation (e.g. *Casuarina equisetifolia* and *Neyraudia reynaudiana*) were mostly found in Abandoned Area scattered within the Site.

10.6.13 2 avifauna species of conservation importance (Chinese Pond Heron *Ardeola bacchus*, and Black Kite *Milvus migrans*) and 1 uncommon avifauna species (Common Myna *Acridotheres tristis*) were recorded in the Project footprint.

Vegetation

10.6.14 125 plant species were recorded in the Study Area (see **Appendix 10.2**). Most species recorded were exotic, which were planted for landscaping (e.g. *Bombax ceiba*, *Lagerstroemia speciosa*, *Bougainvillea spectabilis*) or were fast-growing species that were competitive in disturbed habitats (e.g. *Leucaena leucocephala*, *Lantana camara*, *Mikania micrantha)*. Native plants generally belongs to *Ficus* spp. and other species that are commonly found in Hong Kong, such as *Celtis sinensis* and *Morus alba*.

10.6.15 8 species recorded – 2 native and 6 exotic species – have conservation statuses, which were shown in **Table 10-2** (AFCD 2014b; IUCN 2014). Although they have conservation statuses, all of them are cultivated individuals and are commonly planted in Hong Kong. Therefore, none of them is considered having conservation importance.

Table 10-2 Conservation Statuses of Plants Recorded in the Study Area (AFCD 2014b; IUCN 2014)

Species Name (Chinese Name)	Origin	Conservation Status
Ailanthus fordii (常綠臭椿)	Native	1. Protected under the Forests and Countryside Ordinance (Cap. 96) 2. Listed as "Near Threatened" by the Rare and Precious Plants of Hong Kong (Status in China)
Camellia hongkongensis (香港茶)	Native	1. Protected under the Forests and Countryside Ordinance (Cap. 96) 2. Listed as "Endangered" by the Rare and Precious Plants of Hong Kong (Status in China)
Araucaria heterophylla (異葉南洋杉)	Exotic	1. Listed as "Vulnerable" by the IUCN Red List
Dimocarpus longan (龍眼)	Exotic	1. Listed as "Near Threatened" by the IUCN Red List
Dypsis lutescens (散尾葵)	Exotic	1. Listed as "Near Threatened" by the IUCN Red List
Lagerstroemia speciose (大花紫薇)	Exotic	1. Protected under the Forests and Countryside Ordinance (Cap. 96)
Michelia x *alba* (白蘭)	Exotic	1. Protected under the Forests and Countryside Ordinance (Cap. 96)
Platycladus orientalis (側柏)	Exotic	1. Listed as "Near Threatened" by the IUCN Red List

10.7 Survey Results – Fauna

10.7.1 This section summarizes terrestrial fauna observed throughout the survey period. A species list with details on the distribution, rarity and conservation status can be found in **Appendix 10.2**. For the species with conservation importance, their locations were presented in **Figure 10-2**, while their photographic records can be found in **Appendix 10.3**.

Terrestrial Mammal

10.7.2 2 terrestrial mammal species – House Mouse *Mus musculus* and Brown Rat *Rattus norvegicus* – were recorded in the Study Area. Both species are widely distributed in urban areas associated with human activity, and has no conservation importance (AFCD 2014a). No breeding behaviour or immature individual was recorded in the Study Area.

Avifauna

10.7.3 34 avifauna species were recorded in the Study Area. Commonly recorded species were Crested Myna (*Acridotheres cristatellus*), Eurasian Tree Sparrow (*Passer montanus*) and Red-whiskered Bulbuls (*Pycnonotus jocosus*). Except Common Myna (*Acridotheres tristis*) and Collared Crow (*Corvus torquatus*) are uncommon, all species recorded are common in Hong Kong (AFCD 2014a). Besides Common Myna, Grey Heron (*Ardea cinerea*) and Collared Crow have restricted distributions, all species recorded are widely distributed in Hong Kong.

10.7.4 Out of the 34 recorded species, 10 of them – Great Egret (*Ardea alba*), Grey Heron (*Ardea cinerea*), Chinese Pond Heron (*Ardeola bacchus*), Greater Coucal (*Centropus sinensis*), Collared Crow (*Corvus torquatus*), Little Egret (*Egretta garzetta*), White-throated Kingfisher (*Halcyon smyrnensis*), Black Kite (*Milvus migrans*), Black-crowned Night Heron (*Nycticorax nycticorax*) and Great Cormorant (*Phalacrocorax carbo*) – are species of conservation importance (AFCD 2014a). Their conservation statuses were listed in **Table 10-3**.

Table 10-3 Conservation Statuses of Birds with Conservation Importance Recorded within the Study Area in Recent Surveys (AFCD 2014a)

Common Name (Species Name)	Conservation Status
Great Egret (*Ardea alba*)	1. Listed as "Regional Concern" by Fellowes et al. (2002)
Grey Heron (*Ardea cinerea*)	1. Listed as "Potential Regional Concern" by Fellowes et al. (2002)
Chinese Pond Heron (*Ardeola bacchus*)	1. Listed as "Regional Concern" by Fellowes et al. (2002)
Greater Coucal (*Centropus sinensis*)	1. Listed as "Vulnerable" by the China Red Data Book

Common Name (Species Name)	Conservation Status
Collared Crow (*Corvus torquatus*)	1. Listed as "Local Concern" by Fellowes et al. (2002); 2. Listed as "Near Threatened" by the IUCN Red List
Little Egret (*Egretta garzetta*)	1. Listed as "Regional Concern" by Fellowes et al. (2002)
White-throated Kingfisher (*Halcyon smyrnensis*)	1. Listed as "Local Concern" by Fellowes et al. (2002)
Black Kite (*Milvus migrans*)	1. Protected under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586); 2. Listed as "Regional Concern" by Fellowes et al. (2002)
Black-crowned Night Heron (*Nycticorax nycticorax*)	1. Listed as "Local Concern" by Fellowes et al. (2002)
Great Cormorant (*Phalacrocorax carbo*)	1. Listed as "Potential Regional Concern" by Fellowes et al. (2002)
*All birds are protected under the Wild Animals Protection Ordinance (Cap. 170). ** Species listed as "Least Concern" by IUCN Red List were not included.	

10.7.5 During surveys, a Black-collared Starling (*Gracupica nigricollis*) was building nest on *Roystonea regia* in Developed Area beyond the Project footprint (see **Figure 10-2**). This suggests that Developed Area is a breeding ground of Black-collared Starling.

10.7.6 Immature individuals of Black-crowned Night Heron (*Nycticorax nycticorax*) – a species with conservation importance (**Table 10-3**) – were found on tree tops of a landscaped garden near Kai Tak approach channel and on tree tops in Artificial Coastline. This suggests that these habitats are nursery grounds of Black-crowned Night Heron.

10.7.7 Immature individuals of Eurasian Tree Sparrow (*Passer montanus*) and Red-whiskered Bulbul (*Pycnonotus jocosus*) were found in landscaped gardens (i.e. Developed Area) near Ma Tou Wai. This suggests that Developed Area is a nursery ground of these species.

10.7.8 Great Cormorants (*Phalacrocorax carbo*) were found only in marine waters away from the coast. Both Great Cormorants and Ardeids (e.g. Little Egret *Egretta garzetta* and Black-crowned Night Heron *Nycticorax nycticorax*) were recorded to forage around marine water while White-throated Kingfisher (*Halcyon smyrnensis*) and Great Egret (*Ardea alba*) foraged in Kai Tak Nullah. These suggest that waterbodies within the Study Area are foraging grounds for waterbirds.

10.7.9 Black Kite *Milvus migrans* soared in the sky above Construction Sites and waterbodies in the Study Area searching for food.

Herpetofauna

10.7.10 No herpetofauna was found in the Study Area.

Butterfly

10.7.11 8 butterfly species were recorded in the Study Area. All recorded species are common and widely distributed in Hong Kong (AFCD 2014a). No species with conservation importance was recorded. Butterflies were recorded mainly in landscaped area in Developed Area (e.g. Pale Grass Blue *Pseudozizeeria maha serica*) and around flowering ruderal plants in Abandoned Area (e.g. Red-base Jezebel *Delias pasithoe pasithoe*).

10.7.12 No breeding behaviour, larva or pupa was recorded in the Study Area.

Odonate

10.7.13 3 odonate species were recorded in the Study Area. All species recorded are abundant and widely distributed in Hong Kong (AFCD 2014a). No species with conservation importance was recorded.

10.7.14 No breeding behaviour or naiads was recorded in the Study Area.

Fish & Crustaceans

10.7.15 1 fish species – Grey mullet (*Mugil cephalus*) – was recorded in the Kai Tak Nullah. It is common and widely distributed in Hong Kong (AFCD 2014a). No species with conservation importance was recorded.

10.7.16 No crustacean was found in the Kai Tak Nullah.

10.7.17 No breeding behaviour or immature individual was recorded in the Study Area.

10.8 Evaluation of Habitat

10.8.1 Ecological values of each habitat have been evaluated according to EIAO-TM Annex 8 Table 2.

Table 10-4 Ecological Value of Construction Sites

Criteria	Construction Sites
Naturalness	Artificial
Size	~ 97.4 ha
Diversity	Low flora and fauna diversity, largely exotic
Rarity	Habitat: Common in Hong Kong Species: 1 avifauna species having conservation importance – Black Kite – was recorded. 1 uncommon avifauna species – Common Myna – was also recorded
Recreatability	Recreateable
Fragmentation	Not fragmented
Ecological linkage	No significant ecological linkage to surrounding was identified
Potential value	Low
Nursery / breeding ground	No nursery or breeding ground identified
Age	≤ 15 years
Abundance/ Richness of Wildlife	Very Low
Ecological value	**Very Low**

Table 10-5 Ecological Value of Developed Area and Abandoned Area

Criteria	Developed Area	Abandoned Area
Naturalness	Artificial	Semi-artificial
Size	~ 65.8 ha	~ 19.4 ha
Diversity	Low flora and fauna diversity, largely exotic	Very low flora and fauna diversity, largely exotic
Rarity	Habitat: Common in Hong Kong Species: 4 avifauna species having conservation importance – Great Egret, Little Egret, Black Kite and Black-crowned Night Heron – were recorded.	Habitat: Common in Hong Kong Species: 3 avifauna species having conservation importance – Chinese Pond Heron, Greater Coucal and Black Kite – were recorded.
Recreatability	Recreateable	Recreateable
Fragmentation	Not fragmented	Fragmented
Ecological linkage	No significant ecological linkage to surrounding was identified	No significant ecological linkage to surrounding was identified
Potential value	Low	Low
Nursery / breeding ground	Nursery ground of Black-crowned Night Heron, Eurasian Tree Sparrow and Red-whiskered Bulbul; Breeding ground of Black-collared Starling	No nursery or breeding ground identified

Criteria	Developed Area	Abandoned Area
Age	≤ 100 years	≤ 15 years
Abundance/ Richness of Wildlife	Low	Very Low
Ecological value	**Very Low**	**Very Low**

Table 10-6 Ecological Value of Watercourse and Artificial Coastline

Criteria	Watercourse	Artificial Coastline
Naturalness	Artificial	Artificial
Size (Length)	About 1.4 km	About 2.4 km
Diversity	Very low flora and fauna diversity	Very low flora and fauna diversity
Rarity	Habitat: Uncommon in Hong Kong Species: 5 avifauna species having conservation importance – Great Egret, Grey Heron, Little Egret, White-throated Kingfisher and Black Kite – were recorded.	Habitat: Common in Hong Kong Species: 7 avifauna species having conservation importance – Great Egret, Grey Heron, Chinese Pond Heron, Collared Crow, Little Egret, White-throated Kingfisher and Black-crowned Night Heron – were recorded. In which, Collared Crow is uncommon in Hong Kong.
Recreatability	Recreatable	Recreatable
Fragmentation	Fragmented by several access bridges	Not fragmented
Ecological linkage	Drain water to marine water in Kai Tak Approach Channel, which is a forage ground of waterbirds	Linked to surrounding marine water, which is a forage ground of waterbirds
Potential value	Low	Low
Nursery / Breeding ground	No nursery or breeding ground identified	Nursery ground of Black-crowned Night Heron
Age	≤ 50 years	≤ 90 years
Abundance/ Richness of Wildlife	Very Low	Very Low
Ecological value	**Very Low**	**Low**

10.9 Identification of Ecological Impacts

10.9.1 The proposed Multi-purpose Sport Complex would lead to habitat loss (i.e. about 28 ha in total, which comprises 5.0 ha of Developed Area, 16.1 ha of Construction Sites and 6.9 ha of Abandoned Area) in the Project footprint. However, no habitat with ecological importance will be impacted directly.

10.9.2 As habitats in the Project footprint would be changed (i.e. habitat loss), this may lead to habitat fragmentation and isolation.

10.9.3 Surrounding habitats and their associated communities would be impacted indirectly by liquid contamination (water quality impact), noise, dust and glare, which will be induced from constructional and operational activities.

Direct Impact

10.9.4 There will be a permanent loss of 5.0 ha of Developed Area, 16.1 ha of Construction Sites and 6.9 ha of Abandoned Area, where the Multi-purpose Sport Complex will be located on. Although all vegetation and trees (about 160 nos.) within the Project footprint will be cleared, all flora found in the Project footprint are largely exotic (mainly *Leucaena leucocephala* and *Casuarina equisetifolia*) and commonly found in Hong Kong. No flora with conservation importance will be affected.

10.9.5 Nevertheless, 2 avifauna with conservation importance (Chinese Pond Heron *Ardeola bacchus*, and Black Kite *Milvus migrans*) and 1 uncommon avifauna (Common Myna *Acridotheres tristis*) would be impacted directly, as they were recorded in the Project footprint. However, these species do not rely on construction site or abandoned land. Chinese Pond Heron and Black Kite favour coastal and marine habitats. Common Myna is an introduced species that is well adapted to disturbed habitats. In addition, no nursery ground, breeding, foraging or roosting behaviour was identified in the Project footprint. Therefore, direct impact on these avifauna species due to habitat loss would be minor.

10.9.6 Limited wildlife was observed within the Project footprint and they are common and widespread in Hong Kong. Overall, the direct impact caused by the Project on this disturbed habitat of very low ecological value in construction phase will be minor.

10.9.7 In the operational phase, the Site will be landscaped with trees, shrubs and lawn. The preliminary greening area is about 7.27 ha.

Habitat Fragmentation and Isolation

<u>Construction phase</u>

10.9.8 In construction phase, fencing and barrier established in the Project Site along the Project boundary would obstruct locomotion of animals, especially terrestrial mammals and herpetofauna. However, the Project Site has been disturbed and is surrounded by human disturbed habitats (i.e. Construction Sites & Developed Area), and existing habitats are fragmented. Therefore, no impact resulting from habitat fragmentation and isolation is anticipated.

<u>Operational phase</u>

10.9.9 Regarding operational phase, as the vicinity of the Project Site will be areas disturbed by human activities instead of natural habitat, no impact resulting from habitat fragmentation and isolation is anticipated.

Indirect Impact – Water Quality

Construction phase

10.9.10 Surface runoff and accidental spillage of chemicals would be major water pollution sources in construction phase. These pollutants might go into waterbodies in the Study Area (i.e. marine water & Kai Tak Nullah) and deteriorate their water quality. This would degrade habitat quality of waterbodies, and hence reduce food availability for waterbirds (e.g. egrets and herons). Since several species of waterbirds (including some species with conservation importance) forage around waterbodies in the Study Area (see **Section 10.7.8**), reduced food availability in waterbodies would cause negative impact on waterbirds.

10.9.11 Nevertheless, there are buffer distances of about 50m between the Site and the sea and over 150m between the Site and Kai Tak Nullah. With proper implementation of mitigation measures (e.g. provision of channel to prevent outflow of surface runoff offsite, and proper discharge of treated effluent, see **Chapter 6 – Water Quality Impact Assessment** and **Section 10.11** for details), the potential water quality impact induced by the Project will be minimized and no significant impact is expected.

Operational phase

10.9.12 No water quality impact on ecology is expected during operational phase.

Indirect Impact – Noise

Construction phase

10.9.13 Noise emitted from Powered Mechanical Equipment (PME) in construction phase would be a nuisance to wildlife. Breeding activity (of Black-collared Starling) and nursery grounds (for Black-crowned Night Heron, Eurasian Tree Sparrow & Red-whiskered Bulbul) would also be impacted by noise generated from PME. Nevertheless, since habitats in the Study Area have been exposed to high level of human disturbance (e.g. construction works and heavy traffics etc.), wildlife (including all breeding activity and nursery grounds) found in the Study Area are considered to be well adapted to noise disturbance.

10.9.14 Due to the Study Area has been highly disturbed by human activities (e.g. construction works and heavy traffics etc.), the construction noise transmitted would be much reduced or screened by buildings or structures in between. The noise level is expected to be similar as present. Moreover, since all breeding activity and nursery grounds recorded were far away from the Project footprint (over 150m), nuisance by noise due to the Project would be insignificant.

10.9.15 Therefore, with proper implementation of mitigation measures (e.g. erection of noise barrier, see **Chapter 5 – Noise Impact Assessment** and **Section 10.11** for details), noise generated by the Project in construction phase shall cause only minor impact on wildlife, and insignificant impact on all breeding activity and nursery grounds.

Operational phase

10.9.16 In operational phase, increased human activity, hence traffic and crowd noise, during all types of events would be the major source of noise impact on wildlife. Most of the time, regular sporting activities will be carried out at the Indoor Sports Centre and Public Sports Ground for general public. The degree of noise nuisance is not expected to be worse than that generated from PMEs for construction in the current state. Big events such as international competition that attract significant spectators will be localized at the Main Stadium, which is equipped with retractable roof for noise control. Nevertheless, as big events would be occasional, noise induced by the Project in operational phase shall cause very minor impact on wildlife (including all breeding activity and nursery grounds) in the Study Area.

Indirect Impact – Dust

Construction phase

10.9.17 Earthworks (e.g. excavation and piling) and wind erosion from the Site would generate dust, which could affect the flora in the Study Area. Dust would cover leaves and shrink plants' photosynthesis rate. This would lead to negative impact on plants' health, and hence reduce habitat quality. However, the habitat in the vicinity of the Site has limited flora abundance or diversity and is considered as having low habitat quality. Therefore, the dust impact is considered minor and acceptable. With proper implementation of mitigation measures (e.g. regular and sufficient watering and proper material handling, see **Chapter 3 – Air Quality Impact Assessment** and **Section 10.11** for details), the impact would be further reduced.

Operational phase

10.9.18 No dust impact on ecology is expected in operational phase.

Indirect Impact – Glare

Construction phase

10.9.19 Security floodlights within construction site may cause glare impact, which might interrupt wildlife's roosting behavior. However, considering the vicinity of the Site is highly urbanized, wildlife found in the Study Area are considered to be well adapted to disturbance induced by urban area (such as light pollution). Also, as these lights are usually with low light intensity, the impact is considered as insignificant. With proper implementation of mitigation measures (e.g. all security floodlights should be equipped with adjustable shield, frosted diffusers and reflective covers, and should be carefully controlled to minimize light pollution, see **Chapter 11 – Landscape and Visual Impact Assessment** and **Section 10.11** for details), the impact would be further reduced.

Operational phase

10.9.20 Lighting from the Project (e.g. signage and directional lights, spotlights, and façade lights) would cause glare impact on wildlife. Since wildlife found in the Study Area are considered to be well adapted to disturbance induced by urban area (such as light pollution) as mentioned in **Section 10.9.19**, the impact is considered as insignificant. With proper implementation of mitigation measures (e.g. arranging lighting with due consideration of reflectance so as to avoid glare effect, see **Chapter 11 – Landscape and Visual Impact Assessment** and **Section 10.11** for details), the impact would be further reduced.

Cumulative Impact

10.9.21 Five concurrent projects would be carried out within the Study Area during the construction phase of this Project:

1) East Port of Central Kowloon Route (CKR),

2) Reconstruction and Upgrading of Kai Tak Nullah,

3) Kai Tak Development Stage 4 (D2 road construction),

4) North Apron Remaining Infrastructure, and

5) Kai Tak Approach Channel and Kwun Tong Typhoon Shelter Improvement Works (Phase 2).

10.9.22 Kai Tak Nullah is about 200 – 250m away from the Site and the cumulative impact would be small. Construction sites for Works 1, 3 and 4 are located next to the Project Site. Construction work of these three projects would bring cumulative noise impact on wildlife.

10.9.23 According to **Chapter 5 – Noise Impact Assessment**, the concurrent projects would increase the noise level at sensitive receivers. As mentioned in "**Sections 10.9.10 – 10.9.13**, Indirect Impact – Noise", wildlife utilizing construction sites, abandoned land and developed area accommodates to the existing noisy environment. Also, no ecologically sensitive habitat is found in the vicinity. Therefore, the small noise level increment is expected to bring insignificant impact on wildlife.

10.10 Evaluation of Ecological Impacts

10.10.1 The significance of ecological impacts have been evaluated according to EIAO-TM Annex 8 Table 1.

Table 10-7 Evaluation of the Significance of Ecological Impact on Construction Sites

Criteria	Construction Sites
Habitat quality	Very Low
Species	1 avifauna species with conservation importance (Black Kite) and 1 uncommon avifauna species (Common Myna) were found.
Impact Size / Abundance	≈ 16.1 ha will be affected directly Very low number of fauna.
Impact Duration	Permanent loss of existing habitat of the Project footprint (≈ 16.1 ha). Indirect noise impact will be in both construction & operational phases; while indirect water quality & dust impact will be restricted in construction phase only
Impact Reversibility	Irreversible for the Project footprint, reversible for indirectly impacted area offsite
Impact Magnitude	Habitat Loss: Minor Water Quality: Minor Noise: Minor Dust: Minor Glare: Insignificant
Overall Impact	**Minor**

Table 10-8 Evaluation of the Significance of Ecological Impact on Developed Area and Abandoned Area

Criteria	Developed Area	Abandoned Area
Habitat quality	Very Low	Very Low
Species	4 avifauna species with conservation importance (Great Egret, Little Egret, Black Kite and Black-crowned Night Heron) were found.	3 avifauna species with conservation importance (Chinese Pond Heron, Greater Coucal and Black Kite) were found
Impact Size / Abundance	≈ 5 ha will be affected directly Very low number of fauna.	≈ 6.9 ha will be affected directly Very low number of fauna.
Impact Duration	Permanent loss of existing habitat of the Project footprint (≈ 5 ha). Indirect noise impact will be in both construction & operational phases; while indirect water quality & dust impact will be restricted in construction phase only	Permanent loss of existing habitat of the Project footprint (≈ 6.9 ha). Indirect noise impact will be in both construction & operational phases; while indirect water quality & dust impact will be restricted in construction phase only
Impact Reversibility	Irreversible for the Project footprint, reversible for indirectly impacted area offsite	
Impact Magnitude	Habitat Loss: Minor Water Quality: Very Minor - Minor Noise: Minor Dust: Minor Glare: Insignificant	Habitat Loss: Minor Water Quality: Minor Noise: Minor Dust: Minor Glare: Insignificant
Overall Impact	**Minor**	**Minor**

Table 10-9 Evaluation of the Significance of Ecological Impact on Watercourse and Artificial Coastline

Criteria	Watercourse	Artificial Coastline
Habitat quality	Very Low	Low
Species	5 avifauna species with conservation importance (Great Egret, Grey Heron, Little Egret, White-throated Kingfisher and Black Kite) were found	7 avifauna species with conservation importance (Great Egret, Grey Heron, Chinese Pond Heron, Collared Crow, Little Egret, White-throated Kingfisher and Black-crowned Night Heron) were found. In which, Collared Crow is uncommon in Hong Kong
Impact Size / Abundance	Not affected directly	
Impact Duration	Indirect noise impact will be in both construction & operational phases; Indirect water quality impact will be restricted in construction phase only	
Impact Reversibility	Reversible	
Impact Magnitude	Habitat Loss: N.A. Water Quality: Insignificant Noise: Minor Dust: Insignificant Glare: Insignificant	Habitat Loss: N.A. Water Quality: Very Minor Noise: Minor Dust: Insignificant Glare: Insignificant
Overall Impact	**Very Minor**	**Very Minor**

10.11 Recommendations & Mitigation Measures

10.11.1 Recommendations and mitigation measures have been proposed to minimize the ecological impact to acceptable levels based on the following hierarchy: avoidance, minimization and compensation.

10.11.2 Minimization

- Erection of hoarding, fencing or provision of clear demarcation of work zones to remind workers not to damage area outside the work boundary

- Designate areas for placement of equipment, building materials and wastes away from drainage channels

- Adopt good site practices (e.g. covering exposed soil surface and open stockpile with tarpaulin or similar fabric) and implement mitigation measures proposed in **Chapter 6 – Water Quality Impact Assessment** (e.g. construction of drainage channel at the periphery of the Site for collection of silty water for sedimentation) to minimize water quality impact.

- Implement mitigation measures proposed in **Chapter 5 – Noise Impact Assessment** (e.g. adopting QPME (Quality Powered Mechanical Equipment), and erecting noise barrier) to minimize noise emission and transmission.

- Adopt good site practices (e.g. covering exposed soil surface and open stockpile), and implement mitigation measures proposed in **Chapter 3 – Air Quality Impact Assessment** (e.g. watering regularly) to minimize dust emission.

- Implement mitigation measures proposed in **Chapter 11 – Landscape and Visual Impact Assessment** (e.g. arranging lighting with due consideration of reflectance so as to avoid glare effect) to minimize glare impact.

10.12 Evaluation of Residual Impacts

10.12.1 With proper implementation of mitigation measures, no unacceptable residual impact is anticipated during construction and operational phases.

10.13 Environmental Monitoring and Audit Programme

10.13.1 Regular site audit shall be carried out to ensure that the proposed mitigation measures are implemented properly. No monitoring and auditing programme would be required in operational phase.

10.14 Conclusion

10.14.1 No site of conservation importance was identified in the Study Area. All 5 habitats in the Study Area were considered to have either Low or Very Low ecological value. 20 avifauna species of conservation importance were recorded in past studies, while 10 avifauna species of conservation importance were found in recent surveys.

10.14.2 About 16.1 ha of Construction Sites, 5.0 ha of Developed Area and 6.9 ha of Abandoned Area will be lost in this Project. These habitats have only Very Low ecological value. Although direct impact on 2 avifauna species of conservation importance is expected, only minor impact is expected as no nursery ground, breeding, foraging or roosting behaviour was recorded in the Project footprint. Nevertheless, no site, flora or other fauna species of conservation importance would be impacted directly.

10.14.3 All habitats and fauna species, including all recorded species of conservation importance, are expected in to be impacted indirectly by water quality, noise dust, and/or glare impacts in construction phase, and by noise and/or glare impacts in operational phase. Crowd noise and traffic noise induced during major events will be infrequent and therefore the impact is considered acceptable. Nevertheless, with proper implementation of mitigation measures, all indirect impact would only be insignificant to minor (i.e. acceptable level).

10.14.4 With proper implementation of mitigation measures, residual impact is considered acceptable. No specific monitoring and audit programme is required for terrestrial ecology.

10.14.5 The overall impact on terrestrial ecology is considered as acceptable.

10.15 References

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11 LANDSCAPE AND VISUAL IMPACT ASSESSMENT

11.1 Introduction

Project Background

11.1.1 The Landscape and Visual Impact Assessment (LVIA) is prepared in accordance with the requirements of the EIA Study Brief issued by Environmental Protection Department (EPD) and the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM). Further guidance is given by EIAO Guidance Note 8/2010 and Annexes 10 and 18 of EIAO-TM, Section 3.4.11 and Appendix G of the EIA Study Brief.

11.1.2 The Project Site is situated at the North Apron Area of the former Kai Tak Airport to the northwest of the runway and proximate to existing waterfront areas at Ma Tau Kok. The Kai Tak Airport was the international airport of Hong Kong until 6 July 1998, before being replaced by Chek Lap Kok Airport. Most of the original buildings and structure have been demolished and decontamination of the North Apron Area has been completed. Based on the overlay of 1904 Survey Plan and the Project Site Plan, see **Appendix 11A**, the location of the MPSC Project was previously within an area of sea, with the old Kai Tak Airport situated on totally reclaimed land.

11.1.3 The MPSC Study Area, occupying an area of approximately 28.2 hectares, lies within the footprint of the former Kai Tak Airport and is dissected by a new arterial road (Road D2). According to the EIA Study Brief No. ESB-247/2014, the proposed MPSC development will comprise a main stadium, a public sports ground, an indoor sports centre and other ancillary and supporting facilities such as car parking spaces, hotel, office area for sports-related organizations and commercial area. The proposed components are connected internally via an integrated landscaped deck design, providing access to various major nodes.

11.1.4 The Project elements of relevance to landscape and visual impact assessment on the Project Site include the following:

- The Main Stadium will be located at the south of the site with a capacity of 50,000 seats. It has a proposed height of up to +75mPD and includes a retractable roof. The Main Stadium will be situated close to the waterfront area to enhance its visual prominence as a landmark when viewed from across the Harbour.
- The Public Sports Ground (PSG) will be located at the west of the site and will have 7,000 seats. The height of the PSG will be up to about +36mPD. The PSG is strategically located at the western part of the application site, north of Road D2. The Main Stadium and the PSG are connected to each other via the landscaped deck.
- The Indoor Sports Centre (ISC) will be located at the northeast of the site and is to have 5,400 seats. The height of the ISC will be up to about +40mPD. The ISC is adjacent to the residential developments and open space areas adjacent to the planned Kai Tak MTR Station.
- Office and hotel blocks will be located at the southwest of the site between the Main Stadium and the PSG. The intended gross floor area of offices is approximately 16,000m^2 and the hotel block will have about 300 rooms. The intended heights of

the office and hotel blocks are is up to +43mPD and +50mPD respectively.

- The majority of landscape spaces at the MPSC are located at the east of the site, separating the stadium complex from the planned residential grid development. Visual impact during Operation Phase is intended to be mitigated by the new landscape area.
- Road D2, which is located in the middle of the MPSC and bisects the site into north and south areas. Road D2 will be partially covered by a landscaped deck linking the two areas.
- A landscape deck acts to connect the proposed venues at an upper level. Two major ramps are proposed, connecting the surrounding public circulation areas to the deck.

11.1.5 The implementation programme of the MPSC and related works is as follows:

- The Construction Phase of the Project is targeted for commencement in 2017 and for completion by 2021, a total of 56 months construction period;
- Pre-construction works for the MPSC project, including the topographic survey, tree survey, utility survey and ground investigation, will be completed prior to commencement of the Construction Phase.
- The Operation Phase of the Project shall commence from 2021;
- Both Roads D2 and D3 as well as the junction of D2/D3 would be completed by year 2021.
- Planned development surrounding the Project Site is intended to be undertaken concurrently and be in place by year 2021.

Objective of the LVIA

11.1.6 The objective of the LVIA is to undertake baseline survey and analysis in order to identify critical issues and predict landscape and visual impacts during the Construction and Operation Phases of the Project in accordance with the Study Brief. It identifies, describes and quantifies any potential landscape and visual impacts, evaluates the significance of such impacts on sensitive receivers and proposes measures to avoid or mitigate the significance of any adverse impacts where required.

Scope of the LVIA

11.1.7 The scope of the LVIA assessment includes:

- a definition of the scope and contents of the study, including a description of the assessment methodology;
- a review of the relevant planning and development control framework;
- a baseline study providing a comprehensive and accurate description and identification of the sensitivity of the baseline Landscape Resources, Landscape Character Areas, and Visually Sensitive Receivers (VSRs);
- identification of potential sources of landscape and visual impact during Construction and Operation of the Project;
- identification of the potential landscape and visual impacts and prediction of their

nature, magnitude of change and potential significance, before and after the mitigation measures;

- recommendation of appropriate mitigation measures and associated implementation programmes; and
- An assessment of the acceptability or otherwise of the predicted residual impacts, according to the five criteria set out in Annex 10 of the EIAO-TM.

11.1.8 According to EIA Study Brief Section 3.4.11.2, the Study Area for Landscape Impact Assessment (LIA) shall include areas within 500 m distance from the boundary of the Project Site and is shown in **Figure 11-1-1**, while the Study Area for Visual Impact Assessment (VIA) shall be defined by zones of visual influence and are shown in **Figure 11-4-7**.

11.2 Criteria and Methodology

General

11.2.1 The following legislation, standards and guidelines are applicable to the evaluation of landscape and visual impacts associated with the construction and operation of the Project.

Environmental Legislation, Standards and Guidelines

11.2.2 The LVIA makes reference to the following for preparation of the EIA submission;

- The requirements as stated in Appendix G of the Study Brief No. ESB-274/2014,
- Environmental Impact Assessment Ordinance, Cap.499 Guidance Note No. 8/2010,
- Annex 10 and Annex 18 to the Technical Memorandum (TM) on Environmental Impact Assessment Process.
- Town Planning Board Guidelines (TPB PG-No. 41)
- Study on Landscape Value Mapping of Hong Kong
- Hong Kong Planning Standards and Guidelines particularly Chapter 4 : Recreation, Open Space and Greening, Chapter 10 Conservation and Chapter 11: Urban Design Guidelines;
- Forests and Countryside Ordinance (Cap. 96);
- Town Planning Ordinance (Cap. 131);
- Plant Varieties Protection Ordinance (Cap 490).
- Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586);
- Agriculture, Fisheries and Conversation Department Nature Conservation Practice Note No. 01, 02 (Rev. Jun 2006) and 03;
- Agriculture, Fisheries and Conversation Department Publication “Checklist of Hong Kong Plants 2004”;
- Agriculture, Fisheries and Conversation Department Publication “Rare and Precious Plants of Hong Kong 2003”;

- “Guidelines on Tree Preservation during Development”, GLTMS of DEVB-Website
- “Guidelines on Tree Transplanting”, GLTMS of DEVB-Website
- DEVB TC No.7/2015 - Tree Preservation;
- DEVB TC No. 6/2015 - Maintenance of Vegetation and Hard Landscape Features;
- DEVB TC No.3/2012 – Site Coverage of Greenery for Government Building Projects;
- ETWB TCW No. 29/2004 – Registration of Old and Valuable Trees, and Guidelines for their Preservation;
- ETWB TCW No. 2/2004 – Maintenance of Vegetation and Hard Landscape Features;
- ETWB TCW No. 34/2003 – Community Involvement in Greening Works
- Requirements for Handover of Vegetation to HyD (2012 version);
- General Requirements of Roadside Landscaped Areas to be Handed Over to LCSD for Maintenance.
- WBTC No. 7/2002 – Tree Planting in Public Works;
- Land Administration Office Instruction (LAOI) Section D-12 – Tree Preservation;
- British and European Standard BS EN 12464-2:2014 “Lighting of Work Places Part 2: Outdoor Work Places”
- British and European Standard BS EN 12193:2007 “Light and lighting. Sports lighting"
- Guidelines on Industry Best Practices for External Lighting Installations
- CIE 112-1994 “Glare Evaluation System for Use within Outdoor Sports and Area Lighting”

11.2.3 Reference has been made to the following Outline Zoning Plans from Town Planning Board:-

- Approved Wang Tau Hom and Tung Tau Outline Zoning Plan No. S/K/8/21 (October 2011);
- Approved Hung Hom Outline Zoning Plan No. S/K9/24 (October 2010)
- Draft Ma Tau Kok Outline Zoning Plan No. S/K10/22 (April 2016)
- Approved Tsz Wan Shan, Diamond Hill and San Po Kong Outline Zoning Plan No. S/K11/28 (March 2015)
- Approved Ngau Chi Wan Outline Zoning Plan No. S/K12/16 (November 2004)
- Draft Ngau Tau Kok and Kowloon Bay Outline Zoning Plan No. S/K13/28 (April 2014)
- Approved Kwun Tong (South) Outline Zoning Plan No. S/K14S/20 (August 2015)
- Approved Kai Tak Outline Zoning Plan No. S/K22/4 (September 2012)

Landscape Policy Issues and Designations

11.2.4 Reference has been made to the following plans and studies:-

- The latest RODP (Ref. WP019-04) dated December 2013 by AECOM;
- Technical study on increasing the development density in Kai Tak Planning Review Report(Final) Rev.1 August 2014;
- Kai Tak Development Environmental Impact Assessment Report (No. AEIAR-130/2009);
- Kai Tak Multi-purpose Sports Complex - Project Profile (No. PP-509/2014).

Criteria

11.2.5 Landscape and visual impacts have been assessed separately for the Construction and Operation Phases. Landscape and visual impacts are assessed against four criteria, namely:-

- All direct and indirect impacts on existing/planned/approved land use and on further outlook;
- Impacts on Landscape Resources (the physical and cultural components of the landscape);
- Impacts on Landscape Character (the aggregate impression created by a combination of resources); and
- Impacts on Visually Sensitive Receivers (those people who will see the Project).

11.2.6 The landscape and visual impact analysis contains the following;

- Baseline identification of existing/planned/approved land use condition
- Identification of the impact on existing/planned/approved land use condition;
- Baseline identification of sensitive receivers (resources, character areas and those in the zone of visual influence) and their sensitivity;
- Identification of the source of landscape and visual impact including the extent and typed of impact;
- Assessment of landscape and visual impacts and their magnitude of change during both Construction and Operation Phases;
- Identification of landscape and visual mitigation and enhancement measures;
- Identification of potential cumulative impacts;
- Assessment of the significance of landscape and visual impacts before mitigation; and
- Assessment of the significance of residual landscape and visual impacts during Construction and at Day 1 and Year 10 of Operation.

11.3 Landscape Impact

11.3.1 The assessment of landscape impacts are analysed and evaluated separately for the Construction and Operation Phases. The assessment of landscape impacts involves the following procedures:-

- Identification of the Baseline Landscape Resources (LRs) and Landscape Character Areas (LCAs) within the Study Area.
- Assessment of the Sensitivity of the Landscape Resources and the Landscape Character Areas.
- Identification of Potential Sources of Landscape Change.
- Identification of the Magnitude of Landscape Change.
- Identification of Potential Landscape Mitigation and Enhancement Measures.
- Assessment of the Significance of Landscape Impacts Before and After the Implementation of Mitigation and Enhancement Measures.

11.3.2 Identification *of the Baseline Landscape Resources (LRs) and Landscape Character Areas (LCAs) within the Study Area.* This is achieved by site visit and desktop study of topographical maps, information databases and aerial photographs.

11.3.3 Assessment *of the Sensitivity of the Landscape Resources and the Landscape Character Areas.* This is achieved by desktop study of Landscape Value Mapping of Hong Kong and other relevant information. This is influenced by a number of factors including:-

- whether the LRs / LCAs are considered to be of local, regional, national or global importance;
- statutory or regulatory limitations / requirements relating to the LRs / LCAs;
- quality and maturity of the LRs / LCAs;
- rarity of the LRs / LCAs; and
- ability of the LRs / LCAs to accommodate change.

11.3.4 The sensitivity of each Landscape Resource and Character Area is classified as follows:

High:	Important landscape or landscape resource of particularly distinctive character or high importance, sensitive to relatively small changes
Medium:	Landscape or landscape resource of moderately valued landscape characteristics reasonably tolerant to change
Low:	Landscape or landscape resource, the nature of which is largely tolerant to change

11.3.5 Identification *of Potential Sources of Landscape Change.* These are the various elements of the construction works and operational procedures that would generate landscape change.

11.3.6 Identification *of the Magnitude of Landscape Change.* The magnitude of the change depends on a number of factors including the physical extent of the change, the compatibility of the Project with the surrounding landscape, the duration of impact and the reversibility of change. Landscape changes have been quantified wherever possible. The magnitude of landscape change is classified as follows:

Large:	The landscape or landscape resource would suffer a major change
Intermediate:	The landscape or landscape resource would suffer a moderate change
Small:	The landscape or landscape resource would suffer slight or barely perceptible changes
Negligible:	The landscape or landscape resource would suffer no discernible change

11.3.7 Identification *of Potential Landscape Mitigation and Enhancement Measures.* These may take the form of:

- minimization of works areas, temporary construction;
- adopting alternative designs or revisions to the basic engineering and architectural design to prevent and/or minimise adverse impacts;
- measures such as colour and textural treatments of building features; and
- compensatory measures such as the implementation of landscape design to compensate for unavoidable adverse impacts and to attempt to generate potentially beneficial long term impacts.

A programme for the mitigation measures is provided and discussed from **Sections 11.9.23** to **11.9.27**. The agencies responsible for the funding, implementation, and maintenance of the mitigation measures are proposed in **Tables 11-22** and **11-23**.

11.3.8 Assessment *of the Significance of Landscape Impacts Before and After the Implementation of Mitigation and Enhancement Measures.* By synthesising the magnitude of the various changes and the sensitivity of the various Landscape Resources it is possible to categorise impacts in a logical, well-reasoned and consistent fashion. **Table 11-1** shows the rationale for dividing the degree of significance into four thresholds, namely insubstantial, slight, moderate, and substantial, depending on the combination of a negligible-small-intermediate-large magnitude of change and a low-medium-high degree of sensitivity of the LRs / LCAs. The significance thresholds are defined as follows:

Substantial:	*Adverse / Beneficial* impact where the proposal would cause significant deterioration or improvement in existing landscape quality.
Moderate:	*Adverse / Beneficial* impact where the proposal would cause a noticeable deterioration or improvement in existing landscape quality.

Slight: *Adverse / Beneficial* impact where the proposal would cause a barely perceptible deterioration or improvement in existing landscape quality.

Insubstantial: No discernible change in the existing landscape quality.

Table 11-1 Relationship between Receptor Sensitivity and Impact Magnitude in Defining Impact Significance

Impact Significance		**Receptor Sensitivity (Landscape Resource or VSR)**		
		Low	**Medium**	**High**
Magnitude of Change relative to baseline conditions due to the Project	**Large**	Moderate	Moderate / Substantial	Substantial
	Intermediate	Slight / Moderate	Moderate	Moderate / Substantial
	Small	Slight	Slight / Moderate	Moderate
	Negligible	Insubstantial	Insubstantial	Insubstantial

11.4 Visual Impact

11.4.1 The visual impacts are analysed and evaluated separately for the Construction and Operation Phases. The assessment of visual impacts involved the following procedures:

- Identification of the Zone of Visual Influence (ZVI) during the Construction and Operation Phases of the Project;
- Identification of the Visually Sensitive Receivers (VSRs) within the ZVI at Construction and Operation Phases;
- Assessment of the degree of sensitivity to change of the VSRs;
- Identification of the relative numbers of VSRs;
- Identification of potential sources of visual impacts;
- Assessment of the potential magnitude of visual change;
- Identification of potential visual mitigation and enhancement measures; and
- Prediction of the significance of visual impacts before and after the implementation of the mitigation measures.

11.4.2 *Identification of the Zone of Visual Influence (ZVI) during the Construction and Operation Phases of the Project*. This is achieved by site visit and desktop study of topographic maps and photographs, and preparation of cross-sections to determine visibility of the works from various locations.

11.4.3 *Identification of the Visually Sensitive Receivers (VSRs) within the ZVI at Construction and Operation Phases.* These are the people who would reside, work or take leisure within, or travel through, the ZVI. Both existing VSRs and those within committed development are considered in this assessment. As the MPSC lies on the visual corridor of Kai Tak Development, sensitive receivers for visual impact are identified through review of visual viewpoints according to:

- strategic viewpoints in Hong Kong;
- district viewpoints specified in the OZP for Kai Tak Development; and
- local sensitive receivers based on reciprocal views identified from the MPSC site.

The *Strategic* viewpoints within the visual envelope are considered based on **Appendix 11C** of the Study on Urban Design Guidelines for Hong Kong and other relevant studies.

Viewpoints at *District* level are identified based on the Urban Design Framework shown in **Appendix 11B** and/or any relevant planning brief and studies, including those of the Kai Tak Development.

Local sensitive receivers are identified from survey mapping, direct field observation and panoramic photographs taken from MPSC; existing sensitive receivers are selected from the panoramic photographs while planned sensitive receivers are incorporated based on the OZP.

11.4.4 *Assessment of the Degree of Sensitivity to Change of the VSRs.* Factors considered include:

- the type of VSRs, classified according to whether the person is at home, at work, at play, or travelling. Those who view the impact from their homes are considered to be highly sensitive as the attractiveness or otherwise of the outlook from their home will have a substantial effect on their perception of the quality and acceptability of their home environment and their general quality of life. Those who view the impact from their workplace are considered to be only moderately sensitive as the attractiveness or otherwise of the outlook will have a less important, although still material, effect on their perception of their quality of life. The degree to which this applies depends on whether the workplace is industrial, retail or commercial. Those who view the impact while taking part in an outdoor leisure activity may display varying sensitivity depending on the type of leisure activity. Those who view the impact while travelling on a public thoroughfare will also display varying sensitivity depending on the speed of travel; and
- other factors which are considered (as required by EIAO GN 8/2010) include the value and quality of existing views and views from planned developments, the availability and amenity of alternative views, the duration or frequency of view, and the degree of visibility.

11.4.5 *Classification of the Sensitivity of VSRs.* Classification is as follows:

High:	The VSR is highly sensitive to any change in their viewing experience
Medium:	The VSR is moderately sensitive to any change in their viewing experience
Low:	The VSR is only slightly sensitive to any change in their viewing experience

11.4.6 *Identification of the Relative Numbers of VSRs.* This is expressed in terms of whether there are very few, few, many or very many VSRs in any one category of VSR.

11.4.7 *Identification of Potential Sources of Visual Impact.* These are the various elements of the construction and operation that would generate visual impacts.

11.4.8 *Assessment of the Potential Magnitude of Visual Change.* Factors considered include:

- the compatibility with the surrounding landscape;
- the duration of the impact;
- the reversibility of the impact;
- the scale of the impact and distance of the source of impact from the viewer; and
- the degree of visibility of the impact, and the degree of which the impact dominates the field of vision of the viewer.

11.4.9 *Classification of the Magnitude of Visual Change.* Classification is as follows:

Large:	The VSRs would suffer a major change in their viewing experience;
Intermediate:	The VSRs would suffer a moderate change in their viewing experience;
Small:	The VSRs would suffer a small change in their viewing experience;
Negligible:	The VSRs would suffer no discernible change in their viewing experience.

11.4.10 *Identification of Potential Visual Mitigation and Enhancement Measures.* These may take the form of adopting alternative designs or revisions to the basic engineering and architectural design to prevent and/or minimise adverse impacts; remedial measures such as colour and finishing treatment of building features; and compensatory measures such as the implementation of landscape design measures (e.g. tree planting, creation of new open space etc.) to compensate for unavoidable adverse impacts and to attempt to generate potentially beneficial long term enhancements. A programme for the mitigation measures is provided whilst the agencies responsible for the funding, implementation, management and maintenance of the mitigation measures are identified and their approval-in-principle sought.

11.4.11 Photomontages or computer simulation of viewpoints have been prepared to evaluate the visual impacts with respect to both magnitude and view quality according to Clause 3(iii) in Appendix D of the EIA Brief. In the case when the planned developments have not yet been completed, or access to the sensitive receivers is not available, computer simulation has been prepared based on planned development. Photomontages at representative locations provide comparison between existing views; proposals on Day 1 after completion without mitigation; on Day 1 after mitigation, and in Year 10 after mitigation.

11.4.12 *Prediction of the Significance of Visual Impacts Before and After Implementation of Mitigation and Enhancement Measures.* By synthesising the magnitude of the various visual changes and the sensitivity of the VSR, and the number of individuals in the VSR that are affected, it is possible to categorise the degree of significance of the impacts in a logical, well-reasoned and consistent fashion. **Table 11-1** shows the rationale for dividing the degree of significance into four thresholds, namely, insubstantial, slight, moderate and substantial, depending on the combination of a negligible / small / intermediate / large magnitude of change and a low / medium / high degree of sensitivity of VSRs. Consideration is also given to the relative numbers of individuals in the VSRs in predicting the final impact significance - exceptionally low or high numbers of individuals in a VSR may change the result that might otherwise be concluded from a consideration of the type of the VSRs alone.

11.4.13 The significance of the visual impacts is categorised as follows:-

Substantial:	Adverse / beneficial impact where the proposal would cause significant deterioration or improvement in existing visual quality perceived by the general population;
Moderate:	Adverse / beneficial impact where the proposal would cause a noticeable deterioration or improvement in existing visual quality perceived by the general population;
Slight:	Adverse / beneficial impact where the proposal would cause a barely perceptible deterioration or improvement in existing visual quality perceived by the general population.
Insubstantial:	No discernible change in the existing landscape quality perceived by the general population.

11.5 Glare Impact

11.5.1 Glare is defined in *BS EN 12464-2:2014 Lighting of Work Places - Part 2: Outdoor Work Places* as follows: The sensation produced by bright areas within the field of view of an observer, which can result in one of the following psycho-physical effects:-

- Discomfort Glare – this results in discomfort but without impairing the vision of objects and details.
- Disability Glare – this impairs the vision of objects without necessarily causing discomfort.

11.5.2 Glare caused by reflections in specular surfaces is usually known as veiling reflections or reflected glare. It is important to limit the glare to the users to avoid errors, fatigue and accidents.

11.5.3 Glare impact depends on various factors including type and intensity of the light source, angle of view, distance, the presence and intensity of other background light sources. A qualitative approach will be used in this study to consider possible impacts to the VSRs.

11.5.4 The degree of glare is dependent on the total veiling luminance caused by the lighting installation (L_{vl}) and the equivalent veiling luminance of the environment in front of the observer (L_{ve}).

The level of glare for outdoor lighting installation can be objectively assessed using the International Commission on Illumination's (CIE's) Glare Rating system (Glare Rating system) detailed in *BS EN 12464-2:2014*, which is defined as:-

Glare Rating (GR) = $27 + 24 \log_{10} (L_{vl}/ L_{ve}^{0.9})$

L_{vl} = Total Veiling Luminance from all luminaries = $\sum 10 (E_{eye} / \theta^2)$

L_{ve} = Equivalent veiling luminance of the environment = $0.035\, \rho\, E_{hav} / \pi$

Where

- E_{eye} is the luminance at the observer's eye in a plane perpendicular to the line of sight, in lux, $E_{eye} = (I \cos\Phi \tan\Phi)/d^2$
- $\theta$is the angle between the observer's line of sight and the direction of the light incident from the individual luminaries
- $\Phi$is angle between vertical plane of observer's line of sight and the direction of the light incident from the individual luminaries from the individual luminaries
- I is light source intensity in the direction of observer, in cd
- d is the straight line distance between the source and the observer
- E_{hav} represents the average horizontal luminance of the area, in lux, $E_{hav} = (I \cos\Phi)/d^2$
- ρ represent the average reflectance of the area assuming diffuse reflection. Since these areas have a high percentage of built development, an average reflectance would be appropriate for the calculation of Glare Rating. For the purpose of this assessment a Reflectance ρ of 0.2 for is used for lawn, 0.8 for building surface and 0.8 for water surface.

11.5.5 To calculate the glare rating, the CIE's standard observer is used for this assessment (see **Appendix 11F**). The Glare Rating system is related to the visual comfortable level. In general, the higher the GR the greater will be the visual discomfort. **Table 11-2** below provide a subjective description of glare evaluation using the Glare Rating system:

Table 11-2 A Subjective Interpretation of the CIE's Glare Rating System

Glare Rating GR	**Descriptive Criteria**
90	Unbearable
70	Disturbing
50	just admissible
30	Noticeable
10	Unnoticeable
Source: CIE's Technical Report 112-1994	

11.5.6 Assessment Criteria

BS EN 12193:2007 "Light and Lighting. Sports Lighting" provides recommendations for Glare Rating Limits (GRL) for various areas, tasks and activities, which are ranging from GR of 50 to 55. Typical GRL extracted from the Standard for various areas, tasks and activities similar to those in the MPSC are listed in **Table 11-3** below for information.

Table 11-3 Limiting GRL Value for Lighting Installations

Type of Area, Task, or Activity	**GRL**
Outdoor track 400 m and field for Athletics (all activities)	50 to 55
Baseball	50 to 55
Cricket	50 to 55
Tennis	50 to 55
Cycle racing	50 to 55
American football	50 to 55
Fistball	50 to 55
Handball	50 to 55
Volleyball	50 to 55
Rugby	50 to 55

Based on the above guidelines, a GRL of 50 is adopted for this MPSC project.

11.6 Acceptability of Impacts

11.6.1 An overall assessment is made of the acceptability or otherwise of the residual impacts according to the five criteria set out in Annex 10 of the EIAO-TM.

11.6.2 It is assumed that the funding, implementation, management and maintenance agencies of the mitigation and enhancement measures can be satisfactorily resolved according to the principles in ETWB TCW No. 2/2004. All mitigation and enhancement measures in this report are practical and achievable within the known parameters of funding, implementation, management and maintenance agency. The suggested agencies for the funding and implementation (and subsequent maintenance, if applicable) are indicated in **Tables 11-22** and **11-23.** Approval-in-principle to the implementation and maintenance of the proposed mitigation measures is currently being sought from the appropriate authorities.

11.6.3 According to Annex 10 of EIAO-TM, the evaluation of landscape and visual impacts may be classified into five levels of significance based on type and extent of the effects concluded in the EIA study:

- The impact is **beneficial** if the project will complement the landscape and visual character of its setting, will follow the relevant planning objectives and will improve overall and visual quality;
- The impact is **acceptable** if the assessment indicates that there will be no significant effects on the landscape, no significant visual effects caused by the appearance of the project, or no interference with key views;
- The impact is **acceptable** with mitigation measures if there will be some adverse effects, but these can be eliminated, reduced or offset to a large extent by specific measures;

- The impact is **unacceptable** if the adverse effects are considered too excessive and are unable to mitigate practically;
- The impact is **undetermined** if significant adverse effects are likely, but the extent to which they may occur or may be mitigated cannot be determined from the study. Further detailed study will be required for the specific effects in question.

11.7 Review of Planning and Development Control Framework

Planning Review

11.7.1 This section provides an overview of Government's development intentions of the Study Area, specifically from a landscape planning standpoint. The existing and planned development framework surrounding the Project Area has been reviewed to identify any potential conflicts with intended planned land uses, as well as to ensure a high compatibility between the proposed works and the surroundings. Both statutory and non-statutory plans and studies relevant to the Project have been considered and mapped in order to identify the Project limitations in landscape planning terms.

Review of Recommended Outline Development Plan (Ref. WP019-04) and Approved Kai Tak Outline Zoning Plan NO.S/K22/4

11.7.2 Planning Department commissioned the Kai Tak Planning Review (KTPR) in July 2004. It was tasked to formulate a Preliminary Outline Development Plan (PODP) for the Kai Tak Development, with "no reclamation" as the starting point and to facilitate public participation in the process. The KTPR had proceeded with extensive public engagement activities under the objective of "Planning with the Community" to help build up public consensus on the development proposals. The approved Kai Tak OZP No. S/K22/4 was exhibited on 14 September 2012. The RODP in this report is prepared based on the approved Kai Tak OZP No. S/K22/4.

11.7.3 The Project Site, which is zoned "Other Specified Uses" and "Open Space" covers an area of 28.2 hectares at general ground level of +5mPD. It is currently predominantly vacant land, used for temporary works areas, car parks and storage, located in the North Apron Area in the Kai Tak Development. Under the Kai Tak Outline Zoning Plan S/K22/4, place of recreation, sports or other culture is specified in Column 1 of explanatory notes as always permitted uses.

Review of Technical Study on Increasing the Development Density in Kai Tak Planning Review Report (Final) Rev.1 August 2014

11.7.4 The planning intention of Kai Tak Development (KTD) is to develop a "distinguished, attractive, vibrant and people-oriented community by the Victoria Harbour". Key components include a cruise terminal, a multiple-purpose stadium complex, government offices, institutional and community facilities, hospitals, open spaces, public rental housing and residential / commercial developments.

11.7.5 Following the new initiatives promulgated in the 2013 Policy Address, the possibility of increasing the office and housing supply in the KTD Area was to be reviewed and explored. The Consultant was therefore tasked to conduct a feasibility study to identify and address possible implications that would arise from an increase in the development density of KTD. In general, the proposed increase in the development density will not have a significant adverse impact on the urban, townscape and landscape design concepts and guidelines that have been applied to KTD.

Review of Planning Study on the Harbour and its Waterfront Areas

11.7.6 The Planning Study on the Harbour and its Waterfront Areas Report (2003) suggested that urban design and landscape should aim at enhancing visual relief provided by the Harbour, protecting the Harbour setting, providing easy pedestrian access to the waterfront and encouraging variety and visual excitement.

Review of Stage II Study on Review of Metroplan and the Related Kowloon Density Study Review (2003)

11.7.7 Review of Stage II Study on Review of Metroplan and The Related Kowloon Density Study Review (2003) aims at establishing a coherent planning policy statement based on the findings of previous studies, as well as reviewing and updating the land use-transport-environmental framework for the Metro Area up to the year 2016. The Metroplan advocates construction of a cruise terminal, aviation museum, retail, leisure and entertainment uses, hotels and promenade, as part of the South East Kowloon Development (i.e. Kai Tak Development). The South East Kowloon Development is planned to accommodate public and private housing with associated community facilities. Other major facilities within the overall development include a metropolitan park and an international sports stadium. A comprehensive pedestrian circulation framework is proposed to integrate the South East Kowloon district with the existing open space and streetscape framework. It is considered that the proposed Kai Tak Development and associated works follows and further reinforces the aims of Metroplan.

Review of Planned Developments Adjacent to the Project Site

11.7.8 Related projects are as follows. The position of their work close to the Project Site can be identified on **Figure 11-3-1** and their potential impact is discussed in detail from **Section 11.7.9** to **Section 11.7.39**.

- Kai Tak Development (KTD) – Metro Park;
- Kai Tak Development (KTD) – Station Square;
- Kai Tak Development (KTD) – Dining Cove;
- Kai Tak Development (KTD) – The planned residential and commercial use adjacent to MPSC;
- Kai Tak Development (KTD) – Sung Wong Toi Park;
- Roads D2 and D3 which are managed by CEDD and are under a separate EIA approval;
- Central Kowloon Route (CKR) at the South; and
- Shatin to Central Link (SCL) at the North.

Existing Planning Framework

11.7.9 The extent of the planning control framework within the overall Study Area (500m) is shown in **Figure 11-3-1** and summarised in **Table 11-4** below.

Table 11-4 Schedule of Administrative Planning Zones in 500m Study Area

Ref	Landscape Resources	Study Area (m^2)
Existing Developments		
R	Residential	169,047
G/IC	Government / Institution / Community	86,098
O	Open Space	37,703
OU	Other Specified Uses	29,228
CDA	Comprehensive Development Area	50,527
Planned Developments		
R	Residential	165,146
G/IC	Government / Institution / Community	120,629
O	Open Space	463,900
OU	Other Specified Uses	72,647
CDA	Comprehensive Development Area	96,205
OU(S)	Other Specified Uses (Stadium)	209,279
C	Commercial	23,606

Residential (Existing)

11.7.10 Existing residential areas include: (i) Parts of Kowloon City; (ii) Chun Seen Mei Chuen; (iii) Sky Tower; (iv) Ma Tau Wai Estate; (v) Grand Waterfront; (vi) parts of residential development in Ma Tau Kok; and (vii) The Latitude.

11.7.11 These zones are intended primarily for high-density residential development. Commercial uses are always permitted on the lowest three floors of a building or in the purpose-designed, non-residential portion of an existing building.

Residential (Planned)

11.7.12 Planned Residential areas include: (i) the zones fronting Station Square and to the northeast of the Stadium area; and (ii) the zones located to the northwest of the Stadium area.

11.7.13 These zones are intended primarily for medium-density residential development based on a grid pedestrian street pattern. Retail frontage along the side of the site abutting the open space is provided to enhance vibrancy of the open space. Residential development in the Grid Neighbourhood area should comprise podium-free residential towers and low blocks to achieve diversity in building mass/form for a more interesting building height profile in the area.

Government / Institution / Community (Existing)

11.7.14 Existing G/IC areas include: (i) Robert Black Health Centre at Prince Edward Road

East; (ii) various religious institutions and primary and secondary schools at Prince Edward Road East; (iii) Divisional Fire Station and Ambulance Depot at Shing Tak Street; (iv) The Hong Kong Society For The Blind Workshop And Hostel at Mok Cheong Street; (v) Hong Kong Aviation Club; (vi) Cattle Depot Artist Village; (vii) Kowloon City Ferry Pier Bus Terminus; and (viii) EMSD Headquarters.

11.7.15 These zones are intended primarily for the provision of governmental, institutional or community facilities serving the needs of the local residents and/or a wider district, region or the territory. It is also intended to provide land for uses directly related to, or in support of, the work of the Government, organizations providing social services to meet community needs, and other institutional establishments.

Government / Institution / Community (Planned)

11.7.16 Planned G/IC areas include:- (i) the "G/IC" site along Road D1; (ii) the "G/IC" site abutting Road D2 which is designated for the DSD Desilting Compound and Electricity Sub-station (ESS); (iii) the "G/IC" site to the south of Kwun Tong Bypass in the South Apron corner; (iv) the "G/IC" sites near Road D2 on each side of Kai Tak River, (v) the "G/IC" site near Ma Tau Kok waterfront.

11.7.17 These zones are intended primarily for the provision of governmental, institutional or community facilities serving the needs of the local residents and/or a wider district, region or the territory. It is also intended to provide land for uses directly related to or in support of, the work of the Government, organizations providing social services to meet community needs, and other institutional establishments.

Open Space (Existing)

11.7.18 Existing open space areas include:- (i) To Kwa Wan Recreation Ground; (ii) Sacred Hill; (iii) Sung Wong Toi Playground; (iv) Argyle Street Park Playground; (v) Olympic Garden; (vi) Shek Ku Lung Road Playground; and (vii) Tak Ku Ling Road Rest Garden.

11.7.19 These zones are intended primarily for the provision of outdoor open-air public space for active and/or passive recreational uses serving the needs of local residents as well as the general public.

Open Space (Planned)

11.7.20 Planned open space within the Kai Tak Development is intended primarily for the provision of outdoor open-air public space for active and/or passive recreational uses serving the needs of local residents as well as the general public. This includes *regional, district* and *local* open spaces.

11.7.21 Regional open space is the large-scale open space to serve the recreation needs of tourists, visitors and the local residents as well as the territory.

- The proposed Sung Wong Toi Park located along the western of the MPSC area will accommodate Sung Wong Toi Inscription Rock and a landscape vista looking towards the waterfront promenade of the Dinning Cove.
- The Station Square around the proposed SCL Kai Tak Station will form a contemporary park with cafes and restaurants serving as a gateway of Kai Tak.
- The open spaces around the Stadium site will provide space for dispersal of

spectators and serve additional leisure purpose for the public during non-event days. Part of the site formation level of the Stadium site will be raised to facilitate integration of the main and secondary stadiums as well as to maintain continuity of open space network. The open space in between the Stadium site and Road D3 also functions as a view corridor to Lion Rock.

- The waterfront promenade generally with 20m to 35m in width is planned to form a continuous traffic free pedestrian green connector within the landscape design framework in Kai Tak Development.

11.7.22 District open space is to provide green corridors optimising the pedestrian environment and flow between residential areas, open space and surrounding areas

11.7.23 Local open space is also provided between the residential zones to add amenity to the neighbourhood and to enhance living environment.

11.7.24 The zone “O (landscaped deck)” between the “OU (Stadium)”zones will function as connection points for the Main Stadium and Public Sports Ground which will facilitate a smooth pedestrian flow from the deck level of the Stadium down to the Metro Park.

Other Specified Uses (Existing)

11.7.25 The existing Hong Kong International Trade and Exhibition Centre located near the junction of Kai Cheung Road and Kai Fuk Road is zoned “OU”. This zone is intended primarily for exhibition and ancillary commercial uses.

11.7.26 The Kowloon City Ferry Pier is zoned “OU”. This zone is primarily to provide land intended for a pier.

Other Specified Uses (Planned)

11.7.27 A site at the western end of the curvilinear landscaped elevated walkway is zoned “OU” annotated “Arts and Performance Related Uses”. This zone is intended primarily for arts and performance related uses with a platform above for public viewing as well as outdoor performance.

11.7.28 The “OU” annotated “Landscaped Elevated Walkway” zones will become part of the comprehensive pedestrian network, providing a north-south connection from San Po Kong to the Kai Tak City Centre and an east-west connection from Kowloon Bay and Kwun Tong to the South Apron.

11.7.29 The “OU” zones in the vicinity of the proposed SCL Kai Tak Station are intended primarily for mixed non-industrial land uses. Flexibility for the development/redevelopment/conversion of residential or other uses, or a combination of various types of compatible uses including commercial, residential, educational, cultural, recreational and entertainment uses, either vertically within a building or horizontally over a spatial area, is allowed to meet changing market needs. Physical segregation is to be provided between the non-residential and residential portions within a new/converted building to prevent non-residential uses from causing nuisance to the residents.

11.7.30 The proposed SCL Kai Tak Station located at the focus of Kai Tak City Centre is zoned “OU” annotated “Railway Station with Commercial Facilities”. This zone is primarily intended for the provision of railway station with commercial facilities.

11.7.31 A site at the east of the MPSC development is zoned "OU" annotated "Tunnel Ventilation Shaft". This zone is intended primarily for tunnel ventilation shaft use.

11.7.32 The sites at the Ma Tau Kok waterfront and near MPSC development are zoned "OU" annotated "Waterfront Related Commercial, Cultural and Leisure Uses". This zone is intended for the provision of commercial, cultural and leisure uses at the waterfront area so as to create dinning cove and more vibrant environment.

Comprehensive Development Area (Existing)

11.7.33 Existing CDA areas include:- the sites bounded by Sung Wong Toi Road; Kowloon City Road; Ma Tau Kok Road; and To Kwa Wan Road.

11.7.34 These zones are intended to facilitate the appropriate planning control over development mix, scale, design and layout, taking account of the various environmental, traffic, infrastructure and other constraints.

Comprehensive Development Area (Planned)

11.7.35 Along the waterfront promenade, the planning intention for the area designated "CDA" is for a comprehensive development/redevelopment of the area for residential and/or commercial uses with the provision of waterfront promenade, open space and other supporting facilities.

11.7.36 Along the Kai Tak River, the planning intention for areas designated "CDA" is for commercial use with a lower structure cascading down to the open spaces along the Kai Tak River.

11.7.37 Along the Lung Tsun Stone Bridge, the planning intention for areas designated "CDA" is to ensure their disposition and design would be in harmony with the Preservation Corridor for Lung Tsun Stone Bridge.

Other Specified Uses (Stadium)

11.7.38 The majority of the area within the Study Area is zoned as *"OU (Stadium)"*. This zone is intended primarily for the provision of a multi-purpose stadium complex including a main stadium, a public sports ground and an indoor sports ground and other leisure and recreation facilities. Adjacent open space "O" zone will form part of the stadium complex to support the sports facility including the associated public transport terminus.

Commercial (Planned)

11.7.39 Planned Commercial areas include the area located along Road D1 to Sung Wong Toi Park.

11.7.40 These zones are intended primarily for commercial developments, which may include uses such as office, shop, services, place of entertainment, eating place and hotel, functioning as territorial business/financial centre and regional or district commercial/shopping centre. These areas are usually major employment nodes.

Potential Conflicts with Planning Framework

11.7.41 It is considered that the proposed project would be fully in accordance with the planning goals and objectives for the Study Area.

11.8 Baseline Condition

Landscape Resources

11.8.1 Physical Landscape Resources are the natural components of the landscape and include geology, topography, soils, vegetation and hydrological features. Human and cultural Landscape Resources cover a wide swath of human interaction with the land including settlement patterns, religion, medicine, economics, education and local customs. Each Landscape Resource possesses a varying sensitivity to development. Landscape Resources within the Study Area are described broadly below and are shown on **Figure 11-4-1** with the sensitivity of each summarised in **Table 11-6**. In accordance with the Study Brief, resources have been assessed within a 500m distance limit from the Project Area.

Physical Landscape Resources

Geology

11.8.2 The Study Area is made up completely from fill material to +4.9mPD, laid for the original 1922 Kai Tak reclamation.

Soils

11.8.3 The Study Area is the former Kai Tak Airport which primarily consists of concrete surfacing. Pockets of imported topsoil related to minor planting works following closure of the airport cannot any longer be identified in the current redevelopment area.

Topographic Features

11.8.4 The reclamation was until recently completely flat and hard surfaced. Currently the site is undergoing site formation for a number of development projects and contains temporary earth mounds and excavations.

Hydrological Features

11.8.5 Adjacent to the MPSC, within Kowloon Bay at the eastern portion of Victoria Harbour are the To Kwa Wan and Kwun Tong Typhoon Shelters. Victoria Harbour is a unique public asset and natural heritage of Hong Kong. Its preservation is for the benefit of the current generation as well as those of future.

11.8.6 The Kai Tak Nullah runs through the Study Area and discharges ultimately to Kowloon Bay. The Kai Tak Nullah currently has little inherent landscape value, though beautification works will be carried out in the near future.

11.8.7 No natural water systems exist in the development area. Temporary construction channels and water holding ponds can be found as part of the site formation works.

Vegetation

11.8.8 The Project area and surrounding land is in transitional mode, having been cleared for many years, undisturbed areas are now reverting to a natural state and are characterized by tall grass species, and cover by the invasive weed tree *Leucaena leucocephala*. A Broad Brush Tree Survey within the 500m study boundary has been carried out and results shown in **Appendix 11E**. The Tree Survey Report is presented in **Appendix**

11D. There are more than 2,000 no. trees within the Study Area, of which 159 no. are within the Project Site and identified as being affected by the proposed works and in conflict with programmed activities. These are required to be removed. Of these, 101 no. were identified as *Leucaena leucocephala*.

11.8.9 There are no Registered Old and Valuable Trees in the Project Area.

Human & Cultural Landscape Resources

Residual Areas of Kai Tak Airport

11.8.10 The MPSC development and much of its surroundings are within the former Kai Tak Airport. After closure of the airport, the ground has been occupied by various temporary uses such as public fill banks, bus depots, car sales exhibitions, and recreational grounds. Most of the buildings and structures within the former airport site have been cleared, however the remaining features include:-

- Yet to be removed traces of the hard-standing from the airport runway and apron. These are being used as temporary vehicle parking areas.
- The Hong Kong Aviation Club Buildings were first built in 1958 and then subsequently expanded in 1974. They consist of a hangar, workshops and club building. The buildings were formerly part of the Far East Flying Training School and were sold to the Aviation Club in 1983. The Far East Flying Training School was established in 1943 and moved to the Sung Wong Toi Road in 1958. The Aviation Club Buildings will be preserved under the KTD proposed development.
- The historic extent of the airport reclamation area is defined by the seawall formed within Kowloon Bay
- Ongoing construction activities across the whole airport area mean that much of the Study Area is in a constant state of flux, and in some areas identification of any Landscape Resources in this situation is not possible.

Community Spaces

11.8.11 Public spaces in the Study Area vary from small rest gardens and sitting out areas such as Olympic Garden and at Nga Tsin Wai Road, to playgrounds including Sung Wong Toi Playground and Argyle Street Playground. These have a mix of manmade development combined with maintained planting areas and tree stands.

Urban Development

11.8.12 The surrounding hinterland of the Study Area consists of the dense urban grain of To Kwa Wan, Kowloon City and Kowloon Bay. Human influences include residential and commercial, development with educational, institutional and recreational facilities. These areas include a full mixture of human infrastructure including municipal roads, walls, buildings and planting associated with residential courtyard areas.

Unique Cultural Resources

11.8.13 Within the general area of urban development specifically unique elements of cultural heritage with higher sensitivity can be identified, these generally have some protective status or historical attributes and within the Study Area include features such as the

Emperor's Rock located in Sung Wong Toi Garden, Sacred Hill, the Lung Tsun Stone Bridge and the Cattle Depot Artist Village

Schedule of Landscape Resources

11.8.14 The factors affecting the sensitivity for evaluation of landscape impact are detailed in **Section 11.3.1** above. The Landscape Resources (LR) identified within the Project Study Area have been grouped into differing groups as shown in **Figure 11-4-1** and **Table 11-5** below.

Table 11-5 Schedule of Landscape Resources

Ref.	Landscape Resources	Extent (m^2)
LR1-Vegetation		
LR1-1	Vegetation on MPSC Development Area	89,167
LR1-2	Trees in Amenity Areas of San Po Kong Interchange	10,995
LR1-3	Roadside Planting at Kai Tak Tunnel Ramp	4,051
LR1-4	Existing Trees at Airport Perimeter Fence	17,508
LR1-5	Street Trees on Sung Wong Toi Road	1,225
LR1-6	Temporary Tree Nursery	5,963
LR1-7	Trees on Runway South Apron	38,335
LR1-8	Amenity Areas at Kowloon Bay Interchange	27,680
LR1-9	Landscape at Grand Waterfront	3,990
LR2-Human/Cultural		
LR2-1	Hardstanding at Kai Tak Airport	106,169
LR2-2	Shek Ku Lung Road Playground	4,960
LR2-3	Tak Ku Ling Road Rest Garden	44,287
LR2-4	Olympic Garden	4,105
LR2-5	Argyle Street Playground	5,687
LR2-6	Sung Wong Toi Playground	4,942
LR2-7	Sung Wong Toi Garden	2,805
LR2-8	Hong Kong Aviation Club	12,070
LR2-9	Lung Tsun Stone Bridge Reserve	17,862
LR2-10	Landscape at Kowloon Bay Pumping Station #1	3,156
LR2-11	Landscape at Kowloon Bay Pumping Station #2	6,665
LR2-12	Seawall of Kowloon Bay Typhoon Shelter	20,611
LR2-13	Kowloon City Ferry Pier and Bus Terminus	10,860
LR2-14	Cattle Depot Artist Village	17,474
LR2-15	To Kwa Wan Recreation Ground	11,207
LR3-Hydrology		
LR3-1	Kai Tak Nullah	26,244

Ref.	Landscape Resources	Extent (m²)
LR3-2	Waterbody of Kowloon Bay	342,767
LR4-Urbanised Area		
LR4-1	Urban Development Hinterland	391,022
LR5-Construction Area		
LR5-1	Kai Tak Development Area	1085,408

11.8.15 Photographs of the (LRs) are shown in **Figure 11-4-2, Figure 11-4-3** and **Figure 11-4-4.** They are described in more detail in the sections below.

Vegetation

LR1-1 – Vegetation on MPSC Development Area

11.8.16 The vegetation generally consists of small areas of as yet unaltered land remaining from the airport field areas. Predominantly contained within the Project Area they are unutilised, unmaintained pockets of land surrounded by temporary construction projects and resemble waste land, predominantly covered by tall grass species and the invasive weed tree *Leucaena leucocephala*. Small sized pioneer tree species of *Macaranga tanarius*, *Ficus hispida*, *Celtis sinensis* and *Casuarina* sp. are also to be found. Approximately 160 trees were identified within the MPSC development area with heights ranging from 3-14m, spread 3-10m, and trunk diameter 100-300mm. Tree Group numbers are TG46, TG47, TG48, TG49, TG50, TG51, TG52 and TG71 with reference to **Appendix 11D** and **Appendix 11E**. No important or valuable trees are found in these areas. Sensitivity is considered as **Low.**

LR1-2 – Trees in Amenity Areas of San Po Kong Interchange

11.8.17 Located in the centre of the highway interchange, this disconnected green space holds 11 trees in grass borders, with heights around 4-14 m, spread 2-15 m, and trunk diameter 100-350 mm. Species include *Ailanthus fordii*, *Bischofia javanica* and *Ficus microcarpa*. Tree Group numbers are TG32 and TG34 with reference to **Appendix 11D** and **Appendix 11E**. Sensitivity is considered as **Medium**.

LR1-3 – Roadside Planting at Kai Tak Tunnel Ramp

11.8.18 The roadside margin planting is located over and around the exit ramp and ventilation building to the Kai Tak Tunnel. Generally consisting of about 75 specimens of small trees including *Phoenix roebelenii* and *Strelitzia nobilis*, there is one impressive and mature stand of *Ficus microcarpa*. Tree Group number is TG05 with reference to **Appendix 11D** and **Appendix 11E**. Sensitivity considered as **Medium**.

LR1-4 – Existing Trees at Airport Perimeter Fence

11.8.19 The vegetation is of thin strips of greening along the south perimeter fence of the old airport. No longer being cut and maintained, the strips form a green visual buffer of pioneer tree species. No important or valuable trees are found in these areas. There are approximately 135 trees, both mature and immature, with heights around 4-16m, spread 2-12m, and trunk diameter 100-500mm. Species consist of *Casuarina equisetifolia*, *Delonix regia*, *Ficus microcarpa*, *Macaranga tanarius* var. *tomentosa*, *Morus alba*, *Acacia confusa*, *Phoenix roebelenii* and *Cinnamomum camphora*. Tree Group numbers are TG06, TG58, TG04, TG03 and TG44 with reference to **Appendix 11D** and **Appendix 11E**. Sensitivity considered as **Medium**.

LR1-5 –Street Trees on Sung Wong Toi Road

11.8.20 Consisting of 6 well developed, pavement camphor trees (*Cinnamomon camphora*) of about 8m tall, these are the only street trees in the area. Tree Group number is TG02 with reference to **Appendix 11D** and **Appendix 11E**. Sensitivity considered as **Medium**.

LR1-6 –Temporary Tree Nursery

11.8.21 The temporary tree nursery located on the south apron of Kai Tak Airport is holding trees transplanted out of the MTR construction projects at Kai Tak and will be removed at a future date. Tree Group numbers are TG45 and TG72 with reference to **Appendix 11D** and **Appendix 11E**. Sensitivity considered as **Low**.

LR1-7 – Trees on Runway South Apron

11.8.22 There are some trees in the Runway Precinct within the study boundary, both invasive and planted in association with the various temporary uses, that have existed since the closure of the former airport. There are approximately 255 trees with heights ranging from 4-14m, spread 3-8m, and trunk diameter 100-250mm. Species include Casuarina, Ficus and Macaranga. Tree Group numbers are TG53, TG55, TG56 and TG57 with reference to **Appendix 11D** and **Appendix 11E**. The sensitivity of this resource is assessed as **Medium.**

LR1-8 – Amenity Areas at Kowloon Bay Interchange

11.8.23 There are more than 250 existing trees in the amenity areas near the interchange in Kowloon Bay, with heights around 3-12m, spread 1-10m, and trunk diameter 100-300mm. Predominant species are *Aleurites moluccana*, *Bauhinia blakeana*, and *Casuarina equisetifolia*. Tree Group numbers are TG20, TG21, TG22, TG23, TG24, TG25, TG26, TG27, TG28 and TG29 with reference to **Appendix 11D** and **Appendix 11E**. Sensitivity is considered as **Medium**.

LR1-9 – Landscape at Grand Waterfront

11.8.24 There are approximately 80 trees of varying maturity in the amenity areas near Grand Waterfront development, particularly on San Ma Tau Street, with heights around 3-15m, spread 3-10m, and trunk diameter 100-400mm. The species are mostly *Bombax ceiba* and *Melaleuca quinquinervia*. Tree Group number is TG09 with reference to **Appendix 11D** and **Appendix 11E**. Sensitivity is considered as **Medium**.

Human / Cultural

LR2-1 – Hardstanding at Kai Tak Airport

11.8.25 Consisting of residual taxiways and aircraft parking areas that have been used for various temporary uses since airport closure and are currently in use as temporary vehicle parking areas. These are wide, flat, concrete areas, and the sensitivity is considered as **Low**.

LR2-2 – Shek Ku Lung Road Playground

11.8.26 The southern part of this open space (O) is within the Study Area. Predominantly hard surfaced and primarily for active recreation provision there are however peripherally approximately 110 trees of heights around 4-15m, spread 4-20m, and trunk diameter 100-350mm. Species include *Acacia confusa*, *Bauhinia variegata*, *Bombax ceiba*, *Ficus microcarpa*, *Morus alba* and *Macaranga tanarius* var. *tomentosa*. Tree Group number is TG31 with reference to **Appendix 11D** and **Appendix 11E**. Sensitivity is considered as **Medium**

LR2-3 – Tak Ku Ling Road Rest Garden

11.8.27 The Rest Garden is a local open space (O) with lush trees and shrub planting. It consists of children's play equipment and seating areas under tree shade primarily for passive recreation. There are approximately 30 young to mature trees with heights varying between 3-12m, spread 2-23m, and trunk diameter 100-600mm. Species include *Aleurites moluccana* and *Ficus microcarpa*. Tree Group number is TG16 with reference to **Appendix 11D** and **Appendix 11E**. Sensitivity is considered as **Medium**

LR2-4 - Olympic Garden

11.8.28 The local open space (O) is located at the west end of Prince Edward Road East. Until recently the area contained seating areas and planting beds with 7 large trees and was a popular resting and gathering place for local residents. The site is currently occupied for infrastructure works for KTD however the trees are retained within the site and reinstatement works are intended. Tree Group number is TG43 with reference to **Appendix 11D** and **Appendix 11E**. Sensitivity is considered as **Medium**.

LR2-5 – Argyle Street Playground

11.8.29 An open space with predominantly hard surfacing is primarily for active recreation provision. Football pitches are the main elements in the open space. Seating areas are also provided at the northern side of the playground. There are approximately 13-trees with heights around 3-12m, spread 3-12m, and trunk diameter 100-450mm. An excellent, large specimen *Ficus microcarpa* can be found. Tree Group numbers are TG41 and TG42 with reference to **Appendix 11D** and **Appendix 11E.** Sensitivity considered as **Medium**.

LR2-6 – Sung Wong Toi Playground

11.8.30 A public open space (O) comprised of basketball courts, meandering footpaths, seating areas and ornamental tree and shrub planting. There are roughly 90 trees with heights around 3-20m, spread 2-25m, and trunk diameter 100-1000mm. Species include *Bauhinia blakeana*, *Bombax ceiba*, *Casuarina equisetifolia*, *Delonix regia* and *Ficus virens*. The northern area of the resource has been impacted by underground excavation works relating to Kai Tak Development infrastructure. Tree Group numbers are TG36, TG37 and part of TG38 referring to the **Appendix 11D** and **Appendix 11E**. Due to the size and maturity of the trees as well as its importance in connecting urban green space, sensitivity is considered as **Medium**.

LR2-7 – Sung Wong Toi Garden

11.8.31 A formal open space (O) known as *Sacred Hill*, containing the remaining portion of an important historic relic, *The Emperor's Rock*, and associated with the last child Emperors of the Song Dynasty. The whole Rock was originally situated at the top of nearby Sacred Hill, however it was levelled and the boulder broken up in blasting operations to extend Kai Tak Airport in about 1942. The rock portion bearing three carved characters was located to the new Sung Wong Toi Garden. The space comprises formal clipped hedgerows and screen tree planting along the periphery of an open space. There are approximately 60 no. mature trees with heights around 4-20m, spread 4-25m, and trunk diameter 100-1000mm. Species include *Aleurites moluccana*, *Casuarina equisetifolia*, *Ficus microcarpa*, *Livistona chinensis* and *Melia azedarach*. A potentially registerable *Albizia lebbek* tree of large size forms the centerpiece. Trees form part of Group number TG38 referring to **Appendix 11D** and **Appendix 11E**. Due to the significant historical importance of the Rock, sensitivity is considered as **High.**

LR2-8 –Hong Kong Aviation Club

11.8.32 The landscape surrounding the Aviation Club consists predominantly of a planting buffer on Olympic Road of approximately 23 reasonably mature stands of Casuarina and Bauhinia species. Tree Group number is TG07 referring to the **Appendix 11D** and **Appendix 11E.** An open grass area on the east side facilitates helicopter take-off and landing. Sensitivity considered as **Medium.**

LR2-9 – Lung Tsun Stone Bridge Reserve

11.8.33 The Lung Tsun Stone Bridge is a former pier, buried during the construction of Kai Tak Airport, which connected the Kowloon Walled City to the Harbour. Completed in 1875, the Bridge was about 210 metres long and built of granite. At the time, it was the longest and toughest stone pier in Hong Kong. The remains of the Bridge are classified as archaeological features of high significance. Under the KTD, a 30m-wide corridor (Preservation Corridor) together with a small plaza at its southern end will be provided to allow in-situ preservation of the remnants of the Bridge, the Pavilion for Greeting Officials, the former Kowloon City Pier and the excavated sections of the seawalls. The remnants of Lung Tsun Stone Bridge will not be affected by the infrastructure work of MPSC. There are approximately 40 trees in these areas with heights around 4-6m, spread 4m, and trunk diameter 100-200mm. Species include *Acacia confusa* and *Leucaena leucocephala*. Tree Group number is TG63 with reference to **Appendix 11D** and **Appendix 11E**. As an archaeological protection area, sensitivity is considered as **High.**

LR2-10 – Landscape at Kowloon Bay Pumping Station #1

11.8.34 The newly constructed building is part of the KTD. It features a series of green roofs and decorative landscape markings. Sensitivity is considered as **Low.**

LR2-11 – Landscape at Kowloon Bay Pumping Station #2

11.8.35 The newly constructed building is part of the KTD. It features a series of green roofs and decorative landscape markings. Sensitivity is considered as **Low.**

LR2-12 –Seawall of Kowloon Bay Typhoon Shelter

11.8.36 This is an important heritage link with the construction of the airport. With an inclined stone face and of no particular engineering or material value, the alignment of the airport runway has however been identified as an important part of the collective memory. The sensitivity considered as **Medium**.

LR2-13 – Kowloon City Ferry Pier and Bus Terminus

11.8.37 The pier started operation in 1956 and was the first permanent pier in Hong Kong built after World War II. It had ferry services to Wan Chai, North Point and Tai Koo Shing (later Sai Wan Ho) and a vehicular ferry service to North Point (ceased operation in 1998). Currently there is only one ferry service, to North Point, The bus terminus is an open, hard surfaced parking area serving the district and whilst the Ferry Pier has strong historical value the area of the bus terminus does not so. Sensitivity is considered as **Medium**.

LR2-14 –Cattle Depot Artist Village

11.8.38 The site was originally used as a slaughterhouse from 1908 to 1999. The period buildings were renovated and developed into a village for artists in 2001. It is the only remaining cattle depot in Hong Kong built before World War I. Listed as a Grade III historical site in 1994; it was upgraded to Grade II in 2009. Revitalization of the Cattle Depot is expected to have a synergetic effect on the surrounding areas including Kai Tak new development area and the old quarters in To Kwa Wan like the 13 Streets. There are approximately 140 trees in these amenity areas with heights from 3-14m, spread 2-23m, and trunk diameter 100-600mm. Species include *Aleurites moluccana*, *Bauhinia blakeana*, *Ficus microcarpa* and *Ficus virens*. Tree Group numbers are TG13 and TG14 with reference to **Appendix 11D** and **Appendix 11E**. Sensitivity is considered to be **High**.

LR2-15– To Kwa Wan Recreation Ground

11.8.39 Primarily for active recreation, the facility has a jogging track, 2 basketball courts, 2 hard-surface 7-a-side soccer pitches and a children's playground. Toilets and changing rooms are provided within a surrounding buffer of trees. Tree Group numbers are TG10, TG11 and TG12 with reference to **Appendix 11D** and **Appendix 11E**. Sensitivity is considered as **Medium**.

Hydrology

LR3-1– Kai Tak Nullah

11.8.40 An open drainage channel runs through the centre of the site and is being redeveloped as part of the Kai Tak River Project. Currently under construction as part of Kai Tak Development, the sensitivity is considered as **Low**.

LR3-2 – Waterbody of Kowloon Bay

11.8.41 Located along the former Kai Tak South Apron, it forms the eastern portion of Victoria Harbour, between Hung Hom and Lei Yue Mun. The western part of the bay is now protected from the sea by a breakwater, and forms the To Kwa Wan Typhoon Shelter, whilst the eastern part forms the Kwun Tong Typhoon Shelter. Within the Study Area there is not currently provision of any water access points and water traffic in the study boundary is minimal. Protected under the Protection of the Harbour Ordinance, sensitivity is considered as **High**.

Urbanised Area

LR4-1 – Urban Development Hinterland

11.8.42 The typical collection of buildings and human development infrastructure make up a large percentage of the typical urban fabric. These urban areas are continually undergoing redevelopment and small scale change. The resource includes:-

- residential and commercial buildings;
- schools, clinics and community facilities;
- walls, slopes, roads, bridges and sewers;
- isolated gardens, building greening and roof gardens; and
- signs, masts, substations, car parks and brown field areas.

Sensitivity is considered as **Low**.

Construction Area

LR5-1 – Kai Tak Development Area

11.8.43 A large area of the study is currently under transition as part of the Kai Tak Development. Works are constantly evolving and assessing a baseline for specific resources is not possible due to the continual state of flux. The areas thus identified include the following activities:-

- excavated pits and trenches for underground infrastructure development;
- partly constructed infrastructure;
- temporary material stockpiles;
- temporary buildings and structures;
- erosion control measures; and
- temporary hardstanding and access roads.

Sensitivity is considered **Low**.

Summary Schedule of Landscape Resources

11.8.44 The identified Landscape Resources (LRs) sensitivity assessed in accordance with the criteria in **Section 11.3.1** above. In accordance with the Study Brief, LRs have been assessed within a 500m distance limit from the Project Area. The Landscape Resources identified within the Study Area are described above and their sensitivity to change summarised in **Table 11-6** below:

Table 11-6 Landscape Resources and Their Sensitivity

Ref. No.	**Landscape Resources**	**Quality and Maturity** (High/ Medium/ Low)	**Rarity** (High/ Medium/ Low)	**Importance** (Local/ District/ Regional)	**Statutory Limitations / Requirements**	**Ability to Accommodate Change** (High/ Medium/ Low)	**Sensitivity** (High/ Medium/ Low)
LR1-1	Vegetation on MPSC Development Area	Low	Low	District	(OU) / (O)	High	**Low**
LR1-2	Trees in Amenity Areas of San Po Kong Interchange	Medium	Low	Local	Highway	Medium	**Medium**
LR1-3	Roadside Planting at Kai Tak Tunnel Ramp	Medium	Low	District	Highway	Medium	**Medium**
LR1-4	Existing Trees at Airport Perimeter Fence	Medium	Low	District	Open Space (O)	Medium	**Medium**
LR1-5	Street Trees on Sung Wong Toi Road	Medium	Low	Local	Highway	Low	**Medium**
LR1-6	Temporary Tree Nursery	Low	Low	Local	Open Space (O)	High	**Low**
LR1-7	Trees on Runway South Apron	Medium	Low	District	Open Space (O)	Medium	**Medium**
LR1-8	Amenity Areas at Kowloon Bay Interchange	Medium	Low	Local	Highway / (OU)	Medium	**Medium**
LR1-9	Landscape at Grand Waterfront	Medium	Low	Local	Residential (A)	Medium	**Medium**
LR2-1	Hardstanding at Kai Tak Airport	Low	High	District	(OU)	High	**Low**
LR2-2	Shek Ku Lung Road Playground	Medium	Medium	Local	Open Space (O)	Medium	**Medium**
LR2-3	Tak Ku Ling Road Rest Garden	Medium	Medium	Local	Open Space (O)	Medium	**Medium**
LR2-4	Olympic Garden	Medium	Medium	Local	Open Space (O)	Medium	**Medium**
LR2-5	Argyle Street Playground	Medium	Medium	Local	Open Space (O)	Medium	**Medium**
LR2-6	Sung Wong Toi Playground	Medium	Medium	Local	Open Space (O)	Medium	**Medium**
LR2-7	Sung Wong Toi Garden	High	High	Regional	Open Space (O)	Low	**High**
LR2-8	Hong Kong Aviation Club	Medium	Low	Local	G/IC	Medium	**Medium**
LR2-9	Lung Tsun Stone Bridge Reserve	High	High	Regional	Open Space (O)	Low	**High**
LR2-10	Landscape at Kowloon Bay Pumping Station #1	Medium	Low	Local	G/IC	High	**Low**
LR2-11	Landscape at Kowloon Bay Pumping Station #2	Medium	Low	Local	G/IC	High	**Low**
LR2-12	Seawall of Kowloon Bay Typhoon Shelter	Medium	High	District	Open Space (O)	Medium	**Medium**
LR2-13	Kowloon City Ferry Pier and Bus Terminus	Medium	Medium	District	G/IC / (O) / OU	Medium	**Medium**
LR2-14	Cattle Depot Artist Village	High	High	District	G/IC / (O)	Low	**High**
LR2-15	To Kwa Wan Recreation Ground	Medium	Low	Local	Open Space (O)	Medium	**Medium**
LR3-1	Kai Tak Nullah	Low	Low	District	(OU) / (O)	High	**Low**
LR3-2	Waterbody of Kowloon Bay	High	High	Regional	HPO	Low	**High**
LR4-1	Urban Development Hinterland	Low	Low	Local	highly varied	High	**Low**
LR5-1	Kai Tak Development Area	Low	Low	Regional	highly varied	High	**Low**

Landscape Character

11.8.45 The area of Kowloon relevant to this study is quite varied in its character type within a short distance, exhibiting 3 different character categories and 5 different character types in the Study Area. Predominantly the Study Area can be considered to consist of flat, previously reclaimed land defined as Urban Fringe Landscape. At the margins of the Study Area are Kowloon City and To Kwa Wan Urban Landscapes and the Coastal Waters landscape of the Kowloon Bay Typhoon Shelter.

11.8.46 Each of these Landscape Character Types is described in more detail in the sections below.

Reclamation/Ongoing Major Development Landscape (Urban Fringe Landscape)

11.8.47 These are transitional landscapes which are currently awaiting or are undergoing large scale construction or re-development. Some consist of land undergoing development whilst others are vacated sites which are awaiting re-development. They are typically characterised by a flat, low-lying topography, lack of significant vegetation or significant built structures and may include major earthworks, partially completed structures, as well as features such as cranes and earth moving machinery. In Hong Kong, landscapes on this scale are generally reclaimed from the sea and so are often characterised by their proximity to the coast. As a result of their indeterminate status or the disturbance caused by ongoing construction work, such landscapes usually have an incoherent, desolate and transient character. This type of landscape can be found covering the site area at the former Kai Tak Airport.

Institutional Landscape (Urban Fringe Landscape)

11.8.48 These are landscapes found typically in the urban fringes, mainly on low-lying or flat sites (but in some cases, on hillsides). They are characterised predominantly by their institutional land uses and features and include hospitals, colleges and universities, barracks, youth camps and prisons. Though covering a variety of different types of institution, the combination of features and components and their distribution in these landscapes tends to be very similar. They generally comprise extensive complexes of buildings (usually low or medium rise) separated by open areas used for circulation or parking, with a high coverage of semi-formal landscape and vegetation. The whole landscape will typically be surrounded by a perimeter fence. This results in landscapes which are extensive, reasonably open and semi-formal. This type of landscape can be found north and south of Argyle Road.

City Grid Mixed Urban Landscape (Urban Landscape)

11.8.49 Found mainly on the older reclamations of Hong Kong and Kowloon, these landscapes are some of Hong Kong’s most common and most extensive urban landscapes. Developed on a largely orthogonal or regular city grid, they consist of what are mainly retail land uses at street level with high/medium-rise commercial or residential development above. Streets are often fairly wide and busy with traffic and the large numbers of people using these areas means that street life is vibrant. Building stock is of mixed age and character, and vegetation is generally limited to street tree planting and shrub planting in occasional public open spaces. The result is a landscape which is vibrant, colourful and diversity in terms of its street life and land use, but which possesses only limited variety in terms of its urban spaces. Examples of this type of landscape can be found at Ma Tau Kok and Kowloon City.

Residential Urban Landscape (Urban Landscape)

11.8.50 These are urban landscapes which are wholly or largely given over to residential land use. Developed comprehensively on flat or terraced land, mainly on the edges of urban areas, they are characterized by their medium or high-rise residential estates, set amongst open space, together with associated highways, footbridges, school or community facilities and retail facilities. Vegetation includes roadside trees and shrub planting and planting in open spaces and around residential estates. The result is a fairly homogenous, ordered landscape comprising largely built elements softened to a certain extent by the effects of surrounding planting and greenery. This type of landscape can be found at the public housing area of Tung Tau Estate.

Typhoon Shelter Landscape (Coastal Waters Landscape)

11.8.51 Found generally on the coastal edges of urban areas, these are inshore aquatic landscapes formed by the armour stone breakwaters constructed to protect large numbers of moored vessels. These vessels include freighters, fishing vessels, pleasure craft and sampans. Though they consist primarily of water, other features in these landscapes include jetties, pontoons and navigational features resulting in a landscape that is a transitional one between land and sea. In many cases, the result is a vibrant and active landscape characterized by a variety of form and colour and often by a significant sense of enclosure. This type of landscape can be found at To Kwa Wan and Kwun Tong Typhoon Shelters.

Schedule of Landscape Character Areas

11.8.52 Factors affecting the sensitivity for evaluation of landscape impact are detailed in **Section 11.3.1** above. Landscape Character Areas (LCAs) identified within the Project Study Area have been grouped into 5 different zones as shown in **Figure 11-4-5** and **Table 11-7** below.

Table 11-7 Schedule of Landscape Character Areas

Ref	Landscape Character Area	Landscape Character Type	Extent (m^2)
LCA01	Former Kai Tak Airport	Reclamation/Ongoing Major Development Landscape	1,571,035
LCA02	Institutional Areas North & South of Argyle Road	Institutional Landscape	11,090
LCA03	Ma Tau Kok & Kowloon City	City Grid Mixed Urban Landscape	404,864
LCA04	Tung Tau Estate	Residential Urban Landscape	59,073
LCA05	To Kwa Wan Typhoon Shelter	Typhoon Shelter Landscape	289,738

11.8.53 Photographs of the LCAs are shown in **Figure 11-4-6** and the identified Landscape Character Areas (LCA) in each group is discussed in more detail below.

LCA01 – Former Kai Tak Airport

11.8.54 The Landscape Character Type of Former Kai Tak Airport is Reclamation/Ongoing Major Development Landscape. The Former Kai Tak Airport Site is currently under major redevelopment and is characterised by expansive areas of excavation, wasteland and temporary structures. Landscape quality and maturity is Low however the cultural and historical significance of the area is regionally important. The Landscape Value Map of Hong Kong categorises this landscape as 'Low' in value. Sensitivity is considered as **Low.**

LCA02 – Institutional Areas North & South of Argyle Road

11.8.55 The Landscape Character Type is Institutional Landscape. The Institutional Areas North and South of Argyle Road are at the very extremes of the Study Area. Dominated by the Kowloon Hospital the area of Tin Kwong Road Recreation ground provides welcome greening and open space in the urban area, generating a high quality of mature development in green surroundings. The area is able to accommodate minor incremental changes easily but less so large scale development. generating a high quality of mature development in green surroundings. The area is able to accommodate minor incremental changes easily but less so large scale development. The Landscape Value Map of Hong Kong categorises this landscape as 'High Qualified' in value. Sensitivity is considered as **Medium**.

LCA03 – Ma Tau Kok & Kowloon City

11.8.56 The Landscape Character Type is City Grid Mixed Urban Landscape. Ma Tau Kok and Kowloon City surround the Study Area to the north and east. Dense residential areas of older development, generally lacking in green space and Landscape Resources, they are currently in transition with a number of modern redevelopments being undertaken. The historical value of the areas is important in the development history of Kowloon, containing some of the earliest settlements and a range of development type and scale, having been in continued flux. Change is anticipated in this area and can be relatively well accommodated. The Landscape Value Map of Hong Kong categorises this landscape as 'Moderate' in value. Sensitivity is considered as **Medium**.

LCA04 – Tung Tau Estate

11.8.57 The Landscape Character Type is Residential Urban Landscape. The public housing area at Tung Tau Estate touches on the very north of the Study Area. With standardised blocks in a landscaped environment which has been redeveloped since the introduction of public housing into the area in the 1950's. There has been continual change in the area and large scale development can be relatively well incorporated. The Landscape Value Map of Hong Kong categorises this landscape as 'Moderate' in value. Sensitivity is considered as **Medium**.

LCA05 – To Kwa Wan Typhoon Shelter

11.8.58 The Landscape Character Type is Typhoon Shelter Landscape. The northern point of the To Kwa Wan Typhoon Shelter is found encroaching to the south of the Project Study Area as close as 30m distant from the site boundary. Predominantly frequented by barges and construction traffic to temporary barging points at Kai Tak, the area is currently provided with the visual backdrop of the despoiled land and redevelopment of the old Kai Tak Airport. As part of the Victoria Harbour area it is protected under the Harbour Ordinance and is of regional importance with a unique quality and character. The Landscape Value Map of Hong Kong categorises this landscape as 'High Qualified' in value. Sensitivity is considered as **High**.

Summary Schedule of Landscape Character Areas

11.8.59 The identified Landscape Character Areas (LCAs) in each group are discussed in more detail below and their sensitivity assessed in accordance with the criteria in **Section 11.3.1** above. In accordance with the Study Brief, LCAs have been assessed within a 500m distance limit from the Project Area. The Landscape Character Areas identified within the Study Area as described above and their sensitivity to change are summarised in **Table 11-8** below:-

Table 11-8 Summary of Assessment of Sensitivity of Landscape Character Areas

Landscape Character Areas	**Landscape Character Type**	**Quality & Maturity** (High/ Medium/ Low)	**Rarity** (High/ Medium/ Low)	**Importance** (Local/ District/ Regional)	**Statutory Limitations & Requirements**	**Ability to Accommodate Change** (High/ Medium/ Low)	**Sensitivity** (High/ Medium/ Low)
LCA01 Former Kai Tak Airport	Reclamation/Ongoing Major Development Landscape	Low	Low	Regional	Open Space	High	**Low**
LCA02 Institutional Areas North & South of Argyle Road	Institutional Landscape	High	Medium	Local	---	Medium	**Medium**
LCA03 Ma Tau Kok & Kowloon City	City Grid Mixed Urban Landscape	Medium	Medium	Local	Open Space	Medium	**Medium**
LCA04 Tung Tau Estate	Residential Urban Landscape	Medium	Medium	Local	Open Space	Medium	**Medium**
LCA05 To Kwa Wan Typhoon Shelter	Typhoon Shelter Landscape	High	Medium	Regional	Harbour Ordinance	Low	**High**

Visually Sensitive Receivers

11.8.60 A number of Visually Sensitive Receivers (VSRs) will be affected by the scope of the Project. VSRs are those people who will potentially view the construction of the Project and/or its operation. The Zone of Visual Influence (ZVI) is the area from which any part of the proposed project would be able to be seen, otherwise considered as the viewshed. VSRs will be identified within the ZVI which may contain areas, which are fully visible, partly visible and non-visible from the Project. Beyond this, the effects of distance and the extensive visual context tend to render impacts insignificant.

Zone of Visual Influence（ZVI）

11.8.61 The proposed MPSC is a landmark development of substantial size and may potentially be seen over a wide area. However, the fact that MPSC will be bounded by a mixed neighbourhood of tall residential and commercial development means that the views to MPSC from receivers outside these building clusters will generally be limited to partial glimpses through the spaces between the developments. Therefore, the zone of visual influence (ZVI) of the Project is subdivided into 2 components:- The Primary Zone of Visual Influence (PZVI) and Secondary Zone of Visual Influence (SZVI).

- Primary Zone of Visual Influence (PZVI) envelops of the MPSC where the Project provides a substantial contribution to views experienced by VSRs who will experience a largely unobstructed view of MPSC. The VSRs also include the planned tall residential and commercial developments around the MPSC. The Primary Zone of Visual Influence has been illustrated on **Figures 11-4-7.**
- Secondary Zone of Visual Influence (SZVI) of MPSC where the Project will be visible to some VSRs over the tops of intervening urban areas and from longer distances. The visual envelope of MPSC is bounded by the ridgeline from Victoria Peak, Mount Cameron and Mount Parker of Hong Kong Island to the south and the ridgeline from Kowloon Peak, Tsz Wan Shan, Lion Rock and Beacon Hill to the north and to the east. To the west, it is bounded by the high-rise commercial and residential development at Tsim Sha Tsui and Hung Hom. The Secondary ZVIs has been illustrated on **Figures 11-4-7** and adopted from Kai Tak Development Environmental Impact Assessment Report (Agreement No. CE 35/2006(CE)).

11.8.62 The assessment of visual impacts is considered as a combination of the magnitude of change brought about by the Project in relation to receiver sensitivity. For the purposes of this study, receivers have been grouped into the following categories below:-

Residential (R): Those people who would view the scheme from their home

Functional (F): Those people who would view the scheme from their work/study place The location of the receivers includes the comprehensive development area (CDA), Government institution or community (G/IC) and other specified uses (OU).

Leisure (L): Those people who would view the scheme whilst engaging in leisure, culture or recreation activities including shopping, walking, hiking, worship or sports The location of the receivers includes commercial (C) and open space (O).

Transport (T): Those people who would view the scheme from vehicles.

11.8.63 The factors affecting the sensitivity of visual receivers are detailed in **Section 11.4.4** above and include:-

- value and quality of existing views;
- availability and amenity of alternative views;
- type and estimated number of receiver population;
- duration and frequency of view; and
- degree of visibility.

11.8.64 Generally the sensitivity of visual receivers for the identified groups can be established as detailed below:-

Residential (R)
Those who view the scheme from their homes are considered to be highly sensitive to any visual intrusion. This is because the attractiveness, or otherwise, of the view will have a notable effect on a residents' general quality of life and acceptability of their home environment.

Functional (F)
Those people who view the scheme from their workplace are generally considered relatively less sensitive to visual intrusion. This is because they are normally employed in activities where visual outlook plays a less important role in the perception of the quality of the working environment. They are on the whole classified as a low sensitivity group unless their environmental outlook forms a significant element of their work.

Leisure (L)
For those who view the scheme whilst engaging in outdoor leisure pursuits, visual sensitivity varies depending on the type of cultural activity. Those taking a stroll in a park, for example, would be classified as a high sensitivity group compared to football players who would have a low sensitivity rating.

Transport (T)
For those people who view the scheme from public thoroughfares, the degree of visual intrusion experienced depends on the speed of travel and whether views are continuous or only occasional. Generally, the slower the speed of travel and the more continuous the viewing experience, then the greater the degree of sensitivity.

Schedule of Visually Sensitive Receivers

11.8.65 Within the ZVI for the Construction and Operation Phases, potentially affected Visually Sensitive Receivers (VSRs) have been identified at a "Strategic," "District" and "Local" level.

Strategic Level

11.8.66 Three Key VSRs within the Secondary Zone of Visual Influence are selected from the 8 'Vantage Points' proposed in the *Study on Urban Design Guidelines for Hong Kong* as shown in **Appendix 11C.**

- **(VP3)** Proposed Promenade, South East Kowloon Development
- **(VP4)** Quarry Bay Park, Quarry Bay
- **(VP7)** Victoria Peak

11.8.67 Nine further 'Vantage Points' are selected based on important lookout points and peaks:-

- Lion Rock;
- Kowloon Peak;
- Devil's Peak;
- Mount Parker;
- Mount Cameron;
- North Point Pier;
- Lei Yue Mun Gap;
- International Commerce Centre, West Kowloon; and
- Two International Finance Centre, Central District.

District Level

11.8.68 At the district level, five Vantage Points were identified in the *Urban Design Framework*, according to the Kowloon Planning Area NO.22 approved Kai Tak Outline Zoning Plan No. S/K22/4. Of these, four are within the Primary Zone of Visual Influence whilst one is within the Secondary Zone. The locations are shown in **Figure 11-4-7**, and assessment of VRSs at district level is shown in **Table 11-10.**

- Kai Tak Runway Park
- Future Metro Park South
- Future Metro Park Central
- Future MPSC South
- Future MPSC East

Local Level

11.8.69 Visually Sensitive Receivers (VSR) at Local Level in close vicinity of MPSC are within the Primary Zone of Visual Influence and are selected from reciprocal viewpoints based on panoramic photographs taken from MPSC as well as desktop study. Potentially affected Residential, Functional, Leisure and Transport VSRs are summarised in **Table 11-9** below and their locations shown in **Figure 11-4-8** and **Figure 11-4-9**.

Table 11-9 Schedule of Identified Visually Sensitive Receivers (VSRs)

VSR	**Location**	**Distance to Closest Source** (Metres)	**Height of Viewpoint** (mPD)	**Type of View** (rural/developed, open/restricted, static/transient)
Strategic				
S-01	Proposed Promenade, South East Kowloon Development (VP3)	2070	+7	developed/ open/ transient
S-02	Quarry Bay Park (VP4)	3860	+11	developed/ open/ transient
S-03	Victoria Peak (VP7)	7300	+554	mixed/ open/ transient
S-04	Lion Rock	3260	+495	rural / open/ transient
S-05	Kowloon Peak	3200	+603	rural / open/ transient

VSR	Location	Distance to Closest Source (Metres)	Height of Viewpoint (mPD)	Type of View (rural/developed, open/restricted, static/transient)
S-06	Devil's Peak	5560	+222	rural / open/ transient
S-07	Mount Parker	6300	+532	rural / open/ transient
S-08	Mount Cameron	7100	+439	rural / open/ transient
S-09	North Point Pier	3100	+11	developed/ open/ static
S-10	Lei Yue Mun Gap	5900	0	developed/ open/ transient
S-11	International Commerce Centre	4200	+484	developed/ open/ static
S-12	Two International Finance Centre	5600	+412	developed/ open/ static
District				
D-01	Kai Tak Runway Park	2600	+5	developed/ open/ transient
D-02	Future Metro Park South	1000	+5	developed/ open/ transient
D-03	Future Metro Park Central	420	+5 / +13	developed/ open/ transient
D-04	Future MPSC South	0	+13	developed/ open/ transient
D-05	Future MPSC East	0	+13	developed/ restricted/ transient
Local				
L-01(R)	Residential Development along Sung Wong Toi Road	210	+100	developed/ open/ static
L-02(R)	Mid-rise Development in Chung Seen Mei Chuen and Kowloon City	450	+80	developed/ restricted/ static
L-03(R)	High-rise Residential Groups North of Prince Edward Road East	560	+80	developed/ restricted/ static
L-04(R)	Residents at Choi Hung and Diamond Hill	1020	+80	developed/ open/ static
L-05(R)	Kai Ching Estate and Tak Long Estate	510	+120	developed/ restricted/ static
L-06(R)	Richland Garden	840	+100	developed/ restricted/ static
L-07(R)	Residential Development in To Kwa Wan	300	+100	developed/ restricted/ static
L-08(R)	Laguna Verde	1370	+80	developed/ open/ static
L-09(R)	Grand Waterfront	300	+176	developed/ open/ static
L-10(R)	Harbourfront Landmark	1880	+233	developed/ restricted/ static
L-11(R)	Residential in progress along Prince Edward Road East	850	+100	developed/ restricted/ static
L-12(R)	Low-rise Mixed Use Development Adjacent Grand Waterfront	185	+65	developed/ restricted/ static
L-13(R)	Future Residential Development at Northwest of MPSC	45	+100	developed/ restricted/ static
L-14(R)	Future Residential Development at Northeast of MPSC	45	+110	developed/ restricted/ static
L-15(R)	Future Residential Development at Runway Precinct	830	+80	developed/ restricted/ static
L-01(F)	Education and Healthcare Facilities at Ma Tau Wai	460	+30	developed/ restricted/ static
L-02(F)	Education and Healthcare Facilities at San Po Kong	470	+30	developed/ restricted/ static
L-03(F)	Government Facilities on Concorde Road	450	+90	developed/ restricted/ static
L-04(F)	Development Support Facilities at Kowloon Bay Interchange	45	+70	developed/ restricted/ static

VSR	Location	Distance to Closest Source (Metres)	Height of Viewpoint (mPD)	Type of View (rural/developed, open/restricted, static/transient)
L-05(F)	Education and Healthcare Facilities at Kowloon Bay	830	+60	developed/ restricted/ static
L-06(F)	Kowloon Bay Action Area	1000	+40	developed/ restricted/ static
L-07(F)	Police Operational facility at Dyer Avenue	1600	+15	sea/ open/ static
L-08(F)	Hong Kong Aviation Club	200	+15	developed/ open/ static
L-09(F)	Comprehensive Development Area Along Mok Cheong Street	90	+100	developed/ restricted/ static
L-10(F)	Kowloon Bay Business District	530	+140	developed/ restricted/ static
L-11(F)	Business and Industrial Development in San Po Kong	730	+100	developed/ restricted/ static
L-12(F)	Business and Industrial Development in Hung Hom	1100	+100	developed/ restricted/ static
L-13(F)	Kwun Tong Business District	1550	+100	developed/ restricted/ static
L-14(F)	Hong Kong International Trade and Exhibition Centre	350	+100	developed/ restricted/ static
L-15(F)	Kowloon City Ferry Pier and Transport Terminus	400	+15	developed/ restricted/ transient
L-16(F)	Pacific Trade Centre, Octa Tower, Kowloon Godown	1420	+100	developed/ restricted/ static
L-17(F)	Future Tourism Development in Runway Precinct	1970	+100	developed/ restricted/ static
L-18(F)	Planned Development Along Route 6	260	+80	developed/ restricted/ static
L-19(F)	Planned Commercial Development at Runway Precinct	860	+55	developed/ restricted/ static
L-20(F)	Planned Mixed Use Development at Kai Tak	45	+40	developed/ restricted/ static
L-21(F)	Construction Areas at Kai Tak Development	0	+6	developed/ restricted/ static
L-01(L)	Amenity Users at Greenspace on Prince Edward Road	380	+5	developed/ restricted/ transient
L-02(L)	Amenity Users at Shek Ku Lung Road Playground	460	+5	developed/ restricted/ transient
L-03(L)	Amenity Users at Sze Mei Street Open Space and PTI	850	+5	developed/ restricted/ transient
L-04(L)	Kai Tak Promenade and Open Space Network	0	+5	developed/ restricted/ transient
L-05(L)	Kai Tak Public Open Space Network and Station Square	0	+6	developed/ restricted/ transient
L-06(L)	Visitors to Future Metro Park	40	+5 / +13	developed/ restricted/ transient
L-07(L)	Promenade along Ma Tau Kok	200	+5	developed/ restricted/ transient
L-08(L)	Visitors to Kai Tak Cruise Terminal Roof Garden	1750	+30	developed/ restricted/ transient
L-09(L)	Visitors to Kowloon Bay Typhoon Shelter Promenade	75	+5	developed/ restricted/ transient
L-01(T)	Travellers on Prince Edward Road East	400	+5	developed/ restricted/ transient
L-02(T)	Travellers on Sung Wong Toi Road	65	+5	developed/ restricted/ transient
L-03(T)	Motorists on Kwun Tong Bypass	400	+13	developed/ restricted/ transient

VSR	Location	Distance to Closest Source (Metres)	Height of Viewpoint (mPD)	Type of View (rural/developed, open/restricted, static/transient)
L-04(T)	Harbour Vessels	70	0	developed/ restricted/ transient
L-05(T)	Future Central-Kowloon Route 6	0	+9	developed/ restricted/ transient
L-06(T)	Future Road D2	0	+5	developed/ restricted/ transient
L-07(T)	Future Road D3 and Central Boulevard	0	+5	developed/ restricted/ transient
L-08(T)	Future Road D4 and Taxiway Bridge	1000	+6	developed/ restricted/ transient
L-09(T)	Future Road L6	0	+5	developed/ restricted/ transient

11.8.70 Photographs of the VSRs are shown in **Figure 11-4-10, Figure 11-4-11, Figure 11-4-12** and **Figure 11-4-13** and the identified VSRs are discussed in more detail below. Unless otherwise specified, the sensitivity ratings for construction phase and operation phase are the same.

<u>VSRs at Strategic Level</u>

S-01: Proposed Promenade, South East Kowloon Development (VP3)

11.8.71 The viewing distance between this Vantage Point and MPSC is about 2070m. The viewpoint is also selected in terms of its views to Hong Kong Island rather than north to Kai Tak and there remain many good alternative views available for the VSR. Viewers are occasional. As such the sensitivity of the VSR is considered **Low**.

S-02: Quarry Bay Park, Quarry Bay (VP4)

11.8.72 The viewing distance between this Vantage Point and MPSC is about 3860m. Panoramic views of the Victoria Harbour and across to the Cruise Terminal form the primary focus available to the VSR. As such the sensitivity of the VSR is considered **Low**.

S-03: Victoria Peak (VP7)

11.8.73 The viewing distance between this Vantage Point and MPSC is about 7300m. The Peak is a major tourist attraction that offers views over Central, Victoria Harbour, Lamma Island and the surrounding islands. There remain many superb alternative views available for the VSR, as such the sensitivity of the VSR is considered **Low.**

S-04: Lion Rock

11.8.74 The viewing distance between this Vantage Point and MPSC is about 3260m. Lion Rock is located between Kowloon Tong in Kowloon and Tai Wai in the New Territories. Lion Rock has good alternative views to the city and Hong Kong Island for the limited number of viewers. As such the sensitivity of the VSR is considered **Low.**

S-05: Kowloon Peak

11.8.75 The viewing distance between this Vantage Point and MPSC is about 3200m. Kowloon Peak is located in the northeast corner of New Kowloon, Hong Kong, situated in Ma On Shan Country Park. Visitors can enjoy the entire views of Kowloon Peninsula, Hong Kong Island, Ho Chung and Pak Sha Wan area. There remain many excellent alternative views available for the limited number of viewers, as such the sensitivity of the VSR is considered **Low**.

S-06: Devil's Peak

11.8.76 The viewing distance between this Vantage Point and MPSC is about 5560m. The viewpoint is also selected in terms of its views to Shau Kei Wan in Hong Kong Island rather than north to Kai Tak and there remain many good alternative views available for the limited number of viewers. As such the sensitivity of the VSR is considered **Low**.

S-07: Mount Parker

11.8.77 The viewing distance between this Vantage Point and MPSC is about 6300m. Mount Parker is located in Hong Kong Island and has many good alternative views available for the limited number of viewers; as such the sensitivity of the VSR is considered **Low.**

S-08: Mount Cameron

11.8.78 The viewing distance between this Vantage Point and MPSC is about 7100m. Mount Cameron is located within the Aberdeen Country Park and there are many good alternative views available for the limited number of viewers. As such the sensitivity of the VSR is considered **Low.**

S-09: The North Point Pier

11.8.79 The viewing distance between this Vantage Point and MPSC is about 3100m. The views from this VSR are generally open and across the Harbour. There are also many good alternative views available for the VSR, as such the sensitivity of the VSR is considered **Low**.

S-10: Lei Yue Mun Gap

11.8.80 The viewing distance between this Vantage Point and MPSC is about 5900m. Lei Yue Mun is a short channel in Hong Kong, separating Kowloon and Hong Kong Island. The views from this VSR are wide, changing and open and provide constant good alternatives. The sensitivity of the VSR is considered **Low.**

S-11: International Commerce Centre

11.8.81 The viewing distance between this Vantage Point and MPSC is about 4200m. The International Commerce Centre, located in West Kowloon, is the tallest building in Hong Kong. The views from this VSR are notably spectacular from the dedicated viewing deck. There are many good alternative views available for the VSR and the sensitivity of the VSR is considered **Low.**

S-12: Two International Finance Centre

11.8.82 The viewing distance between this Vantage point and MPSC is about 5600m. Two International Finance Centre is located in Central District on Victoria Harbour with excellent panoramic views. The many good alternative views available to the VSR and restrictions on public access mean that sensitivity is considered **Low.**

VSRs at District Level

D-01: Kai Tak Runway Park

11.8.83 The Park is primarily intended to promote excellent views to Hong Kong Island and Kowloon East rather than Kai Tak. The distance between the Kai Tak Runway Park and the development is about 2.6km. At park level the view north is currently obscured by trees and only boundary glimpse views to the Project Site are possible. With development of the planned adjacent hotel and tourism node the receiver will be outside of the visual envelope during Operation Phase. Sensitivity of the VSR is considered **Low** during Operation Phase**.**

D-02: Future Metro Park South

11.8.84 The distance between the Metro Park South and the development is about 1.0 km. Development is expected to be scheduled in tandem with the programming of MPSC, meaning that receivers are not expected to be subject to Construction Phase impacts. The VSR may have partial views to the MPSC, however the rising ground and potential planting may almost obliterate views at ground level whist the viewpoint is focused on providing panoramic harbour views away from the development. Sensitivity of the VSR is **Medium** during Operation Phase**.**

D-03: Future Metro Park Central

11.8.85 The VSRs in this area are the same as the above D-02, all the factors except the distance are the same. The distance between the Metro Park Central and the development is about 420m. Sensitivity of the VSR is **Medium** during Operation Phase**.**

D-04: Future MPSC South

11.8.86 The VSRs in this area are located within the development site and are selected specifically for their viewpoint being out towards the Harbour and away from the development. However the proximity of the development means that it will still influence the outward looking receivers. Sensitivity to change of the VSR is **Medium** during Operation Phase**.**

D-05: Future MPSC East

11.8.87 The viewpoint is selected for its positioning on the Lion Rock View corridor. The future Road D2 will pass directly through the MPSC site under the landscape deck at this point. The receivers at this point are the many pedestrians and amenity facility users transiting the landscape deck to the road below and the proposed urban park in the future grid neighbourhood. The surrounding ambience of viewpoint is highly influenced by the proposed development and sensitivity is considered to be **High** during Operation Phase.

VSRs at Local Level - Residential

L-01 (R): Residential Development along Sung Wong Toi Road

11.8.88 Receivers in this group include blocks 3, 5, 6 and 7 of the 54 floor Sky Towers development with northwest facing views as well as hotel residents at Harbour Plaza 8 Degrees within the same complex and residential developments along Sung Wong Toi Road located at the west of the MPSC, and will have full view towards the MPSC site.

Residents have no alternative views. The distance between the VSR and the MPSC site is about 210m. The sensitivity of the VSR is **High**.

L-02 (R): Mid-rise Development in Chung Seen Mei Chuen and Kowloon City

11.8.89 The Chung Seen Mei Chuen and Kowloon City receivers are in medium-rise and high-rise pencil towers within the old district. Some south facing residents in high towers and on the southern periphery have full views to the development site during Construction Phase including residents of Le Billionaire. Residents have no alternative views. The distance between the VSR and the MPSC site is about 450m. After the completion of the planned residential development at the northwest of MPSC site however, only a limited number of VSRs at Chung Seen Mei Chuen will retain a partial view to the development site while the view of VSRs at Kowloon City will be blocked. The sensitivity of the VSR is **High** during Construction Phase and **Medium** during Operation Phase.

L-03 (R): High-rise Residential Groups North of Prince Edward Road East

11.8.90 This group includes The Latitude, Tung Wui Estate, Tung Tau Estate, San Po Kong Estate, and Lower Wong Tai Sin Estate. The Tung Tau Estate, San Po Kong Estate and Lower Wong Tai Sin Estate are public housing estates where the higher, south facing residents have only partial views to MPSC site due to views blocked by the Latitude Tower and Tung Wui Estate. The Latitude has five luxury residential towers with 1,159 units predominantly with south views towards the site. Tung Wui Estate is formed by two high-rise residential buildings located at the north of MPSC site. Residents have no alternative views. The distance between the VSR and the MPSC site is about 560m. Development of the mixed use area of Kai Tak development to the north of MPSC site is scheduled to be undertaken concurrently with the Project and will block the views from this VSR to the Project after completion. A worst case scenario is assumed whereby the planned development is not completed by Day 1 of Operation Phase and visual impacts from the Project itself may therefore remain. As such sensitivity is considered as **High** during Construction Phase and **Medium** during Operation Phase.

L-04 (R): Residents at Choi Hung and Diamond Hill

11.8.91 This group includes Rhythm Garden, Choi Hung Estate, Galaxia and the future development at the CDA site on Choi Hung Road. Rhythm Garden is a Home Ownership Scheme and Private Sector Participation Scheme in San Po Kong and Choi Hung Estate, is one of the oldest public housing estates in Hong Kong located in Wong Tai Sin District. Galaxia is a private housing estate located at Diamond Hill Station and Plaza Hollywood shopping centre comprising 5 blocks with a total of 1,684 units. The CDA site on Choi Hung Road is earmarked for mixed residential and commercial development. Southeast facing receivers are at the limit of the visual envelope with restricted corridor views past neighbouring development. Residents have no alternative views. The distance between the VSR and the MPSC site is about 1020m. After the completion of the planned development at the northeast of MPSC site under the KTD, the views of VSRs will be totally blocked. However a worst case scenario is assumed whereby the planned development is not completed by Day 1 of Operation Phase and visual impacts from the Project itself may therefore remain. The sensitivity of this VSR is **High** during Construction Phase and **Medium** during Operation Phase.

L-05(R): Kai Ching Estate and Tak Long Estate

11.8.92 Kai Ching Estate consists of six residential buildings completed in 2013. It houses around 5,200 flats for 13,300 residents. Tak Long Estate consists of nine residential blocks. These high-rise building blocks are located in the northeast of MPSC site and south and west facing residents have clear views towards the MPSC. The open views over Kai Tak afford a wide field of vision although compromised by the ongoing surrounding development. The distance between the VSR and the MPSC site is about 510m. After the completion of the planned mid-rise grid residential development at the northeast of MPSC site, the views of lower level receivers will be totally blocked. The sensitivity is considered as **High.**

L-06(R): Richland Gardens

11.8.93 Richland Gardens is a home ownership scheme and Private Sector Participation Scheme in Kowloon Bay. The height of building is to about +100mPD, where residents on higher levels will have partial westerly views towards the MPSC site past Kai Ching Estate and Tak Long Estate but at a distance of over 1km. The view of residents on lower levels towards the MPSC site will be limited and screened by Government Institutions and the Kwun Tong Bypass. Residents have no alternative views. The distance between the VSR and the MPSC site is about 840m. After the completion of the planned residential development at the northeast of MPSC site, the views of VSRs will be further obscured. The sensitivity is **Medium.**

L-07(R): Residential Development in To Kwa Wan

11.8.94 The zone consists primarily of high-density residential developments located at the southwest limits of the primary visual envelope with the nearest distance between this zone and MPSC site at about 300m. Residents have fair alternative views. The area is under transition with older mid-rise development being replaced by high-rise. Some upper floor residents of newer blocks do have partial views to the site and these will change over the next few years as the area redevelops, precluding most views to the site during Operation Phase. There are many residents in this zone but due to the distance and limited view, sensitivity is considered as **Medium.**

L-08(R): Laguna Verde

11.8.95 Laguna Verde is a private housing estate by Cheung Kong in north-eastern Hung Hom where the residents living on the northeast of the estate have excellent, wide, harbour views as well as direct view towards the MPSC site. The distance between the VSR and the MPSC site is about 1370m. The number of residents in this receiver group is considerable and the sensitivity of this VSR is considered as **Medium.**

L-09(R): Grand Waterfront

11.8.96 Grand Waterfront is a private housing estate and a shopping mall in Ma Tau Kok. The distance between the VSR and the MPSC site is about 300m. A large number of receivers at this VSR face northeast directly towards the MPSC site although these residents attractive, oblique, alternative views of the harbour. Residents have limited alternative views. The receiver sensitivity is considered as **High**.

L-10(R): Harbourfront Landmark

11.8.97 The Harbourfront Landmark is a 70-floor 233 meter tall skyscraper completed in 2001 located in Hung Hom. The distance between the VSR and the MPSC site is about 1880m. The VSRs have a distant view of the Project, where north facing residents at high level have a view over the top of Laguna Verde. High quality alternative views are directly focused to the east across the Victoria Harbour. In consideration of the relatively long and limited viewing distance, the sensitivity of this VSR is considered to be **Medium**.

L-11(R): Residential in progress along Prince Edward Road East

11.8.98 This VSR is located at the north of MPSC site and currently under construction. Future residents will have full and proximate views towards to MPSC site during Construction Phase and no alternatives. The distance between the VSR and the MPSC site is about 850m. However, following completion of the mixed use development at the north of the MPSC site, the view of this VSR will be blocked. A worst case scenario is assumed whereby the concurrent development is not completed by day 1 of Operation Phase and visual impacts from the Project may remain. The sensitivity is considered as **High** during Construction Phase and **Medium** during Operation Phase.

L-12(R): Low-rise Mixed Use Development Adjacent Grand Waterfront

11.8.99 An older neighbourhood of uniform block, mid-rise residential development with ground floor commercial development. The distance between the VSR and the MPSC site is about 185m. Views to the Project Site are only available to the few top floor residents on the northwest end facades who are able to see marginally over the adjacent development of Newport Centre but alternative views are not available. The site is zoned as CDA under the Kai Tak OZP with a stepped profile of development up to +110mPD and is designated for residential and/or commercial uses with the provision of waterfront promenade, open space and other supporting facilities. Development is anticipated to be concurrent with MPSC and as such the sensitivity is considered as **Low** during Construction Phase and **High** during Operation Phase.

L-13(R): Future Residential Development at Northwest of MPSC

11.8.100 The areas to the north of the MPSC are zoned to contain Residential (Group B) in 4 development blocks of height up to +85mPD and one of +100mPD. The planning intent is for medium density, without podium neighbourhoods on a grid street pattern. The distance between the VSR and the MPSC site is about 45m. Receivers are immediately proximate to the MPSC with those viewing southeast fully overlooking the Project Site, although selected, wider views are possible. Development is anticipated to be concurrent with MPSC and as such no Construction Phase assessment is made. Operation Phase sensitivity will be **High.**

L-14(R): Future Residential Development at Northeast of MPSC

11.8.101 This large area zoned Residential (Group B) is intended for medium-density, without podium neighbourhoods on a grid street pattern, with building heights up to +110mPD. The distance between the VSR and the MPSC site is about 45m. The future residents shall be immediately adjacent to the MPSC site and those on the periphery have direct overview of the Project Site, although selected, wider views are possible. Development is anticipated to be concurrent with MPSC and as such no Construction Phase assessment is made. Operation Phase sensitivity will be **High**.

L-15(R): Future Residential Development in Runway Precinct

11.8.102 This zone is intended primarily for low-rise, low-density residential development. The distance between the VSR and the MPSC site is about 830m. Primary views are oriented away from MPSC restricting receivers to just those in the northern blocks that will be able to view the development over the Metro Park and raised central promenade over Road D3. Good alternative harbour views are therefore available. Development is anticipated to be concurrent with MPSC and as such no Construction Phase assessment is made. Operation Phase sensitivity will be **Medium**.

<u>VSRs at Local Level - Functional</u>

L-01 (F): Education and Healthcare Facilities at Ma Tau Wai

11.8.103 This VSR includes the Evangel Hospital, Christian Alliance P.C.Lau Memorial International School, Notre Dame College and Holy Trinity Primary School. The closest distance between the VSR and the MPSC site is about 460m. Some staff and students in this area will be able to have direct views onto the MPSC development, whilst alternative views are available and the quality of these views is fair. With restricted viewing opportunities available, receiver numbers and view duration, the VSR sensitivity is considered as **Medium** during Construction Phase. Following completion of the *Future Mixed Development at Northwest of MPSC L-13(R)* and the *Open Space Network L-04(L)* viewing opportunities are restricted and immediate alternatives enhanced. Operation Phase sensitivity is still considered as **Medium**.

L-02 (F): Education and Healthcare Facilities at San Po Kong

11.8.104 This VSR includes the Ng Wah Catholic Secondary School, Lee Kau Yan Memorial School and, Robert Black Health Centre and is located at the north side of MPSC site at a distance of about 470m. Staff and students in this area will be able to have full views on the MPSC development from upper floors, whilst alternative views are available and the quality of these views is fair. With restricted occasions available to receivers for viewing out however, and with low receiver numbers and view duration, the VSR sensitivity is considered as **Medium** during Construction Phase. Following completion of the *Future Mixed Development at Northwest of MPSC L-13(R)* and the *Open Space Network L-05(L)* viewing opportunities are restricted and immediate alternatives enhanced. Operation Phase sensitivity is considered **Low**.

L-03 (F): Government Facilities on Concorde Road

11.8.105 Currently including the Kai Tak Operation Base and Trade and Industry Tower, further GI/C facilities are in development. The distance between the VSR and the MPSC site is about 450m. Staff working in these areas are able to have full views over the Kai Tak Development and MPSC Project Site will form a large part of that. The alternative views are not available. VSR sensitivity is considered as **Low** during Construction Phase. Following completion of the *Future Mixed Development at Northwest of MPSC L-13(R*) and the *Open Space Network L-05(L)* viewing opportunities are restricted and immediate alternatives enhanced. The sensitivity of the VSR is **Low** during Operation Phase.

L-04 (F): Development Support Facilities at Kowloon Bay Interchange

11.8.106 This area of the Kai Tak Development includes a number of grouped GI/C facilities including the recently completed Electrical and Mechanical Services Dept.

Headquarters, the Kai Tak Tunnel Administration Building, the planned DSD desilting compound, ESS and various facilities to serve the Kai Tak area along Road D2. The closest distance between the VSR and the MPSC site is about 45m. Because of their proximity to the MPSC development, staff working in these areas will be able to have reasonably clear and uninterrupted views directly to the Project. Receiver numbers are relatively restricted however and a variety of reasonable alternative views are available. VSR sensitivity is considered as **Medium.**

L-05 (F): Education and Healthcare Facilities at Kowloon Bay

11.8.107 This VSRs includes S.K.H. Kowloon Bay Kei Lok Primary School, Buddhist Chi King Primary School, Bishop Paschang Catholic School, Yan Chai Hospital Law Chan Chor Si College and Kowloon Bay Health Centre. The distance between the VSR and the MPSC site is about 830m. Occupational receivers on the west side of the buildings have views partially obscured by the existing dense vegetation as well as the elevated road of the Kwun Tong Bypass. Fair alternative views exist to the north and east, looking away from the Project Site. VSR sensitivity is considered as **Medium** during Construction Phase. After completion of all building development at Kai Tak Development, the view of this VSR will be partially blocked by the new residential development at L-14(R). Operation Phase sensitivity is considered **Low.**

L-06 (F): Kowloon Bay Action Area

11.8.108 These existing VSRs in this area include West Kowloon Waste Recycling Centre, and Kowloon Bay Vehicle Examination Centre. Views on the west side of buildings to the MPSC are restricted by the elevated Kwun Tong By-pass at about 1000m distance and the direct harbour views available to this VSR are preferable to viewing towards the Project Site. Receivers in this area are relatively few and sensitivity is considered to be **Low** during Construction Phase. The Planning and Engineering Study for the Development at Kowloon Bay Action Area (KBAA) commenced in August 2014 in order to review and formulate feasible development options. With a possible Environmentally Friendly Linkage System (EFLS) depot and a station being considered in KBAA, the area would have great potential to become a new and vibrant development node in Kowloon East. The existing government facilities currently occupying the KBAA site are proposed to be relocated to release some 6.4 hectares of government land for the comprehensive development. KBAA has the potential to supply additional commercial/office floor space of about 0.42 million m^2. The Study is anticipated to complete in 2016. Operation Phase sensitivity is considered **Medium**.

L-07 (F): Police Operational Facility at Dyer Avenue

11.8.109 Positioned within the Kowloon Bay, staff in this area have full views across the Harbour to the MPSC site. The distance between the VSR and the MPSC site is about 1600m. However alternative good quality views and low receiver numbers mean the VSR sensitivity is considered as **Low**.

L-08 (F): Hong Kong Aviation Club

11.8.110 The Aviation Club was forced to stop flying operation in 2015 however the Club remains as the only remaining local heritage and history of the former Kai Tak Airport. The distance between the VSR and the MPSC site is about 200m. Although immediately adjacent to the MPSC, receivers will overlook the works directly but they are relatively few in number and short in viewing duration. The sensitivity is considered to be **Medium.**

L-09(F): Comprehensive Development Area along Mok Cheong Street

11.8.111 Currently housing small commercial operations in low rise facilities, this VSR has relatively few, short duration receivers. Although the viewing distance between the VSR and the MPSC site is only about 90m and few alternative views are available to the south and west, only limited numbers of receiver exist. The sensitivity is considered to be **Medium** in Construction Phase. Redevelopment of the area is scheduled, potentially with higher sensitivity receivers. Operation Phase sensitivity is considered **High**.

L-10 (F): Kowloon Bay Business District

11.8.112 An area undergoing urban renewal from traditional manufacturing and warehousing to offices and commercial within a new CBD focused on Enterprise Square. High-rise commercial buildings with views to Kai Tak include Billion Centre, Megabox, Enterprise Square V Towers 1 and 2, Enterprise Square III, Manhattan Place, One Kowloon, Exchange Tower, YHC Tower, Nan Fung Commercial Centre 18 Kowloon East and Skyline Tower. More high-rise construction is anticipated in the area over the course of the MPSC development. The distance between the VSR and the MPSC site is about 530m and receiver numbers are considerable and growing. Currently the views from high floors are expansive yet predominantly towards the Project Site although receivers do have good alternatives. The sensitivity of the receivers is considered **Medium.**

L-11 (F): Business and Industrial Development in San Po Kong

11.8.113 A mixed district at the edge of the visual envelope, of mid to tall rise building, largely consisting of commercial and warehouse units with partial residential high-rise buildings. Other than for the buildings directly on Prince Edward Road, the planned mixed development at north of MPSC will entirely conceal the Project during Operation. The distance between the VSR and the MPSC site is about 730m with fair alternative views for most receivers. The sensitivity is considered **Low** during Construction Phase and Operation Phase.

L-12 (F): Business and Industrial Development in Hung Hom

11.8.114 This older district is mixed with similar mid-rise industrial and commercial buildings. The distance between the VSR and the MPSC site is about 1100m with fair alternative views for most receivers. Receivers on the north and east of the area can obtain oblique views across Kowloon Bay to the Project Area but are predominantly obscured by the Grand Waterfront development. Receivers are considered to have **Low** sensitivity.

L-13(F): Kwun Tong Business District

11.8.115 Kwun Tong was at the centre of past manufacturing but is now undergoing urban renewal along with Kowloon Bay. Mid-rise industrial and warehousing units are typically vacated whilst new grade A office buildings and hotels are appearing above the roofline with views towards the Project. Receivers are at almost 1550m distance from the Project Area however with wide, alternative harbour views. Sensitivity is considered to be **Low**.

L-14 (F): Hong Kong International Trade and Exhibition Centre

11.8.116 The Kowloon Bay International Trade & Exhibition Centre is an exhibition centre, shopping mall and performance venue. The distance between the VSR and the MPSC site is about 350m with restricted alternative views for most receivers. Limited upper floor receivers are able to view over the Kwai Fuk Road ramped junction and existing vegetation towards the Project, however the venue is generally inwards looking and users occasional, varied and insensitive to externalities. New GI/C development at Kai Tak may further restrict direct viewing during Operation Phase. Sensitivity is considered to be **Low.**

L-15 (F): Kowloon City Ferry Pier and Transport Terminus

11.8.117 Receivers at the Pier have full and close views towards to the MPSC development however they are relatively few and duration of view is limited with good alternative harbour views. The distance between the VSR and the MPSC site is about 400m. Sensitivity is considered as **Medium.**

L-16 (F): Pacific Trade Centre, Octa Tower, Kowloon Godown

11.8.118 Receivers on the northwest side of mid and low-rise buildings have existing views obscured by construction on the Kai Tak Development. The distance between the VSR and the MPSC site is about 1420m. Wide, forward, harbour views are more desirable to the high-rise receivers of Octa Tower where the site is only visible on the oblique. Sensitivity of these VSRs is considered to be **Low.**

L-17(F): Future Tourism Development in Runway Precinct

11.8.119 This area is intended primarily for the provision of tourism related use with commercial, hotel and entertainment facilities as well as a public observation gallery. The maximum building height is intended at +100mPD. The distance between the VSR and the MPSC site is about 1970m. The view of VSRs to the MPSC development is distant and building orientation is likely to be focused to the Harbour at east and west. The future runway development at Kai Tak will obscure views to lower level receivers. As receivers do have good alternative views, sensitivity of this VSR is considered as **Low** during Operation Phase.

L-18(F): Planned Commercial Development along Route 6

11.8.120 This area consists of development plots along the planned Route 6. These are predominantly zoned G/IC with height restriction of +45mPD. The sites to the south of Kwun Tong Bypass in the South Apron corner are reserved for hospital development to serve the East Kowloon area and surrounding districts with height restriction of +60mPD. The distance between the VSR and the MPSC site is about 260m. Views to the Project Site during Operation may be direct for receivers on the waterfront and in high floors looking west. Future building orientation is likely to be focused to the Harbour and Runway Precinct; these wide and forward harbour views are likely more desirable than oblique north views. Operation Phase sensitivity is assessed as **Medium**.

L-19(F): Planned Commercial Development in Runway Precinct

11.8.121 This zone is intended to form a hotel belt along the waterfront of the Runway Precinct so as to support the nearby tourism node and cruise terminal development. The distance between the VSR and the MPSC site is about 860m. Primary views are oriented away from the MPSC, restricting receivers to just those in the northern blocks that will be able to view the development over the Metro Park and raised central promenade over Road D3. Receivers will have good alternative views. Development is anticipated to be concurrent with MPSC and as such no Construction Phase assessment is made. Operation Phase sensitivity is assessed as **Medium**.

L-20 (F): Planned Mixed Use Development at Kai Tak

11.8.122 Predominantly consisting of planned commercial development within CDA, OU and Commercial zonings. Commercial zoned development to the north of L-13(R) at +60 - 70mPD will be blocked out by the residential units to viewing the Project Site. The CDA sites are typically also mid-rise, however CDA5 at +110mPD immediately to the north of the Project, will have direct and proximate views. Other mixed use development around Station Square will have clear views over the open space corridor. The shortest distance between the VSR and the MPSC site is about 45m. Development is anticipated to be concurrent with MPSC and as such no Construction Phase assessment is made. Operation Phase sensitivity is assessed as **Medium.**

L-21 (F): Construction Areas at Kai Tak Development

11.8.123 Currently being used for construction activities associated with Kai Tak Development, these areas are immediately in the vicinity of the Project Site and will be developed for a variety of uses including open space, government facilities and other uses. Alternative views from these areas exist, including towards the sea and surrounding mountains. Those areas remaining free from immediate built development will in future be outside of the Operation Phase visual envelope as their view will be blocked out by commercial development in L-20(F) as well as well as residential development at L-05(R) and L-14(R). The sensitivity is considered as **Low** during both Construction and Operation Phases.

<u>VSRs at Local Level – Leisure</u>

L-01(L): Amenity Users at Greenspace on Prince Edward Road

11.8.124 For Leisure visitors to Sacred Hill, Sung Wong Toi Playground, Olympic Garden and Argyle Street Playground, the views towards to the Project Area are generally obscured due to their low lying position and close proximity to screening elements such as road traffic, barriers, trees and construction site plant. Surrounding alternative views are also blocked by development and the distance between the VSR and the MPSC site is about 380m. Works associated with Kai Tak Development have already impinged on the green spaces affecting regular users, whilst viewing of the Project Site during Operation Phase will be restricted by further new development. Sensitivity is assessed as **Medium.**

L-02(L): Amenity Users at Shek Ku Lung Road Playground

11.8.125 As is the case for L-01(L), this open space is enclosed by roads, buildings and barriers restricting views from ground level to the site. The distance between the VSR and the MPSC site is about 460m and planned development of the adjacent mixed use neighbourhood at Kai Tak will block this VSR from Operation Phase project views. Construction Phase sensitivity is assessed as **Medium** and Operation Phase sensitivity is assessed as **Low.**

L-03(L): Amenity Users at Sze Mei Street Open Space and PTI

11.8.126 Receivers in this area include pedestrians using Sze Mei Street and the adjacent open space corridor as well as Kai Tak East Playground and Sze Mei Street PTI. The distance between the VSR and the MPSC site is about 850m and alternative views are restricted and towards the north. Views at ground level are generally blocked across Prince Edward Road East, however tall development near the Project Site can be glimpsed currently from the southern end of the VSR. Completion of L-11(R) currently under construction, will in future further restrict views from the receiver towards the Project Area. As such sensitivity is considered as **Medium** during Construction Phase and **Low** during Operation Phase.

L-04(L): Kai Tak Promenade and Open Space Network

11.8.127 The proposed Sung Wong Toi Park located along the west boundary of MPSC site is intended to link the surrounding open space network with local residences and public transport connections. It can be anticipated to be a heavily utilised series of spaces immediately adjacent to the MPSC and is likely to become a destination location for Hong Kong residents and tourists alike. Receivers will have good alternative, transient views. Sensitivity during Operation Phase is considered to be **High.**

L-05(L): Kai Tak Public Open Space Network and Station Square

11.8.128 The Station Square will form a contemporary park with cafes and restaurants serving as a gateway to Kai Tak. There are potentially a large number of daily travellers in this area with full and open views to the MPSC development at the south project boundary. The alternative views of receivers is limited by the proximity of buildings. Sensitivity during Operation Phase is considered to be **High.**

L-06(L): Visitors to Future Metro Park

11.8.129 The Metro Park, located at the south of the MPSC development is designed to be constructed concurrently and will provide a variety of recreation facilities within greenspace for different users with wide harbour views, whilst providing the parkland setting for the MPSC. The distance between the VSR and the MPSC site is about 45m. As a major tourist location, sensitivity during Operation Phase is considered to be **High.**

L-07(L): Promenade along Ma Tau Kok

11.8.130 Existing users of Hoi Sham Park are considerable in number and treasure the amenity views offered over the Harbour, which are predominantly to the south and east rather than to the north where the MPSC site is obliquely viewed. Extended open space areas in the planned promenade are also likely to focus on alternatives to the Project Site, partly obscured by Grand Waterfront Development. The distance between the VSR and the MPSC site is about 200m. Sensitivity is considered as **Medium**.

L-08(L): Visitors to Kai Tak Cruise Terminal Roof Garden

11.8.131 The distance between the rooftop public viewing garden and the MPSC site is about 1750m with wonderful views provided in all directions around the Harbour primarily for tourists. Views to the Project development are restricted and not generally preferred. Sensitivity during Operation Phase is considered to be **Low.**

L-09(L): Visitors to Kwun Tong Typhoon Shelter Promenade

11.8.132 Intended to link the waterfront open space on all sides of the Typhoon Shelter, the promenade is a high quality open space for public enjoyment. Kwun Tong Promenade Stage 1 comprising a 200m waterfront open space opened in 2010. The Stage 2 project extended the waterfront promenade by 750m at the former Kwun Tong Public Cargo Working Area and opened for the public in May 2015 to provide an additional 3.4 hectares. The promenade consists of boardwalks, sitting-out areas, pavilions and shelters with benches, open areas with fitness stations, models of cargo containers and cranes to evoke the historical context of the area, sensory gardens, kiosks, and multi-purpose plazas. The receivers have good alternative views. The distance between the VSR and the MPSC site varies considerably but is adjacent at its most northerly point at about 75m, separated only by the future Route 6. Sensitivity is considered as **Medium**.

<u>VSRs at Local Level – Transport</u>

L-01(T): Travellers on Prince Edward Road East

11.8.133 High speed traffic on Prince Edward Road is currently able to obtain various extended views across the Project Site from close quarters, however the position at ground level precludes easy viewing due to the larger number of barriers and temporary construction interfaces close to roadside. Upper deck bus travel allows clear and full Project Site viewing, however for only relatively brief periods. Planned development of the adjacent mixed use neighbourhood at Kai Tak will block this VSR from Operation Phase views of the Project and potentially much of Construction Phase as well. The distance between the VSR and MPSC site is about 400m. The sensitivity is considered as **Low** during Construction Phase and Operation Phase.

L-02(T): Travellers on Sung Wong Toi Road

11.8.134 Relatively few users are present on this local road however it does provide construction site access to Olympic Avenue project sites and is likely to remain heavy with construction traffic during Kai Tak development. Travel speeds are generally low and views are immediately adjacent to the site but short in duration. The distance between the VSR and MPSC site is about 65m. Sensitivity is considered as **Low.**

L-03(T): Motorists on Kwun Tong Bypass

11.8.135 Kwun Tong Bypass and Future Central Kowloon Route are elevated trunk roads at a closest distance of about 400m from the Project. The view of receivers to the Project Site is distant, varied and in sporadic glimpses between buildings and construction sites. Clear views to the Project during Operation are unlikely due to the surfeit of planned development in the area. The sensitivity is considered to be **Low** during both Construction Phase and Operation Phase.

L-04(T): Harbour Vessels

11.8.136 The majority of boat traffic is from barges in To Kwa Wan Typhoon Shelter which is within 70m from the site boundary. The receivers have good alternative views. The North Point to Kowloon City Ferry also plies its trade close to the Project development whilst it can be anticipated that with the expanded use of the Kai Tak Cruise Terminal and potential increases in tourist related boating during Operation Phase, the sensitivity of these receivers may increase. Sensitivity is considered in Construction Phase as **Low** and assessed as **Medium** during Operation Phase.

L-05(T): Future Central - Kowloon Route 6

11.8.137 This major strategic trunk road to be constructed concurrently with MPSC, it will emerge from a tunnel immediately next to the Project Site, becoming elevated and providing direct and immediate views. The high capacity of the road, coupled with the proximity to the site and expansiveness of view afforded, suggests sensitivity to be assessed as **Medium** during Operation Phase.

L-06(T): Future Road D2

11.8.138 Future Road D2 will pass directly through the MPSC site under the landscape deck. The road is intended to connect the local neighbourhoods at To Kwa Wan to Kowloon Bay and could become heavy with local traffic and resident use, whilst being heavily utilised during sporting events. The receivers have poor alternative views. Sensitivity is considered to be **Medium** during Operation Phase.

L-07(T): Future Road D3 and Central Boulevard

11.8.139 This local distributor road is intended to service the new developments formed on the Kai Tak Runway. It shall be partially covered by a pedestrianised landscape deck linking to the Metro Park at its southern end, whilst closer to the Project Site it will pass under the planned Route 6 elevated road at the southern boundary. New development, roadside noise barriers and ancillary engineering structures are likely to make views to the Project Site occasional and partially obscured. Sensitivity is considered to be **Low** during Operation Phase

L-08(T): Future Road D4 and Taxiway Bridge

11.8.140 Receivers on the taxiway bridge are able to view down the length of the Kwun Tong Typhoon Shelter towards the Project Site. The distance between the VSR and the MPSC site is about 1km. During construction, the Project works will be visually inseparable from other development at Kai Tak, especially construction of the Kowloon - Central Route 6 and Runway Precinct development. Vehicle traffic is likely to consist mainly of construction traffic for a number of years. Sensitivity is considered to be **Low** during both Construction and Operation Phases.

L-09(T): Future Road L6

11.8.141 Providing local neighbourhood access to the new grid residential development at Kai Tak, this short section of road next to the Project boundary will be predominantly utilised by construction traffic during Construction Phase. Through Operation Phase views onto the Project itself will be immediately onto the adjacent open space at +5mPD, whilst views across the landscape deck will not be possible due to raised levels and podium deck structure. Sensitivity is considered to be **Low** during Operation Phase.

Summary Schedule of Visually Sensitive Receivers

11.8.142 The VSRs identified within the Study Area as described above and their sensitivity to change are summarised **Table 11-10** below. For planned VSR existing views are based on the anticipated view without the Project development in place.

Table 11-10 Summary of Assessment of Sensitivity of Visually Sensitive Receivers (VSRs)

VSR No.	**Location**	**Estimated Number of Receivers** (Few / Typical / Many)	**Value and Quality of Existing View** (Good / Fair / Poor)	**Availability and Amenity of Alternative Views**	***Degree of Visibility** (Full/ Partial/ Glimpse)	**Duration of View** (Long/ Medium/ Short)	**Sensitivity** (Low/ Medium/ High)	
							Con.	**Op.**
Strategic Level								
S-01	Proposed Promenade, South East Kowloon Development (VP3)	Typical	Good	Good	Partial	Short	**Low**	
S-02	Quarry Bay Park, (VP4)	Typical	Good	Good	Partial	Short	**Low**	
S-03	Victoria Peak (VP7)	Many	Good	Good	Full	Short	**Low**	
S-04	Lion Rock	Few	Good	Good	Full	Short	**Low**	
S-05	Kowloon Peak	Few	Good	Good	Full	Short	**Low**	
S-06	Devil’s Peak	Few	Good	Good	Full	Short	**Low**	
S-07	Mount Parker	Few	Good	Good	Full	Short	**Low**	
S-08	Mount Cameron	Few	Good	Good	Full	Short	**Low**	
S-09	North Point Pier	Typical	Good	Good	Full	Short	**Low**	
S-10	Lei Yue Mun Gap	Few	Good	Good	Full	Short	**Low**	
S-11	International Commerce Centre	Typical	Good	Good	Partial	Short	**Low**	
S-12	Two International Finance Centre	Typical	Good	Good	Partial	Short	**Low**	
District Level								
D-01	Kai Tak Runway Park	Many	Good	Good	Glimpse	Long	**-**	**Low**
D-02	Future Metro Park South	Many	Good	Good	Partial	Long	**-**	**Medium**
D-03	Future Metro Park Central	Many	Good	Good	Partial	Long	**-**	**Medium**

VSR No.	Location	Estimated Number of Receivers (Few / Typical / Many)	Value and Quality of Existing View (Good / Fair / Poor)	Availability and Amenity of Alternative Views	*Degree of Visibility (Full/ Partial/ Glimpse)	Duration of View (Long/ Medium/ Short)	Sensitivity (Low/ Medium/ High)	
							Con.	**Op.**
D-04	Future MPSC South	Many	Fair	Fair	Full	Long	**-**	**Medium**
D-05	Future MPSC East	Many	Poor	Restricted	Full	Long	**-**	**High**
Local – Residential								
L-01(R)	Residential Development along Sung Wong Toi Road	Many	Fair	None	Full	Long	**High**	
L-02(R)	Mid-rise Residential Development in Chung Seen Mei Chuen an Kowloon City	Typical	Fair	None	Full/Part	Long	**High**	**Medium**
L-03(R)	High-rise Residential Groups North of Prince Edward Road East	Typical	Fair	None	Full/Part	Long	**High**	**Medium**
L-04(R)	Residents at Choi Hung and Diamond Hill	Typical	Fair	None	Full/Part	Long	**High**	**Medium**
L-05(R)	Kai Ching Estate and Tak Long Estate	Many	Fair	Fair	Full/Part	Long	**High**	
L-06(R)	Richland Garden	Typical	Fair	None	Partial	Long	**Medium**	
L-07(R)	Residential Development in To Kwa Wan	Typical	Fair	Fair	Partial	Long	**Medium**	
L-08(R)	Laguna Verde	Typical	Good	Good	Full	Long	**Medium**	
L-09(R)	Grand Waterfront	Many	Fair	Limited	Full	Long	**High**	
L-10(R)	Harbourfront Landmark	Typical	Good	Good	Full	Long	**Medium**	
L-11(R)	Residential in Progress at Prince Edward Road East	Typical	Fair	None	Full/None	Long	**High**	**Medium**
L-12(R)	Low-rise Mixed Use Development Adjacent Grand Waterfront	Typical	Fair	None	Partial	Long	**Low**	**High**
L-13(R)	Future Residential Development at Northwest of MPSC	Many	Fair	Limited /Fair	Full	Long	**-**	**High**
L-14(R)	Future Residential Development at Northeast of MPSC	Many	Fair	Limited /Fair	Full	Long	**-**	**High**

<table>
<tr><th rowspan="2">VSR No.</th><th rowspan="2">Location</th><th rowspan="2">Estimated Number of Receivers (Few / Typical / Many)</th><th rowspan="2">Value and Quality of Existing View (Good / Fair / Poor)</th><th rowspan="2">Availability and Amenity of Alternative Views</th><th rowspan="2">*Degree of Visibility (Full/ Partial/ Glimpse)</th><th rowspan="2">Duration of View (Long/ Medium/ Short)</th><th colspan="2">Sensitivity (Low/ Medium/ High)</th></tr>
<tr><th>Con.</th><th>Op.</th></tr>
<tr><td>L-15(R)</td><td>Future Residential Development in Runway Precinct</td><td>Typical</td><td>Good</td><td>Limited /Good</td><td>Partial</td><td>Long</td><td>-</td><td>Medium</td></tr>
<tr><td colspan="9">Local - Functional</td></tr>
<tr><td>L-01(F)</td><td>Education and Healthcare Facilities at Ma Tau Wai</td><td>Medium</td><td>Fair</td><td>Fair</td><td>Partial</td><td>Medium</td><td colspan="2">Medium</td></tr>
<tr><td>L-02(F)</td><td>Education and Healthcare Facilities at San Po Kong</td><td>Medium</td><td>Fair</td><td>Fair</td><td>Full/Part</td><td>Medium</td><td>Medium</td><td>Low</td></tr>
<tr><td>L-03(F)</td><td>Government Facilities on Concorde Road</td><td>Few</td><td>Fair</td><td>None</td><td>Full/Part</td><td>Medium</td><td>Low</td><td>Low</td></tr>
<tr><td>L-04(F)</td><td>Development Support Facilities at Kowloon Bay Interchange</td><td>Few</td><td>Fair</td><td>Fair</td><td>Full</td><td>Medium</td><td colspan="2">Medium</td></tr>
<tr><td>L-05(F)</td><td>Education and Healthcare Facilities at Kowloon Bay</td><td>Typical</td><td>Fair</td><td>Fair</td><td>Partial</td><td>Medium</td><td>Medium</td><td>Low</td></tr>
<tr><td>L-06(F)</td><td>Kowloon Bay Action Area</td><td>Few</td><td>Fair</td><td>Good</td><td>Partial</td><td>Medium</td><td>Low</td><td>Medium</td></tr>
<tr><td>L-07(F)</td><td>Police Operational Facility at Dyer Avenue</td><td>Few</td><td>Good</td><td>Good</td><td>Full</td><td>Medium</td><td colspan="2">Low</td></tr>
<tr><td>L-08(F)</td><td>Hong Kong Aviation Club</td><td>Few</td><td>Fair</td><td>Limited</td><td>Full</td><td>Long</td><td colspan="2">Medium</td></tr>
<tr><td>L-09(F)</td><td>Comprehensive Development Area along Mok Cheong Street</td><td>Many</td><td>Fair</td><td>Limited</td><td>Full</td><td>Medium</td><td>Medium</td><td>High</td></tr>
<tr><td>L-10(F)</td><td>Kowloon Bay Business District</td><td>Many</td><td>Fair</td><td>Good</td><td>Partial</td><td>Medium</td><td colspan="2">Medium</td></tr>
<tr><td>L-11(F)</td><td>Business and Industrial Developments in San Po Kong</td><td>Many</td><td>Fair</td><td>Fair</td><td>Full/None</td><td>Medium</td><td>Low</td><td>Low</td></tr>
<tr><td>L-12(F)</td><td>Business and Industrial Developments in Hung Hom</td><td>Many</td><td>Fair</td><td>Fair</td><td>Partial</td><td>Medium</td><td colspan="2">Low</td></tr>
<tr><td>L-13(F)</td><td>Kwun Tong Business District</td><td>Many</td><td>Fair</td><td>Good</td><td>Partial</td><td>Medium</td><td colspan="2">Low</td></tr>
<tr><td>L-14(F)</td><td>Hong Kong International Trade and Exhibition Centre</td><td>Many</td><td>Good</td><td>Restricted</td><td>Full</td><td>Medium</td><td colspan="2">Low</td></tr>
<tr><td>L-15(F)</td><td>Kowloon City Ferry Pier</td><td>Few</td><td>Fair</td><td>Good</td><td>Full</td><td>Medium</td><td colspan="2">Medium</td></tr>
</table>

VSR No.	Location	Estimated Number of Receivers (Few / Typical / Many)	Value and Quality of Existing View (Good / Fair / Poor)	Availability and Amenity of Alternative Views	*Degree of Visibility (Full/ Partial/ Glimpse)	Duration of View (Long/ Medium/ Short)	Sensitivity (Low/ Medium/ High)	
							Con.	**Op.**
L-16(F)	Pacific Trade Centre, Octa Tower, Kowloon Godown	Typical	Fair	Good	Partial	Medium	**Low**	
L-17(F)	Future Tourism Development in Runway Precinct	Many	Good	Good	Full	Medium	**-**	**Low**
L-18(F)	Planned Development along Route 6	Many	Good	Good	Full	Medium	**-**	**Medium**
L-19(F)	Planned Commercial Development in Runway Precinct	Many	Good	Good	Full	Medium	**-**	**Medium**
L-20(F)	Planned Mixed Use Development at Kai Tak	Many	Fair	Limited / Fair	Full	Medium	**-**	**Medium**
L-21(F)	Construction Areas at Kai Tak Development	Few	Fair	Fair	Full	Medium	**Low**	**-**
Local - Leisure								
L-01(L)	Amenity Users at Greenspace on Prince Edward Road	Typical	Fair	None	Partial	Short	**Medium**	
L-02(L)	Visitors at Shek Ku Lung Road Playground	Typical	Fair	None	Part/None	Short	**Medium**	**Low**
L-03(L)	Amenity Users at Sze Mei Street Open Space and PTI	Typical	Poor	Poor	Part/None	Short	**Medium**	**Low**
L-04(L)	Kai Tak Promenade and Open Space Network	Many	Good	Good	Full	Short	**-**	**High**
L-05(L)	Kai Tak Public Open Space Network and Station Square	Many	Fair	Limited	Full	Short	**-**	**High**
L-06(L)	Visitors to Future Metro Park	Many	Good	Good	Full	Short	**-**	**High**
L-07(L)	Promenade along Ma Tau Kok	Many	Good	Good	Partial	Short	**Medium**	
L-08(L)	Visitors to Kai Tak Cruise Terminal Roof Garden	Few	Good	Good	Full	Short	**Low**	
L-09(L)	Visitors to Kowloon Bay Typhoon Shelter Promenade	Many	Good	Good	Full	Short	**Medium**	

VSR No.	**Location**	**Estimated Number of Receivers** (Few / Typical / Many)	**Value and Quality of Existing View** (Good / Fair / Poor)	**Availability and Amenity of Alternative Views**	***Degree of Visibility** (Full/ Partial/ Glimpse)	**Duration of View** (Long/ Medium/ Short)	**Sensitivity** (Low/ Medium/ High)	
							Con.	**Op.**
Local - Transport								
L-01(T)	Travellers on Prince Edward Road East	Many	Poor	Limited/Poor	Part/None	Short	**Low**	**Low**
L-02(T)	Travellers along Sung Wong Toi Road	Few	Fair	None	Partial	Short	**Low**	
L-03(T)	Motorists on Kwun Tong Bypass	Many	Fair	Fair	Part/None	Short	**Low**	**Low**
L-04(T)	Harbour Vessels	Many	Fair	Good	Full	Medium	**Low**	**Medium**
L-05(T)	Future Central Kowloon Route 6	Many	Fair	Fair	Glimpse	Short	**-**	**Medium**
L-06(T)	Future Road D2	Many	Poor	Poor	Glimpse	Short	**-**	**Medium**
L-07(T)	Future Road D3 and Central Boulevard	Typical	Poor	Limited/Poor	Glimpse	Short	**-**	**Low**
L-08(T)	Future Road D4 and Taxiway Bridge	Typical	Good	Good	Glimpse	Short	**Low**	**Low**
L-09(T)	Future Road L6	Typical	Fair	Limited/Fair	Glimpse	Short	**-**	**Low**

***NB1** The Kai Tak Development is scheduled to run concurrently with the MPSC project, scheduled for operation by year 2021. A worst case scenario has been adopted in terms of assuming implementation of adjacent projects and their impact on visibility of VSR's towards MPSC.

***NB2:** The Estimated Number of Receivers is categorized as "Few/Typical/Many", " Typical" appears as a scale which means "more than few" and "less than many"

Glare Sensitive Receivers

11.8.143 The areas surrounding the MPSC are mainly existing residential and proposed mixed use development areas including park and leisure activities. For these areas, the background lighting environment is typically classified as medium district brightness areas, such as industrial or residential suburbs E3 in accordance with BS EN 12193. The Environmental Zones Classification is given in **Table 11-11.**

Table 11-11 The Environmental Zone Classifications E0 to E4

Environmental Zone	Lighting Environment	Surrounding
E0	Dark Sky Parks	Starlight Reserves
E1	Intrinsically Dark Areas	National Parks or Protected Sites
E2	Low District Brightness Areas	Industrial or Residential Rural Areas
E3	Medium District Brightness Areas	Industrial or Residential Suburbs
E4	High District Brightness Areas	Town Centres and Commercial Areas

11.8.144 To safeguard and enhance the night time environment it is necessary to control obtrusive light (also known as light pollution), which can present psycho-physical and ecological problems to people, flora and fauna in the surroundings. The limits of obtrusive light for exterior lighting installations are given in **Table 11-12**.

Table 11-12 Obtrusive Light Limitations for Exterior Lighting Installations in Zone E3

Nature	Period	Limit
Upward Light ULR		15.0 %
Maximum value of vertical illuminance on properties, E_{va}	Pre-curfew	10 lux
	Post-curfew	2 lux
Maximum light source intensity, I	Pre-curfew	10.0 kcd
	Post-curfew	1.0 kcd
ULR is the proportion of the flux of the luminaire(s) that is emitted above the horizontal, when the luminaire(s) is (are) mounted in its (their) installed position and attitude.		

11.8.145 Since these areas have a high percentage of built development, for the purpose of this assessment a Reflectance ρ of 0.2 for is used for lawn, 0.8 for building surface and 0.8 for water surface as mentioned in **Section 11.5.4.**

11.8.146 For conservative assessment, the glare rating prediction assumes only man-made lightings from the MPSC whilst associated structures contribute to the veiling luminance of the environment within the study envelope. The prediction assumes dark sky condition. In practice, light from surrounding buildings and reflected from high-reflectance surfaces (such as concrete surfaces for building facade) increases the equivalent veiling luminance of the environment. The higher background luminance would reduce the contrast between the direct light sources and the background lighting environment, which lower the glare rating and reduce the level of discomfort glare on the visual observer. Hence, the general approach adopted for this study would likely over-estimate the glare impact and result in a conservative assessment.

11.8.147 The visual sensitive receivers (VSRs) for the Landscape Visual Impact Assessment (LVIA) study are used for the glare assessment. However, the assessment only considers glare impact on Residential, Leisure and Transportation VSRs. Motorists around MPSC are considered to be potential glare sensitive receivers as the lighting from MPSC might cause safety issue of the motorists traveling on the major roads around MPSC.

11.8.148 For Functional VSRs are not included in this assessment. This reason is because these locations are unlikely to be visited after normal working hours during evening and night periods, hence glare impact would be not be significant.

11.8.149 The identified VSRs for glare impact assessment are summarized on **Table 11-13** below. The VSR locations used in the objective assessment is representative of the area identified in the LVIA study. The identified VSRs include both Construction and Operation Phases. The locations of the VSRs are presented in **Figure 11-4-8** and **Figure 11-4-9**.

Table 11-13 Identified VSRs for Glare Impact Assessment

VSR No.	Location	Distance To Closest Source (m)	Closest Lighting Source
L-01(R)	Residential Development along Sung Wong Toi Road	210	Public Sports Ground
L-02(R)	Mid-rise Residential Development in Chung Seen Mei Chuen an Kowloon City	450	Public Sports Ground
L-03(R)	High-rise Residential Groups North of Prince Edward Road East	560	Indoor Sports Centre
L-04(R)	Residents at Choi Hung and Diamond Hill	1020	Indoor Sports Centre
L-05(R)	Kai Ching Estate and Tak Long Estate	510	Indoor Sports Centre
L-06(R)	Richland Garden	840	Main Stadium
L-07(R)	Residential Development in To Kwa Wan	300	Main Stadium
L-08(R)	Laguna Verde	1370	Main Stadium
L-09(R)	Grand Waterfront	300	Main Stadium
L-10(R)	Harbourfront Landmark	1880	Main Stadium
L-11(R)	Residential in progress at Prince Edward Road East	850	Indoor Sports Centre

VSR No.	Location	Distance To Closest Source (m)	Closest Lighting Source
L-12(R)	Low-rise Mixed Use Development Adjacent Grand Waterfront	185	Main Stadium
L-13(R)	Future Residential Development at Northwest of MPSC	45	Indoor Sports Centre
L-14(R)	Future Residential Development at Northeast of MPSC	45	Indoor Sports Centre
L-15(R)	Future Residential Development in Runway Precinct	830	Main Stadium
L-01(L)	Amenity Users at Greenspace on Prince Edward Road	380	Public Sports Ground
L-02(L)	Amenity Users at Shek Ku Lung Road Playground	460	Indoor Sports Centre
L-03(L)	Amenity Users at Sze Mei Street	850	Main Stadium
L-04(L)	Kai Tak Promenade and Open Space Network	0	Public Sports Ground
L-05(L)	Kai Tak Public Open Space Network and Station Square	0	Indoor Sports Centre
L-06(L)	Visitors to Future Metro Park	40	Main Stadium
L-07(L)	Promenade along Ma Tau Kok	200	Main Stadium
L-08(L)	Visitors to Kai Tak Cruise Terminal Roof Garden	1750	Main Stadium
L-09(L)	Visitors to Kowloon Bay Typhoon Shelter Promenade	75	Main Stadium
L-01(T)	Travellers on Prince Edward Road East	400	Indoor Sports Centre
L-02(T)	Travellers on Sung Wong Toi Road	65	Public Sports Ground
L-03(T)	Motorists on Kwun Tong Bypass	400	Main Stadium
L-04(T)	Harbour Vessels	70	Main Stadium
L-05(T)	Future Central-Kowloon Route 6	0	Main Stadium
L-06(T)	Future Road D2	0	Indoor Sports Centre
L-07(T)	Future Road D3 and Central Boulevard	0	Main Stadium
L-08(T)	Future Road D4 and Taxiway Bridge	1000	Main Stadium
L-09(T)	Future Road L6	0	Indoor Sports Centre

Light Sources

11.8.150 The following direct man-made light sources are considered in the glare assessment:-

- Lighting from MPSC, according to lighting layout, see **Table 11-14**.
- Assumed average highway lighting from CKR and Road D2.
- Assumed buildings light source from surrounding buildings.

11.8.151 The Main Stadium design includes a fixed domed roof with a 92 meter × 114 meter retractable roof on the top height of up to +75mPD in order to allow events to be held under all weather conditions.

11.8.152 The spotlights and floodlights for evening sports inside the Main Stadium are ceiling mounted luminaires with built in anti-glare baffle and visor shield under the fixed roof. Lighting application catalogues are attached in **Appendix 11G** Page 1 to Page 3. According to the catalogue, 0% of the luminance of the light application is emitted above 0°of horizontal level which is known as no spill light emits above the roof level. For sensitive receivers located above roof level, during operation the lightings focus on the player's field of view and do not illuminate discomfort light directly in the viewing direction of sensitive receivers when the retrievable roof is open. For sensitive receivers located below roof level, lightings inside the Main Stadium are blocked by the fixed roof and walls.

11.8.153 Therefore, these illuminations would not cause glare impact to the surrounding and thus they are not considered in the glare impact assessment.

Table 11-14 Lighting From MPSC, According To Lighting Layout

Area	Description	Light sources
Main Stadium	Signage and directional lights Façade lights 9m X 12m LED display panel	LS1a (1-50) LS1b (1-50) LS1c (1-2)
Public Sports Ground	Façade lights Spotlights Signage and directional lights	LS2a (1-23) LS2b (1-25) LS2c (1-21)
Indoor Sports Centre	Façade lights Signage and directional lights Spotlights 9m X 12m LED display panel	LS3a (1-41) LS3b (1-25) & LS3c (1-72) LS3d (1-35) LS3e
Office and Hotel Block	Signage and directional lights Spotlights	LS4a (1-3) & LS4b (1-4) LS4c (1-4)
Podium Deck	Signage and directional lights Spotlights Signage and directional lights	LS6a (1-60) & LS6b (64-218) & LS6c (1-29) LS6d (1-16) LS6e
Road Lighting		LS7

Area	Description	Light sources
Ancillary Building		LS8

11.8.154 Under the proposed development, the location of Stadium Complex has been carefully sited so as to keep away from any residential VSRs as much as possible. The locations of these outdoor lighting installations and lighting characteristic of the luminaries used in the prediction used in this study are indicated in **Appendix 11G**.

11.8.155 For the Construction Phase, the potential sources of glare from direct man-made light sources are security lighting within the construction works area after normal working hours during evening and night periods. Since these lights are usually installed on ground level (approximately 0.5m high above ground) and with low light intensity, they are not considered in this assessment. All security floodlights for construction sites should be equipped with adjustable shield, frosted diffusers and reflective covers, and be carefully controlled to minimise light pollution and night-time glare to the VSRs.

11.9 Impact Assessment

11.9.1 The assessment of landscape impacts will result from:-

- identification of the type and sources of impact and their magnitude that would be generated during construction and operation of the Project; and
- identification of the principal landscape impacts primarily in consideration of the sensitivity of the baseline conditions. The impacts are considered systematically in terms of landscape elements, the Project and its context.

11.9.2 The assessment of potential visual impacts will result from:-

- identification of the type and sources of visual impact and their magnitude that would be generated during construction and operation of the scheme; and
- identification of the principal visual impacts primarily in consideration of the sensitivity of the baseline condition.

Potential Sources of Landscape and Visual Impacts

11.9.3 The nature and scope of the works have been described in **Section 11.1** above. Sources of landscape and visual impact during Construction Phase are as follows:-

- Remaining site clearance work (if any) involving the removal of temporary offices and associated facilities, as well as the removal of existing trees and shrub planting after having considered the likelihood of their retention on site or transplanting;
- Piling, deep foundation construction, basement construction;
- Construction traffic;
- Temporary Traffic Management activities including rerouting of traffic lanes due to the construction of adjacent sites and the construction of Road D2;
- Relocation or re-provision of existing infrastructure and the laying down of utilities including water, drainage, power and waste;
- Presence of construction machinery, construction of the temporary parking areas, on-site accommodation office & structures and working areas, importation and

storage of equipment and materials;

- Construction of the Main Stadium, Public sports ground, Indoor sports centre , the office and hotel block and the podium deck;
- Night lighting and welding;
- Temporary works hoardings, noise barriers and enclosures;
- Dust during dry weather.

11.9.4 The source of landscape and visual impacts of the Project during Operation Phase would be:-

- The operation of Main Stadium, the Public Sports Ground, Indoor Sports Centre and the office and hotel block;
- The operation of new roads serving the planned MPSC;
- The operation of Road D2;
- The operation of new landscape areas and landscaped deck;
- Changes to settlement pattern, scale and human interaction;
- Any ongoing changes in the quality or quantity of Landscape Resources resulting from the Project, including topographic features, vegetation, hydrology and cultural artefacts;
- Loss of visual amenity previously presented by lost Landscape Resources.

Landscape Impact Assessment

Magnitude of Landscape Impacts

11.9.5 The magnitude of the impacts, before implementation of the mitigation measures on Landscape Resources and Landscape Character areas are tabulated below in **Table 11-15** further discussed in detail below. Only those resources and character areas which are affected by the Project are listed and all impacts are adverse unless otherwise stated.

11.9.6 The precise number of trees to be retained, transplanted, felled and compensated shall be determined and agreed separately with government during the Tree Removal Application process under DEVB TC No.7/2015. However at this stage all 159 trees identified have been earmarked for removal.

Table 11-15 Schedule of Landscape Resources and Landscape Character Areas Impacted during Construction and Operation Phases

NO.	Landscape Resources/ Landscape Character Areas	Source of Impact	Area of Resources Affected (m^2)		Estimated Quantity of Trees Affected		
			Construction	Operation	Existing	Removed	Reprovisioned
	Landscape Resources						
LR1-1	Vegetation on MPSC Development Area	Construction work of MPSC	89,167	89,167	158	158	340
LR2-1	Hardstanding at Kai Tak Airport	Construction work of MPSC	106,169	106,169	1	1	
LR2-12	Seawall of Kowloon Bay Typhoon Shelter	Construction Phase barging point.	unknown	unknown	-	-	-
LR3-2	Waterbody of Kowloon Bay	Transportation of materials, waste, workers and visitors	342,767	-	-	-	-
	Landscape Character						
LCA01	Former Kai Tak Airport Landscape Character Area	Construction and operation work and temporary transportation & material storage for the Project.	282,000	282,000	159	159	340
LCA05	To Kwa Wan Typhoon Shelter Landscape Character Area	Transportation of materials, wastes , workers and visitors	289,261	-	-	-	-

Landscape Resources

- LR1-1: The Vegetation on MPSC Development Areas is virtually all contained within the Project Site. Magnitude of change is anticipated to be *Large* during Construction Phase due to the extensive redevelopment of the area. The majority, if not all vegetation, is anticipated to be lost in this resource and remains *Large* during Operation Stage.
- LR2-1: Hard-standing at Kai Tak Airport is predominantly contained within the Project Site and will be removed as part of the development. Magnitude of change is anticipated to be *Large* during both Construction and Operation Phases.
- LR2-12: Seawall of Kowloon Bay Typhoon Shelter is outside of the Project boundary. Currently there is no intention for incorporation of a temporary barging point in this area and as such there would be no anticipated impacts during Construction Phase. However the resource is assessed based on the scenario of a barging point needing to be incorporated and the augmentation of the seawall is considered with reinstatement before Operation. Magnitude of change is anticipated to be *Small* during Construction Phase and *Negligible* during Operation Phase.
- LR3-2: Waterbody of Kowloon Bay is outside of the Project boundary. Currently there is no intention for incorporation of a temporary barging point in this area and as such there would be no anticipated impacts during Construction Phase. However the resource is assessed based on the scenario of a barging point being incorporated and the generation of works traffic is considered. During Operation Phase, the development may contribute to the generation of sea traffic for special events and or tourist activities which could possibly impact the resource. Magnitude of change is anticipated to be *Small* during Construction and *Negligible* during Operation Phase.

Landscape Character Areas

- LCA01: The former Kai Tak airport site will be completely transformed under a number of ongoing development projects surrounding the MPSC. The comprehensive development will see the MPSC at the heart of newly developed residential developments, public transport systems and public parks and facilities. The Project Site is already partially an area of site formation and other minor infrastructure development projects, the magnitude of change is therefore anticipated to be *Small* during Construction. The MPSC forms just a small part of the overall surrounding development and upon completion will be consistent with other concurrent development. The character of the site is anticipated to remain generally urban in character but with significant open space, activity areas and visual corridors that will attract continued user activity. Magnitude of change is considered *Intermediate* during Operation.
- LCA05: The Typhoon Shelter Landscape at To Kwa Wan Typhoon Shelter gains much of its character from the Landscape Character Areas that surround it as well as the vessels that occupy it. The nature of its boundaries significantly influences the sense of character due to visual penetration. Both the Project development site as well as that of the proposed Metro Park and waterfront promenade will

therefore impose their own landscape characters by forming the boundaries of the LCA, even if there are no changes within the area itself. The magnitude of change is anticipated to be *Negligible* during Construction Phase and *Small* during Operation Phase.

Schedule of Impacts to Landscape Resources and Landscape Character

11.9.7 The magnitude of the impacts, before implementation of mitigation measures, on the Landscape Resources and Landscape Character Areas that would occur in the Construction and Operation Phases are summarised in **Tables 11-16** and **11-17** below.

Table 11-16 Summary of Magnitude of Impacts to Landscape Resources before Mitigation

LR	Description	Source of Impact	Extent of Impact (Full / Part / Slight)		Duration of Impact (Short / Med / Long)		Compatibility of Project with surrounding landscape (Good / Fair / Poor)		Reversibility of Change (Yes / No)	Magnitude of Change	
			Con	Op	Con	Op	Con	Op		Con	Op
LR1-1	Vegetation on MPSC Development Area	Construction Work of MPSC	Full	Full	Long	Long	Poor	Poor	Yes	Large	Large
LR1-2	Trees in Amenity Areas of San Po Kong Interchange	None	-	-	-	-	-	-	-	None	None
LR1-3	Roadside Planting at Kai Tak Tunnel Ramp	None	-	-	-	-	-	-	-	None	None
LR1-4	Existing Trees at Airport Perimeter Fence	None	-	-	-	-	-	-	-	None	None
LR1-5	Street Trees on Sung Wong Toi Road	None	-	-	-	-	-	-	-	None	None
LR1-6	Temporary Tree Nursery	None	-	-	-	-	-	-	-	None	None
LR1-7	Trees on Runway South Apron	None	-	-	-	-	-	-	-	None	None
LR1-8	Amenity Areas at Kowloon Bay Interchange	None	-	-	-	-	-	-	-	None	None
LR1-9	Landscape at Grand Waterfront	None	-	-	-	-	-	-	-	None	None
LR2-1	Hard-standing at Kai Tak Airport	Construction Work of MPSC	Full	Full	Long	Long	Poor	Poor	No	Large	Large
LR2-2	Shek Ku Lung Road Playground	None	-	-	-	-	-	-	-	None	None

LR	Description	Source of Impact	Extent of Impact (Full / Part / Slight)		Duration of Impact (Short / Med / Long)		Compatibility of Project with surrounding landscape (Good / Fair / Poor)		Reversibility of Change (Yes / No)	Magnitude of Change	
			Con	Op	Con	Op	Con	Op		Con	Op
LR2-3	Tak Ku Ling Road Rest Garden	None	-	-	-	-	-	-	-	None	None
LR2-4	Olympic Garden	None	-	-	-	-	-	-	-	None	None
LR2-5	Argyle Street Playground	None	-	-	-	-	-	-	-	None	None
LR2-6	Sung Wong Toi Playground	None	-	-	-	-	-	-	-	None	None
LR2-7	Sung Wong Toi Garden	None	-	-	-	-	-	-	-	None	None
LR2-8	Hong Kong Aviation Club	None	-	-	-	-	-	-	-	None	None
LR2-9	Lung Tsun Stone Bridge Reserve	None	-	-	-	-	-	-	-	None	None
LR2-10	Landscape at Kowloon Bay Pumping Station #1	None	-	-	-	-	-	-	-	None	None
LR2-11	Landscape at Kowloon Bay Pumping Station #2	None	-	-	-	-	-	-	-	None	None
LR2-12	Seawall of Kowloon Bay Typhoon Shelter	Construction Phase barging point	Slight	Slight	Long	Long	Good	Good	Yes	Small	Negligible
LR2-13	Kowloon City Ferry Pier and Bus Terminus	None	-	-	-	-	-	-	-	None	None
LR2-14	Cattle Depot Artist Village	None	-	-	-	-	-	-	-	None	None
LR2-15	To Kwa Wan Recreation Ground	None	-	-	-	-	-	-	-	None	None
LR3-1	Kai Tak Nullah	None	-	-	-	-	-	-	-	None	None

LR	Description	Source of Impact	Extent of Impact (Full / Part / Slight)		Duration of Impact (Short / Med / Long)		Compatibility of Project with surrounding landscape (Good / Fair / Poor)		Reversibility of Change (Yes / No)	Magnitude of Change	
			Con	Op	Con	Op	Con	Op		Con	Op
LR3-2	Waterbody of Kowloon Bay	Transportation of materials, wastes workers and visitors	Slight	Slight	Long	Long	Fair	Good	Yes	Small	Negligible
LR4-1	Urban Development Hinterland	None	-	-	-	-	-	-	-	None	None
LR5-1	Kai Tak Development Area	None	-	-	-	-	-	-	-	None	None

Table 11-17 Summary of Magnitude of Impacts on Landscape Character Areas Before Mitigation

LCA	**Description**	**Source of Impact**	**Extent of Impact** (Full / Part / Slight)		**Duration of Impact** (Short / Med / Long)		**Compatibility of Project with Surrounding Landscape** (Good / Fair / Poor)		**Reversibility of Change**	**Magnitude of Change**	
			Con	**Op**	**Con**	**Op**	**Con**	**Op**		**Con**	**Op**
LCA01	Former Kai Tak Airport	All Construction Works	Part	Part	Long	Long	Poor	Good	Yes	Small	Intermediate
LCA02	Institutional Areas North & South of Argyle Road	None	-	-	-	-	-	-	-	None	None
LCA03	Ma Tau Kok & Kowloon City	None	-	-	-	-	-	-	-	None	None
LCA04	Tung Tau Estate	None	-	-	-	-	-	-	-	None	None
LCA05	To Kwa Wan Typhoon Shelter	Transportation of materials, wastes workers and visitors	Slight	Slight	Long	Long	Fair	Good	Yes	Negligibl e	Small

Visual Impact Assessment

Magnitude of Visual Impacts

11.9.8 The magnitude of predicted impacts on Strategic, District and Local Level Visually Sensitive Receivers is discussed below.

Strategic Level and District Level

11.9.9 For the VSRs at strategic level, the view distance and availability of good alternative views mean that the magnitude of change caused by the Project is hardly noticeable within the scope of all the other projects occurring on the Kowloon Peninsula, especially Kai Tak Development as a whole. District level receivers are all potential future receivers from Kai Tak Development and as such there will be no Construction Phase impact.

11.9.10 During the Operation Phase, VSRs at strategic level remain remote, whilst those receivers at district level in the new Kai Tak Development located proximate to the site will be subject to considerable change from the current baseline condition.

Local Level

11.9.11 Existing VSRs at local level have been viewing onto the former Kai Tak Airport in various states of disuse and redevelopment approaching 20 years. The outlook has not been attractive in itself; however the open expanse has been able to provide receivers with distant and open views, which in itself is of value within the dense Kowloon environment. Construction of the MPSC will therefore remain within the context of ongoing redevelopment of the site, such that its effect will be less dramatic than may otherwise be expected for such a large development. The changes also have to be considered in the context of the wider Kai Tak Development of which MPSC forms just a part.

11.9.12 A large number of VSRs in Construction Phase will not be able to view the MPSC during Operation Phase due to other significant development being undertaken under Kai Tak Development, particularly the residential and mixed use grid neighbourhoods to be developed to the northeast and northwest. As such the future visual envelope can be anticipated to shrink considerably during Operation Phase. A worst case scenario is assumed, i.e. some developments within Kai Tak are not initiated or completed by 2021 when the MPSC is intended to be operational. The existing VSRs along Prince Edward Road East will then experience some degree of visual impact at the Operation Phase but no worse than during the Construction Phase. By Year 10 of operation, VSRs L-03(R), L-04(R), L-11(R), L-02(F), L-03(F), L-11(F), L-21(F), L-02(L), L-03(L), L-01(T) and L-03(T) will be screened by developments within Kai Tak along Prince Edward Road East. As such, the visual impact would then be negligible. Whilst these existing VSR's are anticipated to be outside a future reduced VE, the number of receivers in the VE may or may not be reduced due to the newly introduced receivers of Kai Tak development.

11.9.13 Similarly, it is assumed that future VSR's at the planned development areas will not be affected by the Construction Phase impacts of MPSC, which is intended to be developed concurrently. These future VSRs include L-13(R), L-14(R), L-15(R), L-17(F); L-18(F); L-19(F); L-20(F); at L-13(R), L-14(R), L-15(R), L-17(F); L-18(F);

L-19(F); L-04(L); L-05(L); L-06(L); L-05(T); L-06(T); L-07(T); L-09(T) and may not be in place until after commencement of operation of MPSC; however, they are all included in the assessment from Day 1 of Operation Phase of the Project.

Schedule of Impacts to Visually Sensitive Receivers

11.9.14 The magnitude of the impacts, before implementation of mitigation measures, on the identified Visually Sensitive Receivers that would occur in the Construction and Operation Phases are tabulated in **Table 11-18** below. All impacts are adverse unless otherwise stated. It is considered that the baseline visual condition is extremely changeable and incoherent, being itself an area in transition. However the development will bring about a long term, irreversible change in the existing visual resources during Operation of the Project.

Table 11-18 Summary of Magnitude of Impacts on Visually Sensitive Receivers Before Mitigation

VSR	Location	Source of Impact	Compatibility with Surroundings (Good / Fair / Poor)		Scale of Development (Small / Med / Large)		Duration of Impacts (Short / Med / Long)		Reversibility of Change (Yes / No)		Potential Blockage of View (Full / Part / Nil)		Magnitude of Change (Large /Intermediate/ Small / Negligible)	
			Con	Op	Con	Op	Con	Op	Con	Op	Con	Op	Con	Op
Strategic														
S-01	Proposed Promenade, South East Kowloon Development (VP3)	MPSC	Fair	Good	Med	Med	Long	Long	No	No	Nil	Nil	Small	Small
S-02	Quarry Bay Park (VP4)	MPSC	Fair	Good	Small	Small	Long	Long	No	No	Nil	Nil	Negligible	Negligible
S-03	Victoria Peak (VP7)	MPSC	Fair	Good	Small	Small	Long	Long	No	No	Nil	Nil	Negligible	Negligible
S-04	Lion Rock	MPSC	Fair	Good	Small	Small	Long	Long	No	No	Nil	Nil	Negligible	Negligible
S-05	Kowloon Peak	MPSC	Fair	Good	Small	Small	Long	Long	No	No	Nil	Nil	Negligible	Negligible
S-06	Devil's Peak	MPSC	Fair	Good	Small	Small	Long	Long	No	No	Nil	Nil	Negligible	Negligible
S-07	Mount Parker	MPSC	Fair	Good	Small	Small	Long	Long	No	No	Nil	Nil	Negligible	Negligible
S-08	Mount Cameron	MPSC	Fair	Good	Small	Small	Long	Long	No	No	Nil	Nil	Negligible	Negligible
S-09	North Point Pier	MPSC	Fair	Good	Small	Small	Long	Long	No	No	Nil	Nil	Negligible	Negligible
S-10	Lei Yue Mun Gap	MPSC	Fair	Good	Small	Small	Long	Long	No	No	Nil	Nil	Negligible	Negligible
S-11	International Commerce Centre	MPSC	Fair	Good	Small	Small	Long	Long	No	No	Nil	Nil	Negligible	Negligible
S-12	Two International Finance Centre	MPSC	Fair	Good	Small	Small	Long	Long	No	No	Nil	Nil	Negligible	Negligible
District														
D-01	Kai Tak Runway Park	MPSC	-	Good	-	Large	-	Long	-	No	-	Nil	-	Negligible
D-02	Future Metro Park South	MPSC	-	Good	-	Large	-	Long	-	No	-	Nil	-	Small
D-03	Future Metro Park Central	MPSC	-	Good	-	Large	-	Long	-	No	-	Nil	-	Inter
D-04	Future MPSC South	MPSC	-	Good	-	Large	-	Long	-	No	-	Nil	-	Large
D-05	Future MPSC East	MPSC	-	Good	-	Large	-	Long	-	No	-	Nil	-	Large
Local - Residential														
L-01(R)	Residential Development along Sung Wong Toi Road	MPSC	Fair	Good	Large	Large	Long	Long	No	No	Part	Part	Inter	Inter
L-02(R)	Mid-rise Residential Development in Chung Seen Mei Chuen an Kowloon	MPSC	Fair	Good	Large	Large	Long	Long	No	No	Part	Part	Inter	Inter

VSR	Location	Source of Impact	Compatibility with Surroundings (Good / Fair / Poor)		Scale of Development (Small / Med / Large)		Duration of Impacts (Short / Med / Long)		Reversibility of Change (Yes / No)		Potential Blockage of View (Full / Part / Nil)		Magnitude of Change (Large /Intermediate/ Small / Negligible)	
			Con	**Op**	**Con**	**Op**	**Con**	**Op**	**Con**	**Op**	**Con**	**Op**	**Con**	**Op**
L-03(R)	High-rise Residential Groups North of Prince Edward Road East	MPSC	Fair	Fair	Large	Large	Long	Long	No	No	Part	Par	Inter	Inter
L-04(R)	Residents at Choi Hung and Diamond Hill	MPSC	Fair	Fair	Med	Med	Long	Long	No	No	Part	Part	Small	Small
L-05(R)	Kai Ching Estate and Tak Long Estate	MPSC	Fair	Good	Large	Small	Long	Long	No	No	Part	Part	Inter	Small
L-06(R)	Richland Garden	MPSC	Fair	Good	Med	Small	Long	Long	No	No	Part	Part	Small	Negligible
L-07(R)	Residential Development in To Kwa Wan	MPSC	Fair	Good	Small	Small	Long	Long	No	No	Nil	Nil	Negligible	Negligible
L-08(R)	Laguna Verde	MPSC	Fair	Good	Med	Med	Long	Long	No	No	Nil	Nil	Small	Small
L-09(R)	Grand Waterfront	MPSC	Fair	Good	Large	Large	Long	Long	No	No	Part	Part	Large	Large
L-10(R)	Harbourfront Landmark	MPSC	Fair	Good	Small	Small	Long	Long	No	No	Nil	Nil	Small	Small
L-11(R)	Residential in progress at Prince Edward Road East	MPSC	Fair	Fair	Med	Med	Long	Long	No	No	Part	Part	Small	Small
L-12(R)	Low-rise Mixed Use Development Adjacent Grand Waterfront	MPSC	Fair	Good	Large	Large	Long	Long	No	No	Part	Part	Inter	Inter
L-13(R)	Future Residential Development at Northwest of MPSC	MPSC	-	Good	-	Large	-	Long	-	No	-	Full	-	Large
L-14(R)	Future Residential Development at Northeast of MPSC	MPSC	-	Good	-	Large	-	Long	-	No	-	Full	-	Large
L-15(R)	Future Residential Development in Runway Precinct	MPSC	-	Good	-	Small	-	Long	-	No	-	Nil	-	Small
Local - Functional														
L-01(F)	Education and Healthcare Facilities at Ma Tau Wai	MPSC	Fair	Good	Large	Large	Long	Long	No	No	Part	Part	Inter	Inter
L-02(F)	Education and Healthcare Facilities at San Po Kong	MPSC	Fair	Fair	Large	Large	Long	Long	No	No	Part	Part	Inter	Inter

VSR	Location	Source of Impact	Compatibility with Surroundings (Good / Fair / Poor)		Scale of Development (Small / Med / Large)		Duration of Impacts (Short / Med / Long)		Reversibility of Change (Yes / No)		Potential Blockage of View (Full / Part / Nil)		Magnitude of Change (Large /Intermediate/ Small / Negligible)	
			Con	**Op**	**Con**	**Op**	**Con**	**Op**	**Con**	**Op**	**Con**	**Op**	**Con**	**Op**
L-03(F)	Government Facilities on Concorde Road	MPSC	Fair	Fair	Large	Large	Long	Long	No	No	Part	Part	Inter	Inter
L-04(F)	Development Support Facilities at Kowloon Bay Interchange	MPSC	Fair	Good	Large	Large	Long	Long	No	No	Part	Part	Large	Large
L-05(F)	Education and Healthcare Facilities at Kowloon Bay	MPSC	Fair	Good	Med	Small	Long	Long	No	No	Part	Part	Small	Negligible
L-06(F)	Kowloon Bay Action Area	MPSC	Fair	Good	Small	Small	Long	Long	No	No	Nil	Nil	Negligible	Negligible
L-07(F)	Police Operational Facility at Dyer Avenue	MPSC	Fair	Good	Med	Med	Long	Long	No	No	Nil	Nil	Small	Small
L-08(F)	Hong Kong Aviation Club	MPSC	Fair	Good	Large	Large	Long	Long	No	No	Part	Part	Large	Large
L-09(F)	Comprehensive Development Area along Mok Cheong Street	MPSC	Fair	Fair	Large	Large	Long	Long	No	No	Full	Full	Large	Large
L-10F)	Kowloon Bay Business District	MPSC	Fair	Good	Med	Small	Long	Long	No	No	Nil	Nil	Small	Negligible
L-11(F)	Business and Industrial Developments in San Po Kong	MPSC	Fair	Fair	Med	Med	Long	Long	No	No	Part	Nil	Small	Small
L-12(F)	Business and Industrial Developments in Hung Hom	MPSC	Fair	Good	Med	Med	Long	Long	No	No	Nil	Nil	Small	Small
L-13(F)	Kwun Tong Business District	MPSC	Fair	Good	Small	Small	Long	Long	No	No	Nil	Nil	Negligible	Negligible
L-14(F)	Hong Kong International Trade and Exhibition Centre	MPSC	Fair	Good	Large	Large	Long	Long	No	No	Part	Part	Large	Large
L-15(F)	Kowloon City Ferry Pier	MPSC	Fair	Good	Large	Large	Long	Long	No	No	Part	Part	Large	Large
L-16(F)	Pacific Trade Centre, Octa Tower, Kowloon Godown	MPSC	Fair	Good	Small	Small	Long	Long	No	No	Nil	Nil	Negligible	Negligible
L-17(F)	Future Tourism Development in Runway Precinct	MPSC	-	Good	-	Small	-	Long	-	No	-	Nil	-	Negligible
L-18(F)	Planned Development along Route 6	MPSC	-	Good	-	Large	-	Long	-	No	-	Part	-	Large

VSR	Location	Source of Impact	Compatibility with Surroundings (Good / Fair / Poor)		Scale of Development (Small / Med / Large)		Duration of Impacts (Short / Med / Long)		Reversibility of Change (Yes / No)		Potential Blockage of View (Full / Part / Nil)		Magnitude of Change (Large /Intermediate/ Small / Negligible)	
			Con	Op	Con	Op	Con	Op	Con	Op	Con	Op	Con	Op
L-19(F)	Planned Commercial Development in Runway Precinct	MPSC	-	Good	-	Med	-	Long	-	No	-	Nil	-	Small
L-20F)	Planned Mixed Use Development at Kai Tak	MPSC	-	Good	-	Large	-	Long	-	No	-	Full	-	Large
L-21(F)	Construction Areas at Kai Tak Development	MPSC	Fair	-	Large	-	Long	-	No	No	Part	-	Inter	-
Local- Leisure														
L-01(L)	Amenity Users at Greenspace on Prince Edward Road	MPSC	Fair	Good	Large	Large	Long	Long	No	No	Part	Part	Inter	Inter
L-02(L)	Visitors at Shek Ku Lung Road Playground	MPSC	Fair	Fair	Large	Large	Long	Long	No	No	Part	Part	Inter	Inter
L-03(L)	Amenity Users at Sze Mei Street Open Space and PTI	MPSC	Good	Good	Med	Inter	Long	Long	No	No	Part	Part	Inter	Inter
L-04(L)	Kai Tak Promenade and Open Space Network	MPSC	-	Good	-	Large	-	Long	-	No	-	Full	-	Large
L-05(L)	Kai Tak Public Open Space Network and Station Square	MPSC	-	Good	-	Large	-	Long	-	No	-	Part	-	Large
L-06(L)	Visitors to Future Metro Park	MPSC	-	Good	-	Large	-	Long	-	No	-	Part	-	Large
L-07(L)	Promenade along Ma Tau Kok	MPSC	Fair	Good	Large	Large	Long	Long	No	No	Nil	Nil	Inter	Inter
L-08(L)	Visitors to Kai Tak Cruise Terminal Roof Garden	MPSC	Good	Good	Small	Small	Long	Long	No	No	Nil	Nil	Negligible	Negligible
L-09(L)	Visitors to Kowloon Bay Typhoon	MPSC	Good	Good	Small	Small	Long	Long	No	No	Nil	Nil	Negligible	Negligible
Local- Transport														
L-01(T)	Travellers on Prince Edward Road East	MPSC	Fair	Fair	Med	Med	Long	Long	No	No	Part	Part	Small	Small
L-02(T)	Travellers along Sung Wong Toi Road	MPSC	Fair	Good	Large	Large	Long	Long	No	No	Full	Full	Large	Large

VSR	Location	Source of Impact	Compatibility with Surroundings (Good / Fair / Poor)		Scale of Development (Small / Med / Large)		Duration of Impacts (Short / Med / Long)		Reversibility of Change (Yes / No)		Potential Blockage of View (Full / Part / Nil)		Magnitude of Change (Large /Intermediate/ Small / Negligible)	
			Con	Op	Con	Op	Con	Op	Con	Op	Con	Op	Con	Op
L-03(T)	Motorists on Kwun Tong Bypass	MPSC	Fair	Fair	Med	Med	Long	Long	No	No	Part	Part	Small	Small
L-04(T)	Harbour Vessels	MPSC	Fair	Good	Med	Med	Long	Long	No	No	Nil	Nil	Small	Small
L-05(T)	Future Central Kowloon Route 6	MPSC	-	Good	-	Large	-	Long	-	No	-	Full	-	Large
L-06(T)	Future Road D2	MPSC	-	Good	-	Large	-	Long	-	No	-	Full	-	Large
L-07(T)	Future Road D3 and Central Boulevard	MPSC	-	Good	-	Large	-	Long	-	No	-	Part	-	Large
L-08(T)	Future Road D4 and Taxiway Bridge	MPSC	Fair	Good	Small	Small	Long	Long	No	No	Nil	Nil	Small	Small
L-09(T)	Future Road L6	MPSC	-	Good	-	Large	-	Long	-	No	-	Full	-	Large

Glare Impact Assessment

11.9.15 During Operation Phase, the main sources of glare would be from the MPSC perimeter lighting and those from connecting road alignment.

11.9.16 Within the MPSC area, the potential sources of lighting include general amenity area lighting and event security lighting.

11.9.17 The vehicle trafficked areas include Road D2 and the PTI under the landscape deck where the main source of illumination will be the standard roadside units typically required for dual-lane carriageways and associated roadside and street lighting.

11.9.18 Based on the assumption stated from **Section 11.8.143** to **Section 11.8.155**, the glare rating predicted for the VSRs are detailed in **Table 11-19** below.

Table 11-19 Predicted Glare Rating for VSRs near MPSC

VSR	Name	Predicted Glare Rating	Significance
L-01(R)	Sky tower and Residential Development along Sung Wong Toi Road	29	**Noticeable**
L-02(R)	Medium-rise Development in Chung Seen Mei Chuen and Kowloon City	40	**Just admissible**
L-03(R)	High-rise Residential Groups along north of Prince Edward Road East	-	**Unnoticeable**
L-04(R)	Residents at Choi Hung and Diamond Hill	-	**Unnoticeable**
L-05(R)	Kai Ching Estate and Tak Long Estate	-	**Unnoticeable**
L-06(R)	Richland Garden	19	**Noticeable**
L-07(R)	Residential Development in To Kwa Wan	39	**Just admissible**
L-08(R)	Laguna Verde	34	**Just admissible**
L-09(R)	Grand Waterfront	28	**Noticeable**
L-10(R)	Harbourfront Landmark	22	**Noticeable**
L-11(R)	Residential in progress along Prince Edward Road East	-	**Unnoticeable**
L-12(R)	Low-rise residential and commercial adjacent to Grand Waterfront	36	**Just admissible**
L-13(R)	Future Residential Development at Northwest of MPSC	46	**Just admissible**
L-14(R)	Future Residential Development at Northeast of MPSC	47	**Just admissible**
L-15(R)	Future residential development in Runway Precinct	44	**Just admissible**
L-01(L)	Amenity Users at Greenspace on Prince Edward Road	8	**Unnoticeable**
L-02(L)	Amenity Users at Shek Ku Lung Road Playground	-	**Unnoticeable**
L-03(L)	Amenity Users at Sze Mei Street Open Space and PTI	22	**Noticeable**
L-04(L)	Kai Tak Promenade and Open Space Network	30	**Just admissible**
L-05(L)	Kai Tak Public Open Space Network and Station Square	45	**Just admissible**
L-06(L)	Visitors to Future Metro Park	23	**Noticeable**
L-07(L)	Promenade along Ma Tau Kok	37	**Just admissible**

VSR	Name	Predicted Glare Rating	Significance
L-08(L)	Visitors to Kai Tak Cruise Terminal Roof Garden	33	**Just admissible**
L-09(L)	Visitors to Kowloon Bay Typhoon Shelter Promenade	16	**Noticeable**
L-01(T)	Travellers on Prince Edward Road East	-	**Unnoticeable**
L-02(T)	Travellers on Sung Wong Toi Road	27	**Noticeable**
L-03(T)	Motorists on Kwun Tong Bypass	42	**Just admissible**
L-04(T)	Harbour Vessels	40	**Just admissible**
L-05(T)	Future Central-Kowloon Route 6	44	**Just admissible**
L-06(T)	Future Road D2	31	**Just admissible**
L-07(T)	Future Road D3 and Central Boulevard	34	**Just admissible**
L-08(T)	Future Road D4 and Taxiway Bridge	40	**Just admissible**
L-09(T)	Future Road L6	44	**Just admissible**

*Note: Sample calculations of the predicted glare rating for VSRs L-13(R), L-14(R) and L-06(T) are attached in **Appendix 11G.***

11.9.19 The predicted glare rating for the identified VSRs within the study boundary are below the Glare Rating Limit of 50.

Impact Significance Threshold

11.9.20 The analysis of the landscape and visual impacts during construction and operation are presented in the following form of matrix to ascertain the Significance Threshold, as detailed in **Table 11-2-1** above.

11.9.21 The degree of impact or Significance Threshold is considered as follows:-

Substantial: *adverse / beneficial* impact where the proposal would cause significant deterioration or improvement in the existing landscape/visual quality

Moderate: *adverse / beneficial* impact where the proposal would cause a noticeable deterioration or improvement in the existing landscape/visual quality

Slight: *adverse / beneficial* impact where the proposal would cause barely perceptible deterioration or improvement in the existing landscape/visual quality

Insubstantial: no discernible change in the existing landscape/visual quality

11.9.22 The Significance Threshold of those impacts, before implementation of mitigation measures, on the Landscape Resources, Landscape Character Areas and Visually

Sensitive Receivers that would occur in the Construction and Operation Phases is summarised in **Table 11-20** and **Table 11-21** respectively, below. All impacts are adverse unless stated.

Table 11-20 Significance Threshold of Landscape Resources and Landscape Character

Ref	Description	Sensitivity	Magnitude of Change		Significance Threshold WITHOUT Mitigation	
			Construction	**Operation**	**Construction**	**Operation**
Landscape Resources						
LR1-1	Vegetation on MPSC Development Area	**Low**	Large	Large	Moderate	Moderate
LR1-2	Trees in Amenity Areas of San Po Kong Interchange	**Medium**	-	-	-	-
LR1-3	Roadside Planting at Kai Tak Tunnel Ramp	**Medium**	-	-	-	-
LR1-4	Existing Trees at Airport Perimeter Fence	**Medium**	-	-	-	-
LR1-5	Street Trees on Sung Wong Toi Road	**Medium**	-	-	-	-
LR1-6	Temporary Tree Nursery	**Low**	-	-	-	-
LR1-7	Trees on Runway South Apron	**Medium**	-	-	-	-
LR1-8	Amenity Areas at Kowloon Bay Interchange	**Medium**	-	-	-	-
LR1-9	Landscape at Grand Waterfront	**Medium**	-	-	-	-
LR2-1	Hardstanding at Kai Tak Airport	**Low**	Large	Large	Moderate	Moderate
LR2-2	Shek Ku Lung Road Playground	**Medium**	-	-	-	-
LR2-3	Tak Ku Ling Road Rest Garden	**Medium**	-	-	-	-
LR2-4	Olympic Garden	**Medium**	-	-	-	-
LR2-5	Argyle Street Playground	**Medium**				
LR2-6	Sung Wong Toi Playground	**Medium**	-	-	-	-
LR2-7	Sung Wong Toi Garden	**High**	-	-	-	-
LR2-8	Hong Kong Aviation Club	**Medium**	-	-	-	-
LR2-9	Lung Tsun Stone Bridge Reserve	**High**	-	-	-	-
LR2-10	Landscape at Kowloon Bay Pumping Station #1	**Low**	-	-	-	-
LR2-11	Landscape at Kowloon Bay Pumping Station #2	**Low**	-	-	-	-
LR2-12	Seawall of Kowloon Bay Typhoon Shelter	**Medium**	Small	Negligible	Slight/ Moderate	Insubstantial
LR2-13	Kowloon City Ferry Pier and Bus Terminus	**Medium**				-
LR2-14	Cattle Depot Artist Village	**High**				-
LR2-15	To Kwa Wan Recreation Ground	**Medium**				-

Ref	Description	Sensitivity	Magnitude of Change		Significance Threshold WITHOUT Mitigation	
			Construction	Operation	Construction	Operation
LR3-1	Kai Tak Nullah	**Low**	-	-	-	-
LR3-2	Waterbody of Kowloon Bay	**High**	Small	Negligible	Moderate	Insubstantial
LR4-1	Urban Development Hinterland	**Low**	-	-	-	-
LR5-1	Kai Tak Development Area	**Low**	-	-	-	-
Landscape Character						
LCA01	Former Kai Tak Airport	Low	Small	Inter	Slight	Slight/ Moderate
LCA02	Institutional Areas North & South of Argyle Road	Medium	-	-	-	-
LCA03	Ma Tau Kok & Kowloon City	Medium	-	-	-	-
LCA04	Tung Tau Estate	Medium	-	-	-	-
LCA05	To Kwa Wan Typhoon Shelter	High	Negligible	Small	Insubstantial	Moderate

Table 11-21 Significance Threshold of Visually Sensitive Receivers

Ref (VSR)	Description	Sensitivity		Magnitude of Change		Significance Threshold WITHOUT Mitigation	
		Cons.	Op.	Cons	Op	Cons	Op
S-01	Proposed Promenade, South East Kowloon Development (VP3)	Low		Small	Small	Slight	Slight
S-02	Quarry Bay Park, (VP4)	Low		Negligible	Negligible	Insubstantial	Insubstantial
S-03	Victoria Peak (VP7)	Low		Negligible	Negligible	Insubstantial	Insubstantial
S-04	Lion Rock	Low		Negligible	Negligible	Insubstantial	Slight
S-05	Kowloon Peak	Low		Negligible	Negligible	Insubstantial	Insubstantial
S-06	Devil’s Peak	Low		Negligible	Negligible	Insubstantial	Insubstantial
S-07	Mount Parker	Low		Negligible	Negligible	Insubstantial	Insubstantial
S-08	Mount Cameron	Low		Negligible	Negligible	Insubstantial	Insubstantial
S-09	North Point Pier	Low		Negligible	Negligible	Insubstantial	Insubstantial
S-10	Lei Yue Mun Gap	Low		Negligible	Negligible	Insubstantial	Insubstantial
S-11	International Commerce Centre	Low		Negligible	Negligible	Insubstantial	Insubstantial

Ref (VSR)	Description	Sensitivity		Magnitude of Change		Significance Threshold WITHOUT Mitigation	
		Cons.	Op.	Cons	Op	Cons	Op
S-12	Two International Finance Centre	Low		Negligible	Negligible	Insubstantial	Insubstantial
D-01	Kai Tak Runway Park	-	Low	-	Negligible	-	Insubstantial
D-02	Future Metro Park South	-	Medium	-	Small	-	Slight
D-03	Future Metro Park Central	-	Medium	-	Inter	-	Moderate
D-04	Future MPSC South	-	Medium	-	Large	-	Moderate / Substantial
D-05	Future MPSC East	-	High	-	Large	-	Substantial
L-01(R)	Residential Development along Sung Wong Toi Road	High		Inter	Inter	Moderate / Substantial	Moderate / Substantial
L-02(R)	Mid-rise Residential Development in Chung Seen Mei Chuen an Kowloon City	High	Low	Inter	Inter	Moderate / Substantial	Slight / Moderate
L-03(R)	High-rise Residential Groups North of Prince Edward Road East	High	Medium	Inter	Inter	Moderate / Substantial	Moderate
L-04(R)	Residents at Choi Hung and Diamond Hill	High	Medium	Small	Small	Moderate	Slight / Moderate
L-05(R)	Kai Ching Estate and Tak Long Estate	High		Inter	Small	Moderate / Substantial	Moderate
L-06(R)	Richland Garden	Medium		Small	Negligible	Slight / Moderate	Insubstantial
L-07(R)	Residential Development in To Kwa Wan	Medium		Negligible	Negligible	Insubstantial	Insubstantial
L-08(R)	Laguna Verde	Medium		Small	Small	Moderate	Moderate
L-09(R)	Grand Waterfront	High		Large	Large	Substantial	Substantial
L-10(R)	Harbourfront Landmark	Medium		Small	Small	Slight / Moderate	Slight / Moderate
L-11(R)	Residential in progress along Prince Edward Road East	High	Medium	Small	Small	Moderate	Slight / Moderate
L-12(R)	Low-rise Mixed Use Development adjacent to Grand Waterfront	Low	High	Inter	Large	Slight / Moderate	Substantial
L-13(R)	Future Residential Development at Northwest of MPSC		High	-	Large	-	Substantial

Ref (VSR)	Description	Sensitivity		Magnitude of Change		Significance Threshold WITHOUT Mitigation	
		Cons.	Op.	Cons	Op	Cons	Op
L-14(R)	Future Residential Development at Northeast of MPSC		High	-	Large	-	Substantial
L-15(R)	Future Residential Development in Runway Precinct	-	Medium	-	Small	-	Slight / Moderate
L-01(F)	Education and Healthcare Facilities at Ma Tau Wai	Medium		Inter	Inter	Moderate	Moderate
L-02(F)	Education and Healthcare Facilities at San Po Kong	Medium	Low	Inter	Inter	Moderate	Slight / Moderate
L-03(F)	Government Facilities on Concorde Road	Low	Low	Inter	Inter	Slight / Moderate	Slight / Moderate
L-04(F)	Development Support Facilities at Kowloon Bay Interchange	Medium		Large	Large	Moderate / Substantial	Moderate / Substantial
L-05(F)	Healthcare and Education Facilities at Kowloon Bay	Medium	Low	Small	Negligible	Slight / Moderate	Insubstantial
L-06(F)	Kowloon Bay Action Area	Low	Medium	Negligible	Negligible	Insubstantial	Insubstantial
L-07(F)	Police Operational Facility at Dyer Avenue	Low		Small	Small	Slight	Slight
L-08(F)	Hong Kong Aviation Club	Medium		Large	Large	Moderate / Substantial	Moderate / Substantial
L-09(F)	Comprehensive development area along Mok Cheong Street	Medium	High	Large	Large	Moderate / Substantial	Substantial
L-10(F)	Kowloon Bay Business District	Medium		Small	Negligible	Slight / Moderate	Insubstantial
L-11(F)	Business and Industrial Developments in San Po Kong	Low	Low	Small	Small	Slight	Slight
L-12(F)	Business and Industrial Developments in Hung Hom	Low		Small	Small	Slight	Slight
L-13(F)	Kwun Tong Business District	Low		Negligible	Negligible	Insubstantial	Insubstantial
L-14(F)	Hong Kong International Trade and Exhibition Centre	Low		Large	Large	Moderate	Moderate
L-15(F)	Kowloon City Ferry Pier and Transport Terminus	Medium		Large	Large	Moderate / Substantial	Moderate / Substantial

Ref (VSR)	Description	Sensitivity		Magnitude of Change		Significance Threshold WITHOUT Mitigation	
		Cons.	Op.	Cons	Op	Cons	Op
L-16(F)	Pacific Trade Centre, Octa Tower, Kowloon Godown	Low		Negligible	Negligible	Insubstantial	Insubstantial
L-17(F)	Future Tourism Development in Runway Precinct	-	Low	-	Negligible	-	Insubstantial
L-18(F)	Planned Development along Route 6	-	Medium	-	Large	-	Moderate / Substantial
L-19(F)	Planned Hotel Development in Runway Precinct	-	Medium	-	Small	-	Slight / Moderate
L-20(F)	Planned Mixed Use Development at Kai Tak	-	Medium	-	Large	-	Moderate / Substantial
L-21(F)	Construction Areas at Kai Tak Development	Low	Low	Inter	Inter	Slight / Moderate	Slight / Moderate
L-01(L)	Amenity Users at Greenspace on Prince Edward Road	Medium		Inter	Inter	Moderate	Moderate
L-02(L)	Amenity Users at Shek Ku Lung Road Playground	Medium	Low	Inter	Inter	Moderate	Slight / Moderate
L-03(L)	Amenity Users at Sze Mei Street Open Space and PTI	Medium	Low	Inter	Inter	Moderate	Slight / Moderate
L-04(L)	Kai Tak promenade and open space network	-	High	-	Large	-	Substantial
L-05(L)	Kai Tak public open space network and Station Square	-	High	-	Large	-	Substantial
L-06(L)	Visitors to Future Metropark	-	High	-	Large	-	Substantial
L-07(L)	Promenade along Ma Tau Kok	Medium		Inter	Inter	Moderate	Moderate
L-08(L)	Visitors to Kai Tak Cruise Terminal Roof Garden	Low		Negligible	Negligible	Insubstantial	Insubstantial
L-09(L)	Visitors to Kowloon Bay Typhoon Shelter Promenade	Medium		Negligible	Negligible	Insubstantial	Insubstantial
L-01(T)	Travellers on Prince Edward Road East	Low	Low	Small	Small	Slight	Slight
L-02(T)	Travellers on Sung Wong Toi Road	Low		Large	Large	Moderate	Moderate
L-03(T)	Motorists on Kwun Tong Bypass	Low	Low	Small	Small	Slight	Slight

Ref (VSR)	**Description**	**Sensitivity**		**Magnitude of Change**		**Significance Threshold WITHOUT Mitigation**	
		Cons.	Op.	Cons	Op	Cons	Op
L-04(T)	Harbour Vessels	Low	Medium	Small	Small	Slight	Slight / Moderate
L-05(T)	Future Central Kowloon Route 6	-	Medium	-	Large	-	Moderate/ Substantial
L-06(T)	Future Road D2	-	Medium	-	Large	-	Moderate/ Substantial
L-07(T)	Future Road D3 and Central Boulevard	-	Low	-	Large	-	Moderate
L-08(T)	Future Road D4 and Taxiway Bridge	Low	Low	Small	Small	Slight	Slight
L-09(T)	Future Road L6	-	Low	-	Large	-	Moderate

Mitigation and Enhancement Measures

11.9.23 Landscape and visual mitigation measures are ways of amending or improving the design or construction of a development in order to eliminate or reduce landscape and visual impacts. The proposed landscape and visual mitigation measures for potential impacts generated are scheduled in **Tables 11-22** and **11-23** and illustrated on the photomontages from **Figures 11-5-2** to **Figure 11-5-7** and the landscape mitigation plan **Figure 11-5-8.**

11.9.24 Additionally Landscape and Visual Development practices are techniques that should be employed to enhance both applied mitigation measures and the landscape and visual potential of the development area. These are also shown on the above tables and figures.

11.9.25 At the time of reporting, detailed architectural and landscape design solutions are not fully available. It is therefore recommended that detailed landscape proposals and details of architectural design, chromatic treatment and lighting, for all above ground structures, including pedestrian links, stadium connections and ancillary buildings be submitted to Planning Department for review to demonstrate that they would be sensibly designed in a manner that responds to the existing urban context and minimise any residual landscape and visual impact.

Table 11-22 Recommended Construction Phase Landscape and Visual Mitigation / Enhancement Measures

ID No.*	**Type**	**Landscape / Visual Mitigation Measure**	**Funding / Implementation**	**Management/ Maintenance**
CM1	*Visual*	**Controlled Night-Time Lighting** (to mitigate adverse visual impact)	Project Proponent	Contractor
All security floodlights for construction sites shall be equipped with adjustable shield, frosted diffusers and reflective covers, and be carefully controlled to minimize light pollution and night-time glare to nearby receivers				

ID No.*	Type	Landscape / Visual Mitigation Measure	Funding / Implementation	Management/ Maintenance
CM2	*Visual*	**Temporary Landscape Treatments** (to mitigate adverse visual impact)	Project Proponent	Contractor
Including vertical greening, pot planting and application of green roofing to site offices, Hydroseeding of site formation areas and short term greening of site boundaries and land not immediately developed.				
CM3	*Visual*	**Decoration of Hoarding** (to mitigate adverse visual impact)	Project Proponent	Contractor
Erection of screen hoardings should be designed appropriately to be compatible with the existing urban context, either brightly and imaginatively or with visually unobtrusive design and colours where more appropriate.				

Notes: * CM = Construction Mitigation; OM = Operation Mitigation

Table 11-23 Recommended Operation Phase Landscape and Visual Mitigation / Enhancement Measures

ID No.*	Type	Landscape / Visual Mitigation Measure	Funding / Implementation	Management/ Maintenance
OM1	*Landscape Resources / Visual*	**Greening of Walkways, Ramps and Decks** (to mitigate against lost Landscape Resources and provide visual amenity)	Project Proponent	Facility Management Departments
Greening shall be incorporated into at-grade areas and as raised planting areas on pedestrian walkways, ramps and decks.				
OM2	*Landscape Resources / Visual*	**Green Roofs and Vertical Greening** (to mitigate against lost Landscape Resources and provide visual amenity)	Project Proponent	Facility Management Departments
Green roofs and vertical greening should be provided to all built structures where feasible and opportunities should be maximised for incorporation on covered walkways and shade structures.				
OM3	*Landscape Resources*	**Compensatory Tree Planting** (to mitigate against lost Landscape Resources)	Project Proponent	Facility Management Departments
A new parkland area is created in the Project development to be used for the implementation of compensatory tree planting to offset the net loss of key Landscape Resources. It is recommended that 340 trees be planted in this regard and a compensatory tree planting proposal outlining the locations of tree compensation will be submitted separately in seeking relevant government department's approval in accordance with DEVB TC No.7/2015.				

<table>
<tr><th>ID No.*</th><th>Type</th><th>Landscape / Visual Mitigation Measure</th><th>Funding / Implementation</th><th>Management/ Maintenance</th></tr>
<tr><td>OM4</td><td>Landscape Character / Visual</td><td><u>Responsive Building Design</u>
<u>(to enhance landscape character and mitigate against visual inconformity)</u></td><td>Project Proponent</td><td>Facility Management Departments</td></tr>
<tr><td colspan="5">All above ground structures, including, stadia, hotel, pedestrian links, stadium connections and ancillary buildings, shall be sensitively designed in a manner that responds to the existing and planned urban context in terms of scale, height and bulk (visual weight) as well as use of appropriate building materials and colour to create a cohesive visual mass. Subdued tones should be considered for the colour palette with non-reflective finishes to reduce glare effect. Detailed proposals shall be submitted to Planning Department for review in order to demonstrate that they have been be sensibly designed in a manner that responds to the existing urban context and will minimise any residual landscape and visual impact.</td></tr>
<tr><td>OM5</td><td>Landscape Character / Visual</td><td><u>Integration of Development Boundaries</u>
<u>(to enhance landscape character and mitigate against visual inconformity)</u></td><td>Project Proponent</td><td>Facility Management Departments</td></tr>
<tr><td colspan="5">The Project boundaries shall be without fences or barriers, providing seamless physical and visual integration with the surrounding public spaces. Careful consistency of levels and materials shall create and indefinite development edge, integrating the development into the future Song Wong Toi Park, the Station Square Open Space Corridor and the Metro Park.</td></tr>
<tr><td>OM6</td><td>Landscape Character / Visual</td><td><u>Integration with Dining Cove and Waterfront Promenade</u>
<u>(to enhance landscape character and mitigate against visual inconformity)</u></td><td>Project Proponent</td><td>Facility Management Departments</td></tr>
<tr><td colspan="5">Careful design consideration of the interface of the raised stadium deck at 13mPD with that of the Waterfront Promenade at 5mPD shall be undertaken. Visual articulation and physical penetration of the development at promenade level shall be created by avoiding a continuous boundary wall. Furthermore integrated design of the adjacent proposed retail development shall ensure visual cohesion and an improved character setting.</td></tr>
<tr><td>OM7</td><td>Landscape Resources/ Landscape Character/ Visual</td><td><u>Light Penetration Under Deck</u>
<u>(to enable resource mitigation, enhance landscape character and mitigate against visual sterility)</u></td><td>Project Proponent</td><td>Facility Management Departments</td></tr>
<tr><td colspan="5">The landscape deck shall be cut back and light wells incorporated to maximise natural light penetration to at-grade covered areas under the deck, to allow for enhanced visual amenity, improved utilisation of ground space and significant incorporation of both horizontal and vertical greening at ground level.</td></tr>
</table>

ID No.*	Type	Landscape / Visual Mitigation Measure	Funding / Implementation	Management/ Maintenance
OM8	*Landscape Resources/ Landscape Character/ Visual*	**Urban Park** (to mitigate against lost Landscape Resources, provide visual amenity and enhance development Landscape Character)	Project Proponent	Facility Management Departments
Incorporation of a new park within the development area shall facilitate the visual corridors outlined by the urban design framework to create an urban light well, protecting longer views and providing visual amenity to nearby receivers. The park shall maximise tree and shrub planting with emphasis on incorporating native species and integrate facilities primarily for the regular use of adjacent residential communities.				
OM9	*Visual*	**Bespoke Amenity Area Lighting** (to mitigate against visual impact from glare and enhance visual amenity)	Project Proponent	Facility Management Departments
Development of a bespoke project amenity area lighting scheme shall be incorporated that minimises general area light pollution, provides thematic lighting, responds to user demand intensity and minimises pavement obstruction and visual clutter. The following shall be practically considered:- • mounting height and direction of fixtures to avoid sensitive receivers; • reflectance so as to avoid glare effect; • incorporation of low level down lighting integrated onto building facades, walls and structures; • utilising area movement sensors; • programming of operation for minimised utilisation.				

11.9.26 The Construction Phase measures listed above shall be adopted from the commencement of construction and shall be in place throughout the entire construction period. The Operation Phase measures listed above shall be adopted during the detailed design, and be built as part of the construction works so that they are in place at the date of commissioning of the MPSC. However, it should be noted that the full effect of the soft landscape mitigation measures would not be appreciated for several years.

11.9.27 The Project proponent has established implementation funding and contracted a public facility management company to undertake ongoing management and maintenance of the proposed landscape and visual mitigation works throughout the operation period, for the realization of the intended effects of the landscape and visual mitigation measures.

Tree Planting and Greening

11.9.28 Application and approval for removal for all trees shall be obtained in accordance with DEVB TC No.7/2015. The actual numbers of trees retained felled and transplanted will be confirmed subject to this process. Recommendations for tree felling, transplantation and retention are based on the following criteria:-

- the rarity value of the species of trees involved;
- the health, condition, quality and maturity of the tree;

- the site conditions in terms of suitability for transplantation
- the suitability of the species for successful transplantation; and
- the environmental impact and amenity value of the tree.

11.9.29 Compensatory planting required under DEVB TC No.7/2015 shall be undertaken. On-site compensatory planting of more than 340 new trees will be undertaken. It is considered that tree planting within the site project areas alone provides sufficient opportunity to meet the compensatory requirements in both qualitative and quantitative terms.

11.9.30 It is noted that most of the land in ex-Kai Tak Airport is contaminated by aviation fuel. However such areas are well below the formation area for landscape areas at MPSC, including the proposed Open Space and that planting areas will be provided with significant depths of imported top soiling to ensure that no constraint to tree planting exists.

Photomontages

11.9.31 The photomontages are developed to highlight the key mitigation and enhancement measures introduced to reduce residual visual impacts of the development and particularly the above ground structures. A total of 6 key photomontage viewpoints (PMV) have been selected from VSRs located at district and local levels. Contextual renderings are also added in **Appendix 11H.** The PMV have been selected based on the following criteria:

- representing a balanced combination of viewing position, height and distance;
- being both private and publicly accessible places surrounding the MPSC site;
- being from HIGH sensitivity receivers; and
- following the recommendations of the TPB Guidelines on Submission of Visual Impact Assessment for Planning Applications to the Town Planning Board (TPB PG-NO. 41).

11.9.32 The location of the 6 viewpoints is shown in **Figure 11-5-1.** For each viewpoint, the photomontages illustrate the Project works for the four scenarios listed below:-

- Existing Condition;
- Day 1 without Mitigation Measures;
- Day 1 with Mitigation Measures;
- Year 10 with Mitigation Measures.

Photomontage 01: Key Viewpoint VP01 from Future Metro Park (Figure 11-5-2)

11.9.33 The viewpoint represents a view from receivers at the planned Metro Park: *L-06(L)-Visitors to Future Metro Park*, and is selected as also being representative of views from surrounding Leisure and Transport VSR groups on the ground level including: *L-09(L)-Visitors to Kwun Tong Typhoon Shelter Promenade; L-04(T)-Harbour Vessels, L-05(T)-Future Centre Kowloon Route 6; and L-07(T)-Future Road D3 and Central Boulevard.* The photograph was taken from near ground level about +12mPD height towards to the future MPSC. The location of the VP is chosen to approximate the location of a Regional View Corridor comprising views of Mau Tau Kok, Kowloon City and to Lion Rock, which forms part of the Urban Design Guidelines of the Kai Tak OZP. The regional view corridor follows, more or less, the alignment of the Kai Tak River towards the Kowloon ridgeline and Lion Rock. Since the Metro Park has *High* sensitivity receivers close to the MPSC and the changes resulting from the Project are considered to be *Large* during Operation Phase, visual impact is considered as **Substantial** without mitigation measures. With the implementation of mitigation measures, particularly regarding integration of the stadium boundaries and facade design, the significance of residual visual impacts are considered as **Moderate at Day 1** and **Slight at Year 10.**

Photomontage 02: Key Viewpoint VP02 from Future Station Square (Figure 11-5-3)

11.9.34 The viewpoint represents views from Station Square: *L-05(L)-Kai Tak Public Open Space Network and Station Square,* and is selected as being also representative of views from the receivers in this area including: *L-14(R)-Future Residential Development at Northeast of MPSC and L-20(F)-Planned Mixed Use Development at Kai Tak.* The photograph was taken from ground level at about +6.6mPD. Changes resulting from the Project are considered to be *Large* during Operation Phase, visual impact is considered as **Substantial** without mitigation measures. With the implementation of mitigation measures, particularly regarding integration of the stadium boundaries and facade design, the significance of residual visual impacts are considered as **Moderate at Day 1** and **Slight at Year 10.**

Photomontage 03: Key Viewpoint VP03 from Sky Tower (Figure 11-5-4)

11.9.35 The viewpoint is representative of views from the receiver: *L-01(R)-Residential Developments along Sung Wong Toi Road*, as well as being selected as representative of views from surrounding Residential and Functional VSR groups including: *L-07(R)-Residential Development in To Kwa Wan; L-01(F)-Education and Healthcare Facilities at Mau Tau Wai; and L-09(F)- Comprehensive Development Area along Mok Cheong Street.* The photograph was taken from the Sky Tower at an elevation of approximately +100mPD which gives the widest panoramic view for residential VSRs. Although the existing open view will be partially blocked by greening in the planned Sung Wong Toi Park Open Space, it will act as a new visual resource and enhance the visual amenity. Changes resulting from the Project are considered to be *Intermediate* during Operation Phase, visual impact is considered as **Moderate Substantial** without mitigation measures. With the implementation of mitigation measures, particularly regarding integration of the stadium boundaries, greening and façade design, the significance of residual visual impacts are considered as **Moderate at Day 1** and **Slight at Year 10.**

Photomontage 04: Key Viewpoint VP04 from Grand Waterfront (Figure 11-5-5)

11.9.36 The viewpoint represents views from *L-09(R)-Grand Waterfront Development,* and is selected as being also representative of views from the surrounding Residential group: *L-12(R)-Low-rise Mixed Use Development adjacent Grand Waterfront.* These VSRs currently have direct panoramic views over the Project Site. The photograph was taken from the Grand Waterfront at an elevation of approximately +138mPD. During the Operation Phase, the planned open space development immediately in front of MPSC can be expected to enhance the visual amenity, however changes resulting from the Project are considered to be *Large* during Operation Phase, visual impact is considered as **Substantial** without mitigation measures. With the implementation of mitigation measures, particularly regarding integration of the stadium boundaries, greening and façade design, the significance of residual visual impacts are considered as **Slight at Day 1** and **Slight Beneficial at Year 10.**

Photomontage 05: Key Viewpoint VP05 from Future Grid Development (Figure11-5-6)

11.9.37 The aerial viewpoint represents views from *L-14(R) Future Residential Development at Northeast of MPSC*, and is selected as being also representative of views from surrounding Residential and Functional VSR groups including *L-05(R)-Kai Ching Estate and Tak Long Estate; L-04(F)-Development Support Facilities at Kowloon Bay Interchange; and L-14(F)-Hong Kong International Trade and Exhibition Centre.* The photograph was taken at an elevation of approximately +120mPD sourced from Agreement No. CE 35/2006(CE) Technical Study on Increasing Development Density in Kai Tak Planning Review Report (Final). The view will be experienced by planned residents in the upper floors of the future residential developments. The distance between the viewpoint and northeast side of MPSC is only about 40m. Changes resulting from the Project are considered to be *Large* during Operation Phase, visual impact is considered as **Substantial** without mitigation measures. With the implementation of mitigation measures, particularly regarding greening and façade design, the significance of residual visual impacts are considered as **Slight at Day 1** and **Slight Beneficial at Year 10.**

Photomontage 06: Key Viewpoint VP06 from Future Mixed Development (Figure 11-5-7)

11.9.38 The aerial viewpoint represents views from *L-20(F)-Planned Mixed Use Development at Kai Tak,* and is selected as being also representative of views from potential Residential and Functional VSR groups including: *L-13(R)-Future Residential Development at Northwest of MPSC; L-02(R)-Mid-rise Development in Chung Seen Mei Chuen and Kowloon City; L-03(R)-High-rise Residential Groups North of Prince Edward Road East; and L-02(F)-Education and Healthcare Facilities at San Po Kong.* The photograph was taken at an elevation of approximately +105mPD sourced from Agreement No. CE 35/2006(CE) Technical Study on Increasing Development Density in Kai Tak Planning Review Report (Final). The view will be experienced by planned residents in the upper floors of the future residential developments. The distance between the viewpoint and northwes***t*** side of MPSC is only about 45m**.** Changes resulting from the Project are considered to be *Large* during Operation Phase, visual impact is considered as **Substantial** without mitigation measures. With the implementation of mitigation measures, particularly regarding greening and façade design, the significance of residual visual impacts are considered as **Slight at Day 1** and **Slight Beneficial at Year 10.**

Overview

11.9.39 The photomontages demonstrate that the mitigation and enhancement measures integrated into the Project would provide a variety of both landscape and visual benefits and improvements as compared to the current baseline situation. Whilst a large majority of the measures involve greening, which may take upwards of 20 years to see the full benefits in terms of the tree planting, the development will provide significant visual amenity and generate extensive new visual resources which are intended to blend seamlessly with the surrounding hinterland. In particular:-

- The future MPSC site will form new visual resources and enhance the visual amenity;
- The urban park and new landscape deck together with the significant roof greening in the MPSC site will generate immediate visual enhancement for receivers.
- The building form is highly responsive to the location and will help generate an impressive new skyline which will reinforce the identity of the new waterfront area to be created.

Glare Impact

11.9.40 Based on the assessment detailed in **Section 11.9.18**, the predicted Glare Rating at the selected VSR locations are all below the Glare Rating Limit of 50.

11.9.41 It is affirmative that the Lighting Fittings in MPSC have their tilting angles adjustable in order to beam light downward towards the targeted horizontal planes to be illuminated and spillage can be eliminated effectively. So ULR for exterior lighting installation is less than 15.0%.

Mitigation Measures for Potential Glare Impacts

Responsive Lighting Design and Disposition

11.9.42 It should be noted that the external landscape lighting design is carried out by making reference to (1)Lighting Guide 4: Sports Lighting, Chartered Institution of Building Services Engineers; (2) BS EN 12193:2007 Light and Lighting–Sports Lighting, British Standards Institution and (3) Guidance Notes for the Reduction of Obtrusive Light, The Institution of Lighting Professionals as recommended in the Building Services Branch Circular No. 10 of 2011 by Architectural Services Department - Design Considerations for Outdoor Sports Venues Lighting and other relevant international standards for areas applicable to the MPSC project. Those lighting fittings as shown in the **Appendix 11G** are selected for design reference after taking account of their functional performance in respect of colour temperature, average luminance etc. and their titling angles adjustable in order to beam light towards the targeted horizontal planes to be illuminated and spillage can be eliminated effectively. Hence the glare impact could be reduced by proper selection of the type and output luminaries and light fittings (e.g. reflector).

11.9.43 In order to minimise glare impact at the observer, the detailed lighting design for MPSC should select luminaries and fittings type to minimise direct view of the light source (from the sides) to control glare impact on nearby visual sensitive receiver locations. Light fittings could be designed to restrict side dispersion and hence reduce the glare impact on the VSR.

11.9.44 In addition, a strategy of using lamp posts of lower height and with less interval spacing could help to reduce the lighting output from each lamp while maintaining the minimum luminance requirement for the open space. A lowering of the lighting output (i.e. luminous flux) would also help to reduce the glare impact on the observer.

11.9.45 All proposed hard structures should be sensitively designed in a manner that responds to the existing and planned landscape context, and minimises potential adverse glare impacts. The structural design should seek to reduce the apparent visual mass through the use of natural materials such as wooden frame and semi-transparent panels. Subdued tones should be considered for the colour palette with non-reflective finishes to reduce glare effect.

11.9.46 It should be noted that the prediction results assume direct line of sight between the observers and the luminaries of the lighting installation. With tree planting within the MPSC, glare impact would be reduced due to reducing the direct sight of the luminaries.

Construction Lighting Control

11.9.47 During construction, all security floodlights for construction sites should be equipped with adjustable shields, frosted diffusers and reflective covers, and be carefully controlled to minimise light pollution and night-time glare to the VSRs.

Lighting Project Design Planning

11.9.48 Overall lighting design should carefully consider a reasonable level of functional and thematic lighting with due consideration of possible light pollution and night-time glare to the surroundings. Consideration shall be made in the lighting design to the following measures:-

- Lighting shall be designed with due consideration of mounting height and direction of light fixtures so as not to point directly towards any sensitive receiver.
- Lighting shall be arranged with due consideration of reflectance so as to avoid glare effect.
- Lighting shall be regularly monitored during operation.
- Lights located adjacent or in proximity to neighbours shall be carefully designed to prevent possible light intrusion.
- Paving materials should be selected as necessary to reduce potential glare from surface reflectance.
- Particular attention should be paid to the use of lighting having a high intensity or harsher tone (e.g. metal halide lamps).

Operating Hours for Lighting

11.9.49 In respect of operating hours for lighting, limiting the use of external lighting after a specified time at night could reduce the possibility of light nuisance and energy consumption and in turn foster a good living environment for everyone. It is advisable to:-

- Switch off the external lighting when not needed or after business hours.
- Switch off the external lighting after certain time at night (After 11p.m. as recommended by International Commission on Illumination (CIE)).
- Maintain only essential lighting (e.g. lighting for safety and security) at the acceptable level as required.
- Feature lighting serve to enhance a particular feature/building/structure may be subject to even more stringent control as to their lit time.

Automatic Controls for Lighting

11.9.50 Automatic controls could help reduce adverse impacts of external lighting by optimising the use of the external lighting. Examples of such measures include:-

- Incorporate automatic control (e.g. timer switch) to switch off the external lighting when not needed or after business hours, or when concerned premises are not in use, or after certain time at night (11p.m. as recommended by CIE).
- Incorporate automatic control (e.g. photo-sensor for maximising daylight utilisation) to switch on the external lighting only when necessary.
- Incorporate occupancy sensor control (e.g. motion sensor or passive infrared sensor) to switch on the external lighting from off or dimmed state where applicable.

Light Nuisance Control Measures

11.9.51 Measures to reduce light nuisance impacts (e.g. light overspill, light trespass, glare and sky glow) arising from external lighting include:-

- Avoid over-illumination of signs, facades, shop fronts, video walls and facilities with lighting. Over-illumination will increase possibility of light nuisance.
- Position and aim the lighting properly to avoid overspill of light to outside the area being lit up.
- For lighting up vertical structures (e.g. signs & façade), direct the beam to the structures and avoid overspill of light.
- Use lighting with appropriate shields, baffles, louvers and cut-off features to prevent light overspill to nearby residence and into the sky, and glare from the light source. Where necessary, consider to use luminaires with appropriate cut-off classification. To avoid imposing additional wind load which will affect the structure of the existing lighting columns and foundation, please consult relevant professionals in the design of shields, baffles, louvers, etc. for retrofit works.
- Switch off the lighting when it is not operationally required or dim down the lighting when a high illumination level is not essential (e.g. after business hours and where the lighting devices are not for security purposes).
- Avoid using video walls or signs with flickering, colour changing or movement effect in cases where the video walls or signs are facing directly at residents (e.g. when the lighting device and residential premises are on the opposite sides of a road or street). Where unavoidable, reduce the video wall or sign illuminance, the period of operation and/or the flickering rate.
- For signs with light emitting diodes (LEDs), use suitable type of LEDs (e.g. LEDs with baffles, louvres or optic diffusers to control light distribution) to reduce sign luminance and light overspill and to prevent glare from direct view of the light source.
- Avoid directing light at glass curtain wall, shiny shop front display panel, or light colour fabric materials (e.g. used in shade structures in parks, amphitheatres or piazzas) etc. to prevent light overspill and nuisances caused by reflection of light.

Prevention of Glare to Road Users

11.9.52 Glare from external lighting may affect road users resulting in safety concerns. Measures to reduce such glare impact include:-

- Ensure the external lighting is appropriately positioned, aimed or shielded so that illumination of nearby roads will not be adversely affected.
- Ensure appropriate type of lighting is used (e.g. lighting with suitable light distribution pattern, or appropriate cut-off classification) to reduce glare impact on road user

Residual Impacts

Background

11.9.53 The following sections examine the 'significance' of impacts on Landscape Resources, Landscape Character and VSRs following both Construction and Operation Phase mitigation and enhancement measures. The Significance Threshold of those impacts that would occur in the construction and Operation Phases is summarised in **Tables 11-24** and **11-25** below. Residual impacts associated with these works have been assessed but no quantification of residual impacts is required

Residual Impacts on Landscape Resources

Construction Phase

11.9.54 No Substantial Adverse Impacts are anticipated during Construction

11.9.55 Slight Adverse Residual Impacts are anticipated to Resources LR1-1, LR2-1, LR2-12 and Moderate Adverse Residual Impacts to LR3-2.

Operation Phase

11.9.56 The utilisation of landscape mitigation and enhancement measures during Operation are to some extent able to offset the impacts generated during Construction Phase.

11.9.57 No *Adverse* Residual Impacts are anticipated during Operation.

11.9.58 After 10 years of Operation, the extensive tree planting and greening associated with OM1, OM2 and OM3, along with the incorporation of an urban park under OM8 is anticipated to bring *Moderate Beneficial* Residual Impacts to Landscape Resources LR1-1 and LR2-1.

Residual Impacts on Landscape Character

Construction Phase

11.9.59 No *Substantial Adverse* Impacts are anticipated during Construction.

Operation Phase

11.9.60 No *Adverse* Residual Impacts are anticipated during Operation.

11.9.61 After 10 years of Operation, the Project is anticipated to bring *Moderate Beneficial* Residual Impacts to Landscape Character Area LCA01, resulting from the full range of applied landscape and visual mitigation and enhancement measures intended to transform the area from one of urban blight into local community and tourist hub. *Slight Beneficial* Residual Impacts to Landscape Character Area LCA05 are anticipated as a result of potential changes in use and activity resulting from the Project development itself.

Residual Impacts on Visually Sensitive Receivers

Construction Phase

11.9.62 No *Substantial Adverse* Impacts are anticipated during Construction. The mitigation measures outlined are expected to suitably alleviate the severity of any adverse construction impacts, particularly regarding night-time glare and in ensuring orderly site management and programming to minimise impact durations.

11.9.63 Local level, Residential receivers abutting the Project boundary of MPSC will be subject to *Moderate Adverse* Visual Impacts, including:- *L-01(R)-Residential Development along Sung Wong Toi Road; L-02(R)-Mid-rise Residential Development in Chung Seen Mei Chuen and Kowloon City; L-03(R)-High-rise Residential Groups North of Prince Edward Road East; L-05(R)-Kai Ching Estate and Tak Long Estate; and L-09(R)-Grand Waterfront*.

11.9.64 Local level Functional receivers immediately adjacent to the Project Site may also experience *Moderate Adverse* Visual Impacts, including:- *L-04(F)-Development Support Facilities at Kowloon Bay Interchange; L-08(F)-Hong Kong Aviation Club; L-09(F)-Comprehensive Development Area along Mok Cheong Street; and L-15(F)-Kowloon City Ferry Pier and Transport Terminus*.

Operation Phase

11.9.65 No *Substantial Adverse* Impacts are anticipated during Operation. The quality of the baseline visual condition as a derelict brownfield site means that new development has the ability to suitably enhance the visual condition through adopting suitable mitigation and enhancement measures. Whilst the loss of visual amenity of long and open views to many receivers will have the most adverse impact, it is considered that the significant greening of the site, coupled with careful visual integration into the urban context through control of scale, massing and building disposition will provide a long term beneficial visual outlook during Operation for a large number of receivers. Many high floor residents overlooking the site will continue to benefit from long and wide views over and beyond the development, whilst the carefully considered view corridors through the site enable low level receivers to maintain visual penetration.

11.9.66 At Day 1 of Operation, District Level planned receivers abutting the Project boundary of MPSC will be subject to *Moderate Adverse* Visual Impacts, including:- *D-04-Future MPSC South*; and *D-05-Future Road D2*.

11.9.67 At Day 1 of Operation, Local level, Residential receivers abutting the Project boundary of MPSC will be subject to *Moderate Adverse* Visual Impacts, including:- *L-01(R)-Residential Development along Sung Wong Toi Road;* and *L-02(R)-Mid-rise Residential Development in Chung Seen Mei Chuen and Kowloon City*.

11.9.68 At Day 1 of Operation, Local level Functional receivers immediately adjacent to the Project Site may also experience *Moderate Adverse* Visual Impacts, including:- *L-04(F)-Development Support Facilities at Kowloon Bay Interchange; L-08(F)-Hong Kong Aviation Club; L-09(F)-Comprehensive Development Area along Mok Cheong*

Street; L-15(F)-Kowloon City Ferry Pier and Transport Terminus and *L-18(F)-Planned Commercial Development along Route 6.*

11.9.69 At Day 1 of Operation, Local level Leisure receivers immediately adjacent to the Project Site may also experience *Moderate Adverse* Visual Impacts, including:- *L-04(L)-Kai Tak Promenade and Open Space Network; L-05(L)-Kai Tak Public Open Space Network and Station Square*; and *L-06(L)-Visitors to Future Metro Park.*

11.9.70 At Day 1 of Operation, Local level Transport receivers immediately adjacent to the Project Site may also experience *Moderate Adverse* Visual Impacts, including:- *L-05(T)-Future Central Kowloon Route 6*; and *L-06(T)-Future Road D2.*

11.9.71 After 10 years of Operation, no *Moderate Adverse* Impacts are anticipated to remain. The Project is anticipated to bring *Slight Beneficial* Residual Impacts to *L-05(R)-Kai Ching Estate and Tak Long Estate; L-09(R)-Grand Waterfront; L-10(R)-Harbourfront Landmark; L-12(R)-Low-rise Mixed Use Development adjacent to Grand Waterfront; L-13(R)-Future Residential development at the northwest of MPSC; L-14(R)-Future Residential development at the Northeast of MPSC; L-04(F)-Development Support Facilities at Kowloon Bay Interchange; L-07(L)-Promenade along Ma Tau Kok; L-02(T)-Travellers on Sung Wong Toi Road;* and *L-04(T)-Harbour Vessels.*

Glare Impact Assessment Conclusion

11.9.72 Glare impact on VSRs located near the MPSC and associated above ground structure have been reviewed using the Glare Rating method proposed by CIE and adopted in BS EN 12464-2 for outdoor lighting installations.

11.9.73 Based on the objective assessment with a Glare Rating Limit of 50, no significant discomfort glare condition is anticipated at the selected VSRs.

11.9.74 However, with the recommended mitigation measures for the detailed lighting design, the potential glare impacts at these identified VSR can be further reduced.

11.9.75 It must be noted that detailed design for outdoor lighting installations have not yet been finalized at this stage and the conclusion is indicative of typical configuration and is based on assumptions detailed from **Section 11.8.143 to Section 11.8.155** of this report. These assumptions (e.g. location, type and number of luminaries) and the prediction results should be verified in future when detailed design information becomes available.

Table 11-24 Significance of Residual Landscape Impacts

Ref (LCA)	Description	Sensitivity	Magnitude of Change		Significance Threshold WITHOUT Mitigation		Mitigation Measures	Significance Threshold WITH Mitigation		
			Con	Op	Con	Op		Con	Op Day 1	Op Year 10
Landscape Resources										
LR1-1	Vegetation on MPSC Development Area	Low	Large	Large	Moderate	Moderate	CM2 OM1/2/3/8	Slight	Slight Beneficial	Moderate Beneficial
LR2-1	Hardstanding at Kai Tak Airport	Low	Large	Large	Moderate	Moderate	CM2 OM1/2/3/8	Slight	Slight Beneficial	Moderate Beneficial
LR2-12	Seawall of Kowloon Bay Typhoon Shelter	Medium	Small	Negligible	Slight/ Moderate	Insubstantial	-	Slight	Insubstantial	Insubstantial
LR3-2	Waterbody of Kowloon Bay	High	Small	Negligible	Moderate	Insubstantial	-	Moderate	Insubstantial	Insubstantial
Landscape Character Areas										
LCA01	Former Kai Tak Airport	Low	Small	Intermediate	Slight	Slight/ Moderate	CM1/2/3 OM1-9	Insubstantial	Slight Beneficial	Moderate Beneficial
LCA05	To Kwa Wan Typhoon Shelter	High	Negligible	Small	Insubstantial	Moderate	OM6	Insubstantial	Insubstantial	Slight Beneficial

Table 11-25 Significance of Residual Visual Impacts

Ref (VSRs)	Description	Sensitivity		Magnitude of Change		Significance Threshold WITHOUT Mitigation		Mitigation Measures	Significance Threshold WITH Mitigation		
		Con	Op	Con	Op	Con	Op		Con	Day 1	Year 10
Strategic											
S-01	Proposed Promenade, South East Kowloon Development (VP3)	Low		Small	Small	Slight	Slight	CM1 OM4/5/9	Insubstantial	Insubstantial	Insubstantial
S-02	Quarry Bay Park, (VP4)	Low		Negligible	Negligible	Insubstantial	Insubstantial	CM1 OM4/5/9	Insubstantial	Insubstantial	Insubstantial
S-03	Victoria Peak (VP7)	Low		Negligible	Negligible	Insubstantial	Insubstantial	CM1 OM4/5/9	Insubstantial	Insubstantial	Insubstantial
S-04	Lion Rock	Low		Negligible	Negligible	Insubstantial	Insubstantial	CM1 OM4/5/9	Insubstantial	Insubstantial	Insubstantial
S-05	Kowloon Peak	Low		Negligible	Negligible	Insubstantial	Insubstantial	CM1 OM4/5/9	Insubstantial	Insubstantial	Insubstantial
S-06	Devil's Peak	Low		Negligible	Negligible	Insubstantial	Insubstantial	CM1 OM4/5/9	Insubstantial	Insubstantial	Insubstantial
S-07	Mount Parker	Low		Negligible	Negligible	Insubstantial	Insubstantial	CM1 OM4/5/9	Insubstantial	Insubstantial	Insubstantial
S-08	Mount Cameron	Low		Negligible	Negligible	Insubstantial	Insubstantial	CM1 OM4/5/9	Insubstantial	Insubstantial	Insubstantial
S-09	North Point Pier	Low		Negligible	Negligible	Insubstantial	Insubstantial	CM1 OM4/5/9	Insubstantial	Insubstantial	Insubstantial
S-10	Lei Yue Mun Gap	Low		Negligible	Negligible	Insubstantial	Insubstantial	CM1 OM4/5/9	Insubstantial	Insubstantial	Insubstantial
S-11	International Commerce Centre	Low		Negligible	Negligible	Insubstantial	Insubstantial	CM1 OM4/5/9	Insubstantial	Insubstantial	Insubstantial
S-12	Two International Finance Centre	Low		Negligible	Negligible	Insubstantial	Insubstantial	CM1 OM4/5/9	Insubstantial	Insubstantial	Insubstantial

Ref (VSRs)	Description	Sensitivity		Magnitude of Change		Significance Threshold WITHOUT Mitigation		Mitigation Measures	Significance Threshold WITH Mitigation		
		Con	Op	Con	Op	Con	Op		Con	Day 1	Year 10
District											
D-01	Kai Tak Runway Park	-	Low		Negligible	l	Insubstantial	CM1	-	Insubstantial	Insubstantial
D-02	Future Metro Park South	-	Medium	-	Small	**-**	Slight	OM4/5/9	-	Insubstantial	Insubstantial
D-03	Future Metro Park Central	-	Medium	-	Inter	**-**	Moderate	OM2/4/5/8/9	-	Slight	Insubstantial
D-04	Future MPSC South	-	Medium	-	Large	**-**	Moderate / Substantial	OM1/2/4/5/6/9	-	Moderate	Slight
D-05	Future MPSC East	-	High	-	Large	**-**	Substantial	OM1/2/7/9	-	Moderate	Slight
Local - Residential											
L-01(R)	Residential Development along Sung Wong Toi Road	High		Inter	Inter	Moderate / Substantial	Moderate / Substantial	CM1/2/3 OM1/2/4/5/6/9	Moderate	Moderate	Slight
L-02(R)	Mid-rise Residential Development in Chung Seen Mei Chuen and Kowloon City	High	Medium	Inter	Inter	Moderate / Substantial	Moderate	CM1/2/3 OM1/2/4/5/9	Moderate	Slight	Insubstantial
L-03(R)	High-rise Residential Groups North of Prince Edward Road East	High	Medium	Inter	Inter	Moderate / Substantial	Moderate	CM1/2/3 OM1/2/4/5/9	Moderate	Slight	Insubstantial
L-04(R)	Residents at Choi Hung and Diamond Hill	High	Medium	Small	Small	Moderate	Slight / Moderate	CM1/2 OM1/2/4/5/9	Slight	Slight	Insubstantial
L-05(R)	Kai Ching Estate and Tak Long Estate	High		Inter	Small	Moderate / Substantial	Moderate	CM1/2/3 OM1/2/4/5/9	Moderate	Slight	**Slight Beneficial**
L-06(R)	Richland Garden	Medium		Small	Negligible	Slight / Moderate	Insubstantial	CM1/2 OM2/4/5/9	Slight	Insubstantial	Insubstantial
L-07(R)	Residential Development in To Kwa Wan	Medium		Negligible	Negligible	Insubstantial	Insubstantial	CM1/2 OM2/4/5/9	Insubstantial	Insubstantial	Insubstantial

Ref (VSRs)	Description	Sensitivity		Magnitude of Change		Significance Threshold WITHOUT Mitigation		Mitigation Measures	Significance Threshold WITH Mitigation		
		Con	Op	Con	Op	Con	Op		Con	Day 1	Year 10
L-08(R)	Laguna Verde	Medium		Small	Small	Moderate	Moderate	CM1/2 OM2/4/5/6/9	Slight	Slight	Insubstantial
L-09(R)	Grand Waterfront	High		Large	Large	Substantial	Substantial	CM1/2 OM2/4/5/6/9	Moderate	Slight	**Slight Beneficial**
L-10(R)	Harbourfront Landmark	Medium		Small	Small	Slight / Moderate	Slight / Moderate	CM1 OM2/4/5/6/9	Slight	Slight	**Slight Beneficial**
L-11(R)	Residential in progress along Prince Edward Road East	High	Medium	Small	Small	Moderate	Slight / Moderate	CM1/2/3 OM1/2/4/5/9	Slight	Slight	Insubstantial
L-12(R)	Low-rise Mixed Use Development adjacent to Grand Waterfront	Low	High	Inter	Large	Slight / Moderate	Moderate / Substantial	CM1/2/3 OM2/4/5/6/9	Slight	Slight	**Slight Beneficial**
L-13(R)	Future Residential Development at Northwest of MPSC	-	High	-	Large	-	Substantial	OM1/2/3/4/8/9	-	Slight	**Slight Beneficial**
L-14(R)	Future Residential Development at Northeast of MPSC	-	High	-	Large	-	Substantial	OM1/2/3/4/8/9	-	Slight	**Slight Beneficial**
L-15(R)	Future Residential Development in Runway Precinct	-	Medium	-	Small	-	Slight / Moderate	OM4/5/9	-	Slight	Insubstantial
Local - Functional											
L-01(F)	Education and Healthcare Facilities at Ma Tau Wai	Medium		Inter	Inter	Moderate	Moderate	CM1/2/3 OM1/2/4/5/9	Slight	Slight	Insubstantial
L-02(F)	Education and Healthcare Facilities at San Po Kong	Medium	Low	Inter	Inter	Moderate	Slight / Moderate	CM1/2/3 OM1/2/4/5/9	Slight	Slight	Insubstantial
L-03(F)	Government Facilities on Concorde Road	Low	Low	Inter	Inter	Slight / Moderate	Slight / Moderate	CM1/2/3 OM1/2/4/5/9	Slight	Slight	Insubstantial

Ref (VSRs)	Description	Sensitivity		Magnitude of Change		Significance Threshold WITHOUT Mitigation		Mitigation Measures	Significance Threshold WITH Mitigation		
		Con	Op	Con	Op	Con	Op		Con	Day 1	Year 10
L-04(F)	Development Support Facilities at Kowloon Bay Interchange	Medium		Large	Large	Moderate / Substantial	Moderate / Substantial	CM1/2/3 OM1/2/4/5/9	Moderate	Slight	**Slight Beneficial**
L-05(F)	Healthcare and Education Facilities at Kowloon Bay	Medium	Low	Small	Negligible	Slight / Moderate	Insubstantial	CM1/2 OM2/4/5/9	Slight	Insubstantial	Insubstantial
L-06(F)	Kowloon Bay Action Area	Low	Medium	Negligible	Negligible	Insubstantial	Insubstantial	CM1 OM4/5/9	Insubstantial	Insubstantial	Insubstantial
L-07(F)	Police Operational Facility at Dyer Avenue	Low		Small	Small	Slight	Slight	CM1OM4/5/6/9	Insubstantial	Insubstantial	Insubstantial
L-08(F)	Hong Kong Aviation Club	Medium		Large	Large	Moderate / Substantial	Moderate / Substantial	CM1/2/3 OM1/2/4/5/6/9	Moderate	Moderate	Slight
L-09(F)	Comprehensive Development Area along Mok Cheong Street	Medium	High	Large	Large	Moderate / Substantial	Substantial	CM1/2/3 OM1/2/4/5/6/9	Moderate	Moderate	Slight
L-10(F)	Kowloon Bay Business District	Medium		Small	Negligible	Slight / Moderate	Insubstantial	CM1 OM4/5/9	Insubstantial	Insubstantial	Insubstantial
L-11(F)	Business and Industrial Developments in San Po Kong	Low	Low	Small	Small	Slight	Slight	CM1/2/3 OM1/2/4/5/9	Insubstantial	Insubstantial	Insubstantial
L-12(F)	Business and Industrial Developments in Hung Hom	Low		Small	Small	Slight	Slight	CM1 OM4/5/6/9	Insubstantial	Insubstantial	Insubstantial
L-13(F)	Kwun Tong Business District	Low		Negligible	Negligible	Insubstantial	Insubstantial	CM1 OM4/5/9	Insubstantial	Insubstantial	Insubstantial
L-14(F)	Hong Kong International Trade and Exhibition Centre	Low		Large	Large	Moderate	Moderate	CM1/3 OM1/2/4/5/9	Slight	Slight	Insubstantial
L-15(F)	Kowloon City Ferry Pier and Transport Terminus	Medium		Large	Large	Moderate / Substantial	Moderate / Substantial	CM1/2/3 OM1/2/4/5/6/9	Moderate	Moderate	Slight

Ref (VSRs)	Description	Sensitivity		Magnitude of Change		Significance Threshold WITHOUT Mitigation		Mitigation Measures	Significance Threshold WITH Mitigation		
		Con	Op	Con	Op	Con	Op		Con	Day 1	Year 10
L-16(F)	Pacific Trade Centre, Octa Tower, Kowloon Godown	Low		Negligible	Negligible	Insubstantial	Insubstantial	CM1 OM4/5/9	Insubstantial	Insubstantial	Insubstantial
L-17(F)	Future Tourism Development in Runway Precinct	-	Low	-	Negligible	-	Insubstantial	OM1/2/4/5/9	-	Insubstantial	Insubstantial
L-18(F)	Planned Development along Route 6	-	Medium	-	Large	-	Moderate / Substantial	OM1/2/4/5/9	-	Moderate	Slight
L-19(F)	Planned Commercial Development in Runway Precinct	-	Medium	-	Small	-	Slight / Moderate	OM1/2/4/5/9	-	Slight	Insubstantial
L-20(F)	Planned Mixed Use Development at Kai Tak	-	Medium	-	Large	-	Moderate / Substantial	OM1/2/4/8/9	-	Slight	**Slight Beneficial**
L-21(F)	Construction Areas at Kai Tak Development	Low	Low	Inter	Inter	Slight / Moderate	Slight / Moderate	CM1/2/3 OM1/2/4/5/8/9	Slight	Slight	**Slight Beneficial**
Local - Leisure											
L-01(L)	Amenity Users at Greenspace on Prince Edward Road	Medium		Inter	Inter	Moderate	Moderate	CM1/2/3 OM1/2/4/5/9	Slight	Slight	Insubstantial
L-02(L)	Amenity Users at Shek Ku Lung Road Playground	Medium	Low	Inter	Inter	Moderate	Slight / Moderate	CM1/2/3 OM1/2/4/5/9	Slight	Slight	Insubstantial
L-03(L)	Amenity Users at Sze Mei Street Open Space and PTI	Medium	Low	Inter	Inter	Moderate	Slight / Moderate	CM1/2/3 OM1/2/4/5/9	Slight	Slight	Insubstantial
L-04(L)	Kai Tak Promenade and Open Space Network	-	High	-	Large	-	Substantial	OM1/2/4/5/6/7/9	-	Moderate	Slight
L-05(L)	Kai Tak Public Open Space Network and Station Square	-	High	-	Large	-	Substantial	OM1/2/4/5/6/7/9	-	Moderate	Slight
L-06(L)	Visitors to Future Metro Park	-	High	-	Large	-	Substantial	OM1/2/4/5/6/9	-	Moderate	Slight

Ref (VSRs)	**Description**	**Sensitivity**		**Magnitude of Change**		**Significance Threshold WITHOUT Mitigation**		**Mitigation Measures**	**Significance Threshold WITH Mitigation**		
		Con	**Op**	**Con**	**Op**	**Con**	**Op**		**Con**	**Day 1**	**Year 10**
L-07(L)	Promenade along Ma Tau Kok	Medium		Inter	Inter	Moderate	Moderate	CM1/2/3 OM1/2/4/5/6/9	Slight	Slight	**Slight Beneficial**
L-08(L)	Visitors to Kai Tak Cruise Terminal Roof Garden	Low		Negligible	Negligible	Insubstantial	Insubstantial	CM3 OM1/2/4/5/9	Insubstantial	Insubstantial	Insubstantial
L-09(L)	Visitors to Kowloon Bay Typhoon Shelter Promenade	Medium		Negligible	Negligible	Insubstantial	Insubstantial	OM1/2/4/5/9	Insubstantial	Insubstantial	Insubstantial
Local - Transport											
L-01(T)	Travellers on Prince Edward Road East	Low	Low	Small	Small	Slight	Slight	CM1/2/3 OM1/2/4/5/9	Insubstantial	Insubstantial	Insubstantial
L-02(T)	Travellers on Sung Wong Toi Road	Low		Large	Large	Moderate	Moderate	CM1/2/3 OM1/2/4/5/6/9	Slight	Slight	**Slight Beneficial**
L-03(T)	Motorists on Kwun Tong Bypass	Low	Low	Small	Small	Slight	Slight	CM1 OM1/2/4/5/9	Insubstantial	Insubstantial	Insubstantial
L-04(T)	Harbour Vessels	Low	Medium	Small	Small	Slight	Slight / Moderate	CM1/2/3 OM1/2/4/5/6/9	Insubstantial	Slight	**Slight Beneficial**
L-05(T)	Future Central Kowloon Route 6	-	Medium	-	Large	-	Moderate/ Substantial	OM1/2/4/9	-	Moderate	Slight
L-06(T)	Future Road D2	-	Medium	-	Large	-	Moderate/ Substantial	OM1/2/4/7/9	-	Moderate	Slight
L-07(T)	Future Road D3 and Central Boulevard	-	Low	-	Large	-	Moderate	OM2/4/9	-	Slight	Insubstantial
L-08(T)	Future Road D4 and Taxiway Bridge	Low	Low	Small	Small	Slight	Slight	CM1/2/3 OM2/4/9	Insubstantial	Insubstantial	Insubstantial
L-09(T)	Future Road L6	-	Low	-	Large	-	Moderate	OM1/2/4/5/7/9	-	Slight	Insubstantial

11.10 Cumulative Impacts

11.10.1 The Project is at the heart of the Kai Tak Development and the LVIA has attempted to assess the baseline within the context of the hugely changing environment and fluctuating visual receivers. The programming for other projects within the region is not definitive, however it can be anticipated that in some circumstances the concurrent development of surrounding projects may lead to both intensified impacts as well as enhanced mitigation being adopted though integrated planning and management, this to local visual receivers in particular. The improvement of the local environment, which should benefit from the extensive programmed greening and open space provision surrounding the Project area as identified on the Outline Zoning Plan, should assist in further mitigating against the identified adverse landscape and visual residual impacts.

11.10.2 As the significance of a number of landscape and visual impacts occurring from the Project appears to be “beneficial” it can be further assumed that these aspects will contribute in mitigating against adverse impacts occurring on other surrounding concurrent projects and that the urban renewal in the district will create an integrated and enhanced landscape and visual environment, generated for the public good.

11.11 Environmental Monitoring and Audit

Design Phase

11.11.1 The landscape and lighting designs shall be checked by a Registered Landscape Architect to be appointed by the Project Proponent independently to ensure that the proposed landscape measures, lighting mitigation measures and additional measures (if required), are fully incorporated for mitigating the landscape, visual and glare impacts and for resolving any potential conflicts with civil engineering, geo-technical, structural, lighting, signage, drainage, underground utility and operational requirements prior to construction. Any changes to the mitigation measures that may be recommended to meet alterations in the baseline conditions or to contract documentation. The external lighting design shall refer to and comply with a list of recognized international design standards, the selection of lighting fittings, luminaires and fitting types shall facilitate the control of glare impact on nearby visual sensitive receiver locations, eliminate lighting spillage, with strategical application of lamp post with respect to height and spacing, in line with colour and texture of hard landscape structure and context.

Construction Phase and Operation Phase

11.11.2 The landscape and visual and glare mitigation measures proposed shall be incorporated in the construction Contract Documents including the requirements for successful establishment and growth of new tree planting and shrubs, and controls of security floodlights such as providing adjustable shields, frosted diffusers and reflective covers with various control measures, such as operation hour, automatic controls for lighting and nuisance control measures, and prevention of glare to road users to minimise light pollution and night-time glare, so as to ensure the effectiveness of the mitigation measures described above through Construction and Operation Phase. A specialist landscape sub-contractor shall be employed by the works Contractor for the implementation of tree and soft landscape works and subsequent maintenance operation during a 12 month establishment period.

11.11.3 The implementation and maintenance of mitigation measures shall be checked regularly by a Registered Landscape Architect, as a member of the Environmental

Team (ET) during the Environmental Monitoring and Audit (EM&A) to ensure that they are fully realised and compliant with the intended aims of the measures. Any potential conflicts among the proposed mitigation measures, the Project works, and operational requirements should also be identified and resolved early.

11.11.4 The extent of the agreed works areas shall be regularly checked during the Construction Phase by the Environmental Team (ET). Any trespass by the Contractor outside the limit of the works leading to damage to existing trees shall be reported to the Independent Environmental Checker and Architect's Representative.

11.11.5 The planting should commence during the construction contract and monitoring of the planting establishment should be undertaken once every two months for a 12 month period through the first operational year of the Project. Further details of the specific EM&A requirements are detailed in **Section 11.11** of this report and in the EM&A Manual under separate cover.

11.12 Recommendation

11.12.1 Under the proposed MPSC development, the cultural and historical features surrounding the Project will be preserved and a new landscape design within the MPSC Study Area implemented that is considered appropriate to the planned context of the area and should produce long term landscape and visual benefits.

11.12.2 The current Landscape Resources and Landscape Character within the site are of limited quality and value. The Project provides a clear opportunity to enhance these public assets and undertake significant tree planting and public space creation. Approximately 160 trees will be lost through the Project, with none of any importance or high amenity value. It is anticipated that the Project will lead to the planting of more than 340 new trees.

11.12.3 Based on the analysis, implementation of mitigation measures, and as illustrated by the photomontages, the proposed MPSC development does not have a significant visual impact and is considered to be fully acceptable in terms of visual impact. Based on the visual impact assessment, a total of 5 viewpoints from VSRs at district and local levels are selected to provide examples for representative VSRs at different locations around the Project Site. They are selected for preparation of photomontages to demonstrate the changes in visual outlook that will result from the Project.

11.12.4 The following Landscape and Visual mitigation measures are proposed to be undertaken:-

Construction Phase

CM1	Controlled Night-Time Lighting
CM2	Temporary Landscape Treatment
CM3	Decoration of Hoarding

Operation Phase

OM1	Greening of Walkways, Ramps and Decks
OM2	Green Roofs and Vertical Greening
OM3	Compensatory Tree Planting
OM4	Responsive Building Design

OM5	Integration of Development Boundaries
OM6	Integration with Dining Cove and Waterfront Promenade
OM7	Light Penetration Under Deck
OM8	Urban Park
OM9	Bespoke Amenity Area Lighting

11.12.5 With suitable mitigation measures taken to enhance the visual compatibility, the different facilities within the MPSC development will have an overall enhanced visual effect on the area. The landscape deck will contribute to provide an attractive open space and integrate all the buildings within MPSC development. The landscape deck provides seamless linkage from the MTR station to the Metro Park and surrounding development within the KTD. It offers people a visually stimulating environment and a sense of place, in comparison to the typical tall residential and office buildings found in the surrounding areas.

11.12.6 The following Glare mitigation measures proposed in **Section 11.9.42** to **11.9.52** are to be undertaken:-

- Responsive Lighting Design and Disposition
- Construction Lighting Control
- Lighting Project Design Planning
- Operating Hours for Lighting
- Automatic Controls for Lighting
- Light Nuisance Control Measures
- Prevention of Glare to Road Users

11.12.7 In summary:-

- The Project is compatible with the statutory planning framework;
- No Adverse Residual Landscape Impacts are generated by the Project during Operation Stage; and
- No Substantial Adverse Residual Impacts to Landscape Resources, Landscape Character or VSRs are generated by the Project at any stage.
- No Adverse Glare Impact will be imposed on VSRs as the predicted glare rating generated by the Project for the identified VSRs are below the Glare Rating Limit.

11.12.8 Overall, it is considered that, in the terms of Annex 10 of the EIAO TM, the landscape, visual and glare impacts are **ACCEPTABLE** once the prescribed mitigation measures are applied at completion and properly maintained throughout operation of the Project.

12 CULTURAL HERITAGE IMPACT ASSESSMENT

12.1 Introduction

12.1.1 According to EIA Study Brief Section 3.4.12 and Appendix H, the cultural heritage impact assessment (CHIA) shall be carried out within the Study Area which is limited to a distance of 200 metres from the site boundary of the Project and associated works. The location of the Project and the extent of the Study Area is shown in **Figure 12-1-1**. There are CHIAs reported in previously approved EIA reports. The current CHIA reviews previous assessments and provides an updated cultural heritage impact assessment, including an archaeological impact assessment.

12.1.2 This CHIA will review relevant findings of CHIA in approved EIA reports, including:

- EIA Report for Kai Tak Development (Register No.: AEIAR-130/2009) (EIA Report KTD)
- EIA Report for Shatin to Central Link (SCL) – Tai Wai to Hung Hom Section (Register No.: AEIAR-167/2012) (EIA Report SCL)

12.1.3 At present, there are unearthed Lung Tsun Stone Bridge Remnants and archaeological features found at To Kwa Wan Station of SCL.

12.1.4 An updated cultural heritage impact assessment will be performed, following the criteria and guidelines for evaluating and assessing the cultural heritage impact as stated in Annexes 10 and 19 of the Technical Memorandum (TM) of Environmental Impact Assessment Ordinance (EIAO).

12.1.5 The Archaeological Review is carried out by Archaeologist, Mr. Yeung Chun Tong, whose CV is included in **Appendix 12A**.

12.2 Methodology

12.2.1 The methodology of this CHIA is prepared according to EIA Study Brief 3.4.12 and Appendix H and Annexes 10 and 19 of the TM.

12.2.2 Desktop Study includes:

- Identification of the Study Area as shown in **Figure 12-1-1**.
- Literature review on geological and topographical records in the context of archaeological review.
- Review of historical background, including historical background from university and public libraries.
- Desktop research to identify declared and proposed monument, graded and proposed graded historical buildings or structures or sites, and Government historic sites identified by Antiquities and Monuments Office (AMO) within the Study Area.
- Review approved EIA Report KTD and EIA Report SCL according to EIA Study Brief 3.4.12.1 in the context of cultural heritage impacts with particular attention given to the unearthed Lung Tsun Stone Bridge Remnants and archaeological features found at To Kwa Wan Station of SCL.
- Perform historical review of the Study Area and the area in the vicinity.

12.2.3 Based on the above reviews, the requirement on whether further field evaluation as stated in Appendix H of the EIA Study Brief is assessed. In the case when field evaluation is required, such field evaluation shall be performed according to Appendix H of the EIA Study Brief, otherwise, any archaeological impacts caused by the Project will be assessed based on the desktop study.

12.3 Desktop Study

Geological Background

12.3.1 Based on the Agreement No. 9AT 034 – Provision of Consultancy Services to facilitate the preparation of the Technical Feasibility Statement and carry out related studies for the Multi-purpose Stadium Complex at Kai Tak Kowloon City District (AECOM 2010), the superficial geology of the Project Site Area is mainly fill under Holocene of Quaternary group.

12.3.2 A review of previous Ground Investigation (GI) reports undertaken at or in the vicinity of the Project Area was conducted by AECOM to obtain available information about the geological condition around the Project Area. Based on the findings by AECOM, AECOM states that "*The general geological sequence around the MPSC Project Area was fill, marine deposit, alluvium and medium grained granite of varying weathering grades.*" No archaeological like relics were reported in the GI Reports. The GI locations is included in **Appendix 12C1** and the geological map covering Hong Kong Island and Kowloon is included in **Appendix 12C2**.

12.3.3 In terms of geology, based on the Further Archaeological Excavation Report of Kai Tak Development Engineering Study cum Design and Construction of Advance Works – Investigation, Design and Construction (AECOM 2009), the Report states that "*The study area, which were formerly the shallow coastal waters of Kowloon Bay, is mainly composed of 20th century reclamation fill over marine mud and sand. However, around the periphery of the study area, in particular along its north edges, the areas are mapped as alluvium. Such fertile sediments were invariably targeted by people in the past for agriculture and settlement.*" The Report also states that "*The marine silty sand of Hang Hau Formation of Holocence is identified as the superficial stratum of Kowloon Bay seabed. The Lung Tsun Stone Bridge and the Former Kowloon City Pier are founded on the layers of marine silty sand and reclamation fill soil.*"

Historical Background

12.3.4 A review of the *historical* map of Hong Kong and aerial photographs covering the Project Area has been undertaken. Based on the overlay of 1904 Survey Plan and the Project Site Plan, see **Figure 12-3-1**, the location of the Project Area would be at sea. Comparing **Figure 12-3-1** and **Figure 12-3-2**, part of the Project Site was reclaimed during construction of Kai Tak Runway prior to 1963. Based on the aerial photographs reviewed, see **Figure 12-3-2** and **Figure 12-3-3**, about 50% of the Project Area was reclaimed between 1963 and 1972.

12.3.5 Based on the information obtained from Civil Aviation Department (CAD) website, CAD states that "*The Hong Kong Government approved a master plan for airport development in 1954. In 1958, a new runway was constructed on a promontory into Kowloon Bay. The name Hong Kong International Airport was officially adopted for Kai Tak Airport. In 1962, a passenger terminal building was built.*" The master plan for the development of Kai Tak Airport is shown in **Appendix 12B**. **Figure 12-3-2** is an aerial photograph showing the Kai Tak Airport in 1963.

12.3.6 CAD states that "*In 1976, the Hong Kong Air Cargo Terminal was opened. In 1981, Stage 4 development of the passenger terminal building was completed. The Stage 5 development of the terminal was commenced in 1984 and completed in 1988.*" **Figure 12-3-4** is an aerial photograph showing the Kai Tak Airport in 1988.

12.3.7 The new airport (Chek Lap Kok Airport) officially opened on 6 July 1998 and Kai Tak Airport was subsequently closed**. Figure 12-3-5** is an aerial photograph showing the area of Old Kai Tak Airport on October 1998, which shows that the Old Kai Tak Airport was already closed.

12.3.8 The passenger terminal of the Old Kai Tak Airport was later used for government offices, automobile dealerships and showrooms, car parks, sand depot, concrete plant, a go-kart racecourse, a bowling alley, a snooker hall, a golf range and other recreational facilities. **Figure 12-3-6** and **Figure 12-3-7** are aerial photographs showing the area of Old Kai Tak Airport on July 2000 and January 2014 respectively.

Built Heritage Review

12.3.9 According to the Impact Assessment studies on cultural heritage of the approved EIA Report KTD, several built heritage were identified in Kai Tak Area as shown in **Figure 12-1-1**, including:

- Former Kai Tak Airport's two wind poles
- The airport pier
- Fire Stations A, B and C
- Seawall and the runway
- The Old Far East Flying Training School
- Sung Wong Toi Inscription Rock
- Fish Tail Rock and Kowloon Rock

12.3.10 Subsequently, remnants of Lung Tsun Stone Bridge were discovered at North Apron area. Among these resources, heritage significance of Sung Wong Toi Inscription Rock and Lung Tsun Stone Bridge is high, and Far East Flying Training School and Fish Tail Rock are moderate, appropriate protective measures are needed. The heritage significance for other resources is low and no mitigation is required. No heritage resource is located within the Project Site.

Archaeological Review

12.3.11 The archaeological background based on the EIA Report KTD is cited that "*The majority of the Study Area consists of land reclaimed for expansions of the former Kai Tak Airport and has no archaeological potential, however, historical research has indicated Kai Tak Area once contained historically significant structures and sites, specifically, the Lung Tsun Stone Bridge and Sacred Hill.*"

12.3.12 Historically significant structures and sites in Kai Tak Area are listed below:

- Lung Tsun Stone Bridge (**Figure 12-1-1**)

  (a) KTD EIA Report states that "*Lung Tsun Stone Bridge was built in 1873. The construction works of the Lung Tsun Stone Bridge (pier) was commenced in 1873 and completed in 1875. The Lung Tsun Stone Bridge was later modified and extended in phases until 1910. The Bridge was given a new name, the Kowloon City Pier, upon completion of the final extension works in the early 1920s.*"

  (b) With reference to the approved EIA Report SCL, the EIA Report states that "*Lung Tsun Stone Bridge was a landing pier built in 1873-1875. The pier linked the east gate of Kowloon Walled City with the coastline. The stone bridge was subsequently buried underground during the Kai Tak reclamation in 1924. Archaeological works in 2003 for Kai Tak Development did not find the bridge but in a subsequent development EIA work, a follow-up archaeological investigation in 2008 had revealed part of the Bridge and the Former Kowloon City Pier.*"

  (c) According to the Conservation Management Plan (CMP) for the Site of Lung Tsun Stone Bridge prepared by the Antiquities and Monuments Office (AMO) in 2009, the remains of the Lung Tsun Stone Bridge are classified as archaeological features of high significance and a set of conservation guidelines, based on charters and principles is proposed as a framework to guide the conservation, management, maintenance and interpretation of the remnants in future.

  (d) EIA Report SCL states that "*The 1924 reclamation seawall marked the coastline at that time. Part of the first phase Lung Tsun Stone Bridge was buried by reclamation in 1924 behind the seawall. The landing steps of the 1924 seawall were located at approximately by 130 metres east of the Bridge.*"

- Former Kowloon City Pier

  - EIA Report SCL states that "*Former Kowloon City Pier was constructed in 1930. The southern section of the Lung Tsun Stone Bridge and the Former Kowloon City Pier were likely demolished and buried in reclamation during the Japanese Occupation (1941-1945). Two supporting concrete pillars of the Former Kowloon City Pier were exposed in 2008 archaeological excavation.*" According to the Conservation Management Plan for the Site of Lung Tsun Stone Bridge prepared by the Antiquities and Monuments Office (AMO) in 2009, the broken concrete supporting pillars and landing steps of the Former Kowloon City Pier are classified as archaeological features of medium significance.

- Site of the Former Sacred Hill (see **Figure 12-1-1**)
    - SCL EIA Report states *that* "*This site is most famously associated with the last* emperor *of the Song Dynasty, who fled south from the invading Mongol Army in the Late 13th Century. The stay of the Song Court in Kowloon City for the five months of the summer and autumn of 1277 is an important historical event, and the Sung Wong Toi was the central local memorial of that stay.*"
    - KTD EIA Report concludes that Sacred Hill remained a significant cultural site before it was destroyed in part during the Japanese Occupation in 1942 for use as reclamation fill for the runway extension at Kai Tak. KTD EIA Report also concludes that no evidence of the hill remains.
- Sacred Hill (North) Area (see **Figure 12-1-1**)
    - SCL EIA Report states that "*An area north of Sacred Hill was excavated and revealed a large assemblage of Song Dynasty pottery. Findings strongly suggested that inhabitant existed in Kowloon City area from Song to Yuen Dynasty.*"

12.3.13 With reference to the approved EIA Report SCL, known archaeological sites, covering the planned To Kwa Wan Station, were identified in Sacred Hill (North) area. Though the nearest archaeological site boundary identified in EIA Report SCL is within 200 metres from the Project Boundary, this archaeological site is being studied according to EIA Report SCL, under the obligation of the Project Promoter of SCL, MTR Corporation Ltd. An archaeological survey-cum-excavation and additional investigation was recommended. Such archaeological survey-cum-excavation and additional investigation was carried out by Environmental Resources Management (ERM) for the SCL Work Contractor. The Interim Archaeological Survey cum-Excavation and Additional Investigation Report (ERM 2014) (hereinafter called the ERM Interim Report) is provided in the AMO website.

12.3.14 The scope of the assessment area in the Interim Report of archaeological survey-cum-excavation and additional investigation is defined in **Figure 12-3-8** which presents the Study Area of Sacred Hill (North) for archaeological survey-cum-excavation and additional investigation (hereafter referred to as "the Site"). The ERM Interim Report states that "*The Site is situated in the Sacred Hill (North) Study Area at the former Kai Tak airport located east of Olympic Avenue and north of Sung Wong Toi Road.*"

12.3.15 In terms of geology, the ERM Interim Report states that "*The Site is mainly located on alluvium soil except the southeast part of the Site was the sea area containing marine sand.*"

12.3.16 For the historical background, the ERM Interim Report states that "*The Site area was mainly agricultural fields with scattered houses by the coast. Reclamation works at the Sacred Hill area was implemented in the 1930s. Throughout the years between 1924 and 1939, the area around the Site had been reclaimed. During the Japanese occupation between 1941 and 1945, the Sacred Hill area and the Site were converted* *to airport. Buildings and streets established in the 1920 to 1930s at the Site area were demolished and a drainage nullah was built. In the 1960s, the Site area was modified and the nullah cutting across the western part of the Site was filled to make way for construction of the new airport runway.*"

12.3.17 For the archaeological background, the ERM Interim Report states that "*The key archaeological works previously conducted in the areas adjacent to the Site* (as summarized in **Table 12-1**) *suggest that the Site area has archaeological potential.*"

Table 12-1 Key Findings of Previous Archaeological Works (Extracted from Interim Report of an Archaeological Survey-cum-excavation and Additional Investigation in Sacred Hill (North) Area)

Archaeological Works (Year)	Description
1918 and 1937	Mr. W. Schofield conducted the first archaeological investigation between 1918 and 1937, in which pre-Han wares and Tang to Song dynasties deposits were discovered on shores of the Sacred Hill (ERM 2011).
2002 – 2003	Based on the archaeological investigation for the *South East Kowloon Development, Site Investigation at North Apron of Kai Tak Airport* (ERM 2003), a celadon bowl rim dated to the Song Dynasty was discovered in a safety island of Olympic Avenue (ERM 2003).
2008	According to Kai Tak EIA Report, an archaeological impact assessment was conducted including an archaeological excavation at an area north of Sacred Hill. A large number of celadon and white ceramic shards dated to the Sung-Yuan Dynasties were unearthed (Archaeological Assessments Ltd. 2008).
2009	An archaeological survey was conducted in 2009 under the *Sewage Interception Scheme in Kowloon City – Investigation* via the Drainage Services Department to examine the archaeological potential of the proposed work area of the pumping stations, namely pumping station no. 1 (SPS1) and no. 2 (SPS2). The survey discovered a total of 51 pieces of historic pottery fragments in an excavation area of 600 m^2 (ENSR 2009).
2009 – 2010	An archaeological survey-cum-rescue excavation for a pumping station was undertaken to salvage the archaeological materials as part of the Sacred Hill (North) Study Area from October 2009 to July 2010. A large quantity of pottery and porcelain shards dating back to Song-Yuan Dynasties. Findings strongly suggested that inhabitant existed in Kowloon City area from the Song-Yuan Dynasties (ERM 2011).

12.3.18 The key findings of the archaeological survey in the ERM Interim Report are as follows.

12.3.19 The ERM Interim Report states that "*Carbon granules, brick fragments, small stones, iron nails, glasses, porcelain shards and pottery shards, which can be dated from the Late Qing Dynasty to the Republic of China period, were found at the north portion of the Site. A large quantity of porcelain shards, pottery shards and tile fragments, which can be dated to the Song-Yuan Dynasties, were found at the north, northwest and northeast portion of the Site. A large quantity of carbon granules, porcelain shards and pottery shards, which can be dated to the Song-Yuan Dynasties, were found at the west portion of the Site. A large quantity of porcelain shards and pottery shards, which can be dated to the Song-Yuan Dynasties, were found at the middle portion of the Site.*"

12.3.20 The ERM Interim Report also states that "*Archaeological features identified from the Site comprise stone built wall structures, pond features, garbage pit features, ceramic shards, coins, metal fragments, a few pieces of human bone fragments, wood pieces, etc. As most of the ceramic shards identified are of poor quality and with sign of being used, it is reasonable to speculate that they are mainly the remains of household utensils of the ordinary families living within the Site or in the close proximity.*"

12.3.21 The ERM Interim Report states that "*The findings of the Site provided information on the past history of the Site and in the proximity. A large quantity of ceramic shards, including a large amount of poor quality ceramic shards and a small amount of high quality ceramic shards, were unearthed from the Site and most of them showed signs of being used which reflected that there were people living within the Site or in the proximity as early as Song-Yuan Dynasties. The presence of Song-Yuan Dynasties building features in the Site provided further evidence to confirm this.*" However, the ERM Interim Report states that "*It was also found that the southern portion of the Site was the coastal area before reclamation with no archaeological deposit.*"

Findings

12.3.22 No declared monument is within the Project Site Boundary or the Study Area after examining total 114 items in the list of Declared Monuments in Hong Kong (as at 20 May 2016).

12.3.23 No government historic sites is within the Project Site Boundary or the Study Area after examining total 13 items in the Government Historic Sites Identified by AMO (as at 10 November 2010).

12.3.24 No graded historic buildings is within the Project Site Boundary or the Study Area after examining the List of the 1,444 Historic Buildings in Building Assessment (as at 20 May 2016).

12.3.25 Based on the above desktop study, Built Heritage Impact Assessment is not required as there is no built heritage within the Study Area of the Project and associated works.

12.3.26 One site of archaeological interest, Lung Tsun Stone Bridge, is identified within the Study Area, see **Figure 12-1-1**. Lung Tsun Stone Bridge was included in the List of Sites of Archaeological Interest in Hong Kong (as at November 2012). The remains of Lung Tsun Stone Bridge are classified as archaeological features of high significance. The CMP gives an overall assessment with levels of significance. It concluded that the remnants of original Lung Tsun Stone Bridge shall be preserved in-situ. The Site shall be properly conserved, maintained, interpreted and presented its heritage values and significance. No speculative recreation or excessive intervention would be allowed at the Site in accordance with the widely accepted conservation principles and guidelines. The CMP recognizes that heritage aspects of the Site must be balanced with other aspects such as use, financial constraints, and any future needs of KTD. The Conservation Guidelines of this CMP are a series of statements of what should and what should not be done to the Site.

12.3.27 Review of EIA Report KTD and EIA Report SCL reveals that the 1924 reclamation seawall, the Former Kowloon City Pier, Site of Former Sacred Hill, and Sacred Hill (North) Area, lie within a narrow strip on the north and east boundary of the CHIA Study Area. The heritage significance of 1924 reclamation seawall and Former Kowloon City Pier have been studied and documented in the Conversation Management Plan (CMP) for the Site of Lung Tsun Stone Bridge by the AMO. CMP includes a set of conservation guidelines to guide the conservation, management, maintenance and interpretation of remnants for the future of the site and CMP recommended original remnants of Lung Tsun Stone Bridge should be preserved in-situ with no excessive intervention allowed at the burial of the original Bridge's remnants.

12.3.28 As archaeological survey-cum-excavation and additional investigation for Sacred Hill (North Area) was carried out by ERM for the SCL Work Contractor, stating that the southern part of the surveyed area was the coastal area before reclamation as discussed in **Section 12.3.21**. No further field excavation for the Site of Former Sacred Hill is required as EIA Report KTD concludes that no evidence of the hill remain.

12.4 Historical Review

Preamble

12.4.1 Kai Tak Airport was *situated* at Kowloon East sea front, looking west to To Kwa Wan, adjacent to Kowloon City, Ma Tau Wai, crossing over to San Po Kong, Kowloon Bay, Ngau Tau Kok, Kwun Tong, and extending to Lei Yue Mun as well as other districts in the east.

12.4.2 From the historical perspective, Kai Tak Airport was the air traffic point linking Hong Kong with the rest of the world. On account of this, tourism, transportation, commerce, academic and cultural interflow were extensively developed, rendering Hong Kong a mega city in Asia.

12.4.3 Kai Tak Airport in Kowloon East was created by reclaiming land. Broadly speaking, the reclamation covered the entire Kowloon Bay area. Hence, without reclamation, there would be no airport either. It had to be said though that even without air traffic, the Bay area would still be an important traffic artery to the outside world and hub of Hong Kong politics and economy.

Economic Development

Salt Industry

12.4.4 Previously, Kowloon Bay area was called Kwun Fu, taking after the hill of the same name. Area bordering the sea was ideal for producing sea salt. As early as the Song Period (960-1279), officials controlled the salt fields, mining them as a government asset. Salt, indispensable in daily life, was managed by officials who set the salt price and amassed considerable revenue. As salt fields in Kwun Fu were under the local government, officials were put in charge, responsible for the production of sea salt, taxation, transportation and trade. Soldiers were also stationed. The Rock Inscription at Joss House Bay, Sai Kung, recorded accounts about officials in charge of the Kwun Fu salt fields. This Rock Inscription which is located at the back of Tin Hau Temple is a declared monument according to AMO website.

12.4.5 Near the end of the Song Period, Mongolians invaded south as far as Guangdong province, to decimate the teetering Song Dynasty. The last Song emperors, Zheng and Bing, retreated to Kwun Fu to take refuge because of the presence of officials and soldiers. Today, “Sung Wong Toi Monument” commemorates this particular event. Emperor Zheng died of sickness in Lantau and was succeeded by his younger brother Emperor Bing. Soon, neither he could escape from the ill fate. In order to avoid the Mongolian soldiers’ pursuit, legend has it that Song Official Lu Xiu Fu piggy-backed Emperor Bing to the Pearl Estuary where both drowned in suicide.

12.4.6 Hong Kong then was not called such and historically it found itself surprisingly as the last base of the Song Dynasty. This should be counted as evidence that Kwun Fu had a sound economic foundation.

12.4.7 Existence of salt fields meant attracting workers to bake and make salt. They and their families congregated, forming large and small villages. This provided the impetus for industry, farming, and trade to grow. Hence, the early stage of Hong Kong societal development should date from East Kowloon in the Song Period.

12.4.8 The present building of underground rail in Kowloon City has uncovered relics of homes, wells and pottery pieces pertaining to the Song (960-1279) and Yuan (1271-1368) Periods. It was obvious that wells were dug at the time to provide water for living. Wells found in Kowloon City prove that the location was highly populated during the Song Period.

12.4.9 Salt making in Kwun Fu continued in the Yuan Period. During the Ming Period (1368-1644), Hong Kong was part of Guangzhou’s Dongguan district. The official in charge carried the title of “Kwun Fu Inspecting Magistrate”. His office was called “Kwun Fu Quarters”, situated in Kowloon City. The name “Kwun Fu” remained, representing the then Hong Kong.

12.4.10 In the Qing Period (1644-1911), because of political unrest, salt fields lay fallow and workers dispersed. Subsequently government decided to open the salt trade to the public and this led to the birth of wealthy salt dealers.

12.4.11 Salt traders in Guangdong depended on the sea route to transport the sea salt from its production site to various cities. Powerful pirates along China’s south-east coastline often robbed passing ships. During Jiaqing reign (1796-1820) of the Qing Period, the infamous pirate Cheung Po Tsai was active around Hong Kong with his base in Lei Yue Mun. His activity gravely endangered sea transport of salt and rice. The Qing government tried to eliminate the pirates, and finally in Jiaqing 15th Year (1810), Cheung Po Tsai surrendered.

12.4.12 Trading ships inevitably passed by the temple east of Kwun Fu and this defined the spot where the Song Dynasty set up customs to levy tax. East Kowloon became the sea route artery in the Song Period.

12.4.13 During Shunzhi 18th Year of the Qing Period (1661), to preclude collusion between residents and Taiwan's Zheng Cheng Gong, government ordered residents along the seacoast to move fifty miles inland. This impacted adversely on the further development of Kwun Fu and its vicinity. During Kangxi 8th Year (1669), Kwun Fu inspecting magistrate was reinstated, resuming control of the seacoast. During Yongzheng 1st Year (1723), a cannon podium was built in Tung Lung Island to strengthen sea traffic safety. During Jiaqing 15th Year (1810), the cannon podium was moved to Kowloon Bay. Thereafter the significance of Kowloon Bay was enhanced and the title of the official in charge was renamed "Kowloon inspecting magistrate".

12.4.14 During Daoguang 26th Year (1846), Kowloon inspecting magistrate recommended to the Royal Court the building of a Kowloon Walled City for defence which was completed in the following year (1847). Within the walled city, cannon was installed, soldiers stationed, and offices set up to take charge of administration and tax affairs.

12.4.15 In essence, cannon installation was to safeguard sea traffic, and prevent pirate robbery in relation to the busy sea traffic. Customs and excise were instituted to assure government revenue vis-à-vis prosperous sea transport. Building the walled city was testament to reinforcing military defence and sea customs.

Stone Quarry Industry

12.4.16 Indubitably, early Hong Kong residents were fishermen. Then salt fields developed in Kwun Fu. In tandem with the salt business was mining stones, i.e. excavating hills, and refining rocks for building purposes.

12.4.17 Stone quarries in Hong Kong Island were located in Shau Kei Wan while those in Kowloon were along Kowloon Bay. Villagers in Lei Yue Mun, Ngau Tau Kok, Sai Tso Wan and Cha Kwo Ling in East Kowloon worked in the stone quarries. At the time, portion of the stones mined was retained for internal consumption, while the rest was shipped as commodities from Hong Kong to other areas.

Cultural Development

12.4.18 Fishing as livelihood was the oldest form of activity in Hong Kong. It dated back to the New Stone Age. To avoid typhoons, fishermen stayed within bay areas. As typhoons generally landed on Hong Kong east in summer, fishing villages concentrated in Hong Kong west. Since Kowloon Bay is situated in Hong Kong east unsheltered by mountains, it was not ideal as a fishing port.

12.4.19 However, from the Song Period, with Kowloon Bay becoming a business area for salt and stone mines, more people congregated. Some fishermen naturally selected the bay area for their boats to anchor. Consequently East Kowloon was also influenced by fisherman culture.

12.4.20 Judging from fishermen's belief, certain unique culture was revealed. Their life at sea was dangerous and they sought protection from water and sea spirits to dispel disaster but garner good fortune. Kowloon Bay residents did not deviate from this traditional culture which was clearly illustrated through conservation of ancient temples in this district.

12.4.21 In Daoism, North Emperor (Pak Tai) a.k.a. Zhen Wu Di, celestial spirit ruling the North, was classified as water within the five elements of gold, wood, water, fire, and earth. It was therefore worshipped as the water spirit. In the vicinity of To Kwa Wan's Hok Yuen Kok was built a temple for North Emperor in Guangxu of the Qing Period (1876). The current temple was built in 1929. The North Emperor temple was not erected exclusively for fishermen, and the water spirit North Emperor was worshipped also by residents of the district.

12.4.22 Heaven Empress Tin Hau was the most revered celestial spirit by the fishermen. She was the guardian spirit of the seas and was addressed as "Ma Zu", meaning motherly care of children. A temple for Heaven Empress was built in Guangxu 11th Year of the Qing Period (1885) at Ha Heung Road in To Kwa Wan.

12.4.23 Additionally, a temple called "Hoi Sham Miu" dedicated to Lung Mu (dragon mother) was located on a small island in To Kwa Wan bay. According to legend, the dragon spirit lived in the sea. It was later humanized to become the dragon king of the sea. Hence fishermen hoped to have his protection. Dragon mother was originally an ordinary mortal. It was reported that she brought up the little dragon to maturity. This explained why she was worshipped as dragon mother. Hence dragon mother was respected in the sea world, and trusted to have the power to uphold safety at sea. Since she looked after little dragon, she was deemed to be able to protect children as well. Therefore by worshipping dragon mother, it also meant caring of women and children.

12.4.24 In 1964, Hoi Sham Temple was demolished. To carry on the unique traditional belief, the original Lung Mu statute was moved to the temple for Heaven Empress in Ha Heung Road in To Kwa Wan.

12.4.25 Another celestial spirit worshipped by fishermen was Tam Kung who apparently could predict weather, a skill most helpful for fishing out at sea. Hence it was popular in Hong Kong to worship him. Tam Kung was originally a celestial spirit from Huizhou in Guangdong. This belief in Tam Kung was introduced to Hong Kong to which Huizhou residents migrated. Huizhou people were not fishermen; they specialized in breaking stones. So, apart from being welcomed by Hong Kong fishermen, Tam Kung was also regarded as a protection spirit by the stone workers of Huizhou.

12.4.26 Although no temple for Tam Kung could be found in East Kowloon, the one across the harbour at Shau Kei Wan was a good illustration of the dual-purpose belief. The temple was built in Guangxu 31st year of the Qing Period (1905). Shau Kei Wan was once a reputed fishing village, with a stone quarry nearby. Fishermen and stone workers all sought Tam Kung's protection in this temple.

12.4.27 Lei Yue Mun in East Kowloon was not a typhoon shelter. Residents there came mainly from Meixian and Huizhou in Guangdong. They also worked in the nearby stone quarry. However, unlike their counterparts in Shau kei Wan across the sea, they chose the most popular female spirit to worship and built for her another Heaven Empress temple in Lei Yue Mun.

12.4.28 Similar situation occurred in Kowloon City's Nga Tsin Wai, a Hakka village surrounded by a wall for protection against robbers. The wall was erected by migrating Hakkas in the 16th century, Ming Period. Today, the structure in Nga Tsin Wai was built in the 18th century Qing Period after the repeal of the sea ban. Prior to setting up the Kowloon City Quarters, this walled village was regarded as an ancient district. That was why it was called "Kowloon Old City". "Nga Tsin" means in front of the official's office. Hence the area around Ngam Chin Wai used to be the government administration centre where the office for the "Kwun Fu inspecting magistrate" was located. Generally, a Hakka walled village was occupied exclusively by one clan. Nga Tsin Wai was different in that it accommodated residents of three clans: Ng, Chan, and Li. For this reason, it was inappropriate for the walled village to build an ancestral temple for one clan only. Instead, by applying the fishermen's belief, a temple for Heaven Empress was built, substituting ancestors' protection by that of the Heaven Empress.

12.4.29 Hau Wong temple located at Kowloon City's Junction Road was built in Yongzheng 8th Year of the Qing Period (1730). It commemorated a Song emperor's uncle Yang Liang Jie. He protected Emperors Zheng and Bing in their retreat to Kowloon. His loyalty was praised by the residents. Hau Wong temple and Sung Wong Toi Monument held the same message of commendation, reflecting the deep affection Kowloon City had for the Song Dynasty. It also indicated that many residents of this area were descendants of the refugees who came south, and who continued in Hong Kong the Chinese culture of the North.

Population Development

12.4.30 The early salt industry and later the stone quarry trade demonstrated the economic value of Kowloon Bay area. Setting up government offices emphasised the political focus. Cannon installation pointed to the military base. Pirates' existence was related to sea traffic. All these explained why the area was populated, signifying conditions conducive for living.

12.4.31 After the Xin Hai Revolution in 1911, there was a surge of Chinese refugees migrating to Hong Kong, causing a housing shortage. At the start of 1914, Mr. Ho Kai and Mr Au Tak formed The Kai Tack Land Investment Company Limited, with the objective of solving the housing problem. The company applied to the Hong Kong government to reclaim the sea of the Kowloon Bay to make land for house construction.

12.4.32 Sea reclamation proceeded in three stages. The first commenced in 1916 and the second was completed in 1927. At this point, on account of economic recession and poor financial administration, Kai Tack Company verged on bankruptcy. The Hong Kong Government bought the reclaimed land for $1 million to establish an air force military base. Later, it invested $2.7 million to continue the third stage of reclamation completed in 1930.

12.4.33 In early 1920, the Kowloon Bay reclaimed land was called "Kai Tak Reclamation" or "Kai Tak Waterfront". Thereafter, "Kai Tak" became the name for the newly developed area. Although there was this vast piece of land in Kowloon Bay, it was ultimately not utilised for residential purposes. Instead a huge international airport was established.

12.4.34 Kai Tak history was less than a hundred years. However, its surrounding areas held the oldest politics, economy, and transportation history in Kowloon. Kai Tak was a very important airport for Hong Kong. Today the salt fields, stone quarries, and Kowloon Walled City are history.

Observations

12.4.35 As relics of homes, wells and pottery pieces pertaining to the Song (960 – 1279) and Yuan (1271 – 1368) Periods have been uncovered during the development of underground rail in Kowloon City, there is a need to know more about the past of Kai Tak and its neighbourhood in order to preserve these valuable memories.

12.4.36 The cruise pier is already in operation. When the Project opens, it will promote more human flow into Kowloon City area. The former Kwun Fu will be alive again with a new look. Government should grasp the opportunity to exhibit the history about Kowloon Bay area. The future Lung Tsun Stone Bridge Preservation Corridor and Sung Wong Toi Park will be public open space within which space could be allocated for an exhibition hall to display related cultural materials, files, sketches and photos for the promotion of education in this field. Citizens will be able to not only watch sports and cultural activities but also experience the past, present, and future development of East Kowloon. The opportunity would definitely enhance the people's affection for Hong Kong.

12.5 Impact Assessment

12.5.1 As shown on the overlay of 1904 Survey Plan and the Project Site Plan, see **Figure 12-3-1**, the Study Area is a reclaimed land and there is no archaeological deposit according to ERM Interim Report, as archaeological survey-cum-excavation and additional investigation for Sacred Hill (North Area) was carried out by ERM for the SCL Work Contractor, no separate field excavation under this CHIA is required.

12.5.2 Apart from the archaeological site mentioned in EIA Report KTD, there is no cultural heritage impact in this Project. The MPSC will not interfere with Lung Tsun Stone Bridge Site of Archaeological Interest. The distance from Lung Tsun Stone Bridge and Former Kowloon City Pier to the nearest MPSC building is about 80m, as shown on **Figure 12-1-1**. Noting that most vibrations caused by construction (e.g. piling works) and their possible impact would be insignificant beyond 50 m, the potential impact is extremely low. In case if there is any slight impact, Conservation Guideline 7 as stated in CMP shall be followed.

12.5.3 Based on the 2014 layout and 1904 map as shown in **Figures 12-5-1** and **12-5-2** respectively, the location of the proposed Kai Tak Sports Complex would be at sea. It is unlikely that ancestors have congregated at the Project Site. Hence the Project has no archaeological value.

12.5.4 The airport had been vacated and the original concomitant facilities were of no further use. Future construction would not produce problems related to conservation of cultural relics.

12.6 Recommendation

12.6.1 Built Heritage Impact Assessment is not required as there is no built heritage within the Study Area of the Project and associated works.

12.6.2 The Project will not interfere with Lung Tsun Stone Bridge Site of Archaeological Interest. The southern portion of the former Sacred Hill and the southern portion of the archaeological survey-cum-excavation area of SCL – Tai Wai to Hung Hom Section for Sacred Hill (North) fall within the CHIA Study Area. Since no archaeological deposit was discovered from the southern portion of the archaeological survey-cum-excavation at Sacred Hill (North) and these two areas fall outside the project site, no further archaeological survey-cum-excavation under this Project is required.

12.6.3 There is no significant cultural heritage impact arising from this Project and therefore no mitigation measure is required.

12.7 References

12.7.1 EIA Report of Kai Tak Development (Register No.: AEIAR-130/2009)

12.7.2 EIA Report of Shatin to Central Link (SCL) – Tai Wai to Hung Hom Section (Register No.: AEIAR-167/2012)

12.7.3 Shatin to Central Link – Tai Wai and Hung Hom Section: Archaeological Survey-cum-Excavation for Sacred Hill (North), Works Contract 1109 – Stations and Tunnels of Kowloon City Section, Interim Archaeological Survey-cum-Excavation and Additional Investigation Report (April 2014)

12.7.4 Agreement No. CE 35/2006 (CE) – Kai Tak Development Engineering Study cum Design and Construction of Advance Works – Investigation, Design and Construction, Further Archaeological Excavation Report (August 2009)

12.7.5 Piggott, Peter 1989/1990 Kai Tak: A History of Aviation in Hong Kong, Government Information Services, Government Printer, Hong Kong

12.7.6 Kai Tak Airport 1925-1998, Civil Aviation Department
http://www.cad.gov.hk/english/kaitak.html, Retrieved 5 December 2014

12.7.7 Master Plan for the Development of Kai Tak Airport, Civil Aviation Department
http://www.cad.gov.hk/english/60th_images/airport10.jpg, Retrieved 22 January 2015

12.7.8 Aerial photographs of Kai Tak Airport, Survey and Mapping Office, Lands Department

12.7.9 Declared Monuments in Hong Kong (as at 20 May 2016), Antiquities and Monuments Office

12.7.10 Government Historic Sites Identified by AMO (as at 10 November 2010), Antiquities and Monuments Office

12.7.11 List of Sites of Archaeological Interest in Hong Kong (as at November 2012), Antiquities and Monuments Office

12.7.12 List of 1,444 Historic Buildings in Building Assessment (as at 20 May 2016), Antiquities and Monuments Office

13 ENVIRONMENTAL MONITORING AND AUDIT REQUIREMENTS

13.1 Introduction

13.1.1 This chapter summarizes the findings in the EIA and evaluates the need for environmental monitoring and audit (EM&A) in construction and operational phases. The aim of this EM&A is to continuously monitor the changes of environmental parameters and the effectiveness of mitigation. This helps early identification of unacceptable environmental deterioration and allows formulation of rectification works at an early stage.

13.1.2 Methodology and requirement of monitoring work are detailed in a standalone Environmental Monitoring and Audit Manual (EM&A Manual).

13.2 Air Quality Impact

13.2.1 With implementation of dust suppression measures, no unacceptable construction air quality impact is anticipated. Regular air quality monitoring should be carried out at representative ASRs to ensure that relevant air quality standard can be met.

13.2.2 Weekly site audit should be carried out to check the implementation status of the recommended mitigation measures for air quality impact throughout the construction period.

13.2.3 Based on the modeling results, the operation of the Project is unlikely to cause exceedance of the air quality objectives at the identified ASRs for all modeled parameters except the annual average NO_2. The exceedance is mainly due to high background level and offsite air pollutant sources. No monitoring or audit is proposed.

13.3 Hazard to Life

13.3.1 As no adverse hazard to life impact is anticipated in this Project, no environmental monitoring or audit is proposed.

13.4 Noise Impact

13.4.1 Regular noise monitoring shall be carried out at representative NSRs during the construction phase to ensure that relevant noise criteria can be met and the noise mitigation measures are effective. Weekly site audit should be carried out to check the implementation status of the recommended mitigation measures for noise impact throughout the construction period.

13.4.2 During operational phase, real time noise monitoring at selected locations shall be conducted during the event in the Main Stadium in the first 3 years of operation. After the 3-year monitoring period, a review of the findings of the monitoring will be conducted to determine whether further monitoring will be required. The corresponding actions shall follow the Event and Action Plan in the EM&A Manual. The organizer should also provide a manned complaint hotline to respond to complaints from the nearby NSRs immediately.

13.5 Water Quality Impact Assessment

13.5.1 During the construction phase, no off-site marine water quality impact would be expected from the Project and there would not be any marine-based works for the proposed works Subject to the requirements in the effluent discharge licence to be issued under the Water Pollution Control Ordinance, regular water quality monitoring may be carried out at representative water discharge locations to ensure that relevant water quality standard can be met, but this is not considered necessary as no adverse construction water quality impact is expected if the mitigation measures are implemented properly.

13.5.2 Weekly site audit should be carried out to check the implementation status of the recommended mitigation measures for water quality impact throughout the construction period.

13.5.3 The sewerage and stormwater system has been designed and constructed to separate the sewage and uncontaminated surface runoff completely. Provisions shall be made to collect the contaminated surface runoff such as the use of interception system and oil and petrol interceptors. As the Project area shall be serviced by public sewers, no unacceptable water quality impact is anticipated.

13.5.4 In case when natural turf is adopted at the Main Stadium or the Public Sports Ground, the operator shall control pesticides as per Pesticides Ordinance (Cap. 133) and prepare a Stormwater Re-use Management Plan to ascertain that stormwater is properly re-used. The stormwater Re-use Management Plan will set out the proposed surface run-off monitoring locations, monitoring frequency and parameters, as well as the Event and Action Plan and mitigation measure, etc.

13.6 Sewerage and Sewage Treatment Implications

13.6.1 Based on the estimated sewage flow of the Project, and the sewerage and sewage treatment capacity in Kai Tak Development area, no adverse sewerage impact will be caused by the Project. No monitoring or audit is proposed.

13.7 Waste Management Implications

13.7.1 Construction waste includes Construction and Demolition (C&D) materials from excavation, site formation and demolition, bentonite from piling works, chemical waste from plant maintenance and general refuse. Chemical waste will be generated from maintenance of equipment. No adverse construction waste impact is expected if the mitigation measures are implemented properly.

13.7.2 The Contractor should formulate waste management measures on waste minimization, storage, handling and disposal in a Waste Management Plan as part of the Environmental Management Plan in accordance with the Environment, Transport and Works Bureau Technical Circular (Works) No. 19/2005. Weekly site audit should be carried out to check the implementation status of the recommended waste management measures throughout the construction period.

13.7.3 During the operational phase of the Project, no adverse waste impact is expected if the mitigation measures are implemented properly. No monitoring or audit is required.

13.8 Land Contamination Assessment

13.8.1 The land contamination issues in the Project Site have been reviewed and assessed. Basically, the land contamination identified in the North Apron had been cleaned up and the site is considered clean for the intended use. Also, there will be no use with potential land contamination in the Project site. Environmental monitoring in relation to land remediation is not required.

13.9 Terrestrial Ecological Impact Assessment

13.9.1 No site of conservation importance was identified in the Study Area. All identified habitats were considered to have either Low or Very Low ecological value. All habitats and fauna species, including all recorded species of conservation importance, are expected to be impacted indirectly by water quality, noise and/or dust impacts during the construction phase. Nevertheless, with proper implementation of mitigation measures, all indirect impact would only be insignificant to minor. Implementation status and the effectiveness of these measures shall be audited through regular site inspection during the construction phase.

13.9.2 In the operational phase, indirect impact would only be induced by crowd noise and traffic noise during major events. However, this will occur infrequently and therefore the impact is considered acceptable. With proper implementation of mitigation measures, residual impact is considered acceptable. No specific monitoring and audit programme is required for terrestrial ecology during the operation phase of the Project.

13.10 Landscape and Visual Impact Assessment

13.10.1 Environmental management and audit for landscape and visual resources is recommended during the design, construction and operation phases of the Project.

Design Phase

13.10.2 The landscape measures and lighting mitigation measures proposed to mitigate the landscape, visual and glare impacts of the scheme should be embodied into the detailed landscape and engineering design specifications, drawings and contract documents. The design phase EM&A requirements for landscape and visual resources comprise the audit of detailed landscape works specifications to be prepared during the detailed design stage together with ensuring that the design is sensitive to landscape and visual impacts and that landscape resources are retained as far as practicable. In the event of a non-conformity, the Event and Action Plan provided in the EM&A Manual shall be followed.

Construction & Operational Phases

13.10.3 Prior to commencement of the main construction contract, a specialist landscape contractor should be employed by the Project Proponent in order to facilitate the advance preparation and relocation of any trees in conflict with the proposed works. A specialist landscape sub-contractor should be employed by the works contractor for the implementation of further soft landscape works and subsequent maintenance operations during the establishment period.

13.10.4 All measures undertaken by the works and landscape contractors shall be audited by a Registered Landscape Architect, as a member of the Environmental Team (ET), on a regular basis to ensure compliance with the intended aims of the measures. In the event of a non-conformity, the Event and Action Plan provided in the EM&A Manual shall be followed.

13.11 Cultural Heritage Impact Assessment

13.11.1 No EM&A requirements are required during the construction and operation phases of the proposed works as there are no adverse impacts on known sites of archaeological interest, potential areas of archaeological interest or built heritage.

14 IMPLEMENTATION SCHEDULE OF MITIGATION MEASURES

14.1 Introduction

14.1.1 This chapter presents the implementation schedule of mitigation measures for the project. **Table 14.1** (also contained in Appendix A of the EM&A Manual) summarizes the details of the recommended mitigation measures for all works areas. For each recommended mitigation measures, both the location and timing for the measure have clearly been identified as well as the parties responsible for implementing the measure and for maintenance (where applicable).

Table 14.1 Environment Mitigation Implementation Schedule

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location/Duration of measures/ Timing of completion of measures	Implementation Agent	Implementation Stage **				Relevant Legislation & Guidelines
					Des	C	O	Dec	
Air Quality									
3.7	A1	Good housekeeping to minimize dust generation, e.g. by properly handling and storing dusty materials	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A2	Store cement in shelter with 3 sides and the top covered by impervious materials if the stack exceeds 20 bags	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A3	Cement delivered in bulk should be stored in a closed silo fitted with an audible high level alarm which is interlocked with the material filling line and no overfilling is allowed	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A4	Loading, unloading, transfer, handling or storage of bulk cement should be carried out in a totally enclosed system or facility, and any vent or exhaust should be fitted with an effective fabric filter or equivalent air pollution control system	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A5	Dusty materials (e.g. debris) should be wetted by misting / water-spraying before any loading, unloading, transfer or transport operation	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A6	Any skip hoist for material transport should be fully enclosed by impervious sheeting	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A7	Surfaces where any pneumatic or power-driven drilling, cutting, polishing or other mechanical breaking operation takes place should be sprayed with water or a dust suppression chemical continuously	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A8	Any area that involves demolition activities should be sprayed with water or a dust suppression chemical immediately prior to, during and immediately after the activities to maintain the entire surface wet	Whole construction site	Contractor		✓			EIAO-TM, APCO

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location/Duration of measures/ Timing of completion of measures	Implementation Agent	Implementation Stage **				Relevant Legislation & Guidelines
					Des	C	O	Dec	
3.7	A9	Excavation area should be minimized as far as possible	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A10	Stockpile of dusty materials should not be extended beyond the pedestrian barriers, fencing or traffic cones	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A11	Excavated or stockpile of dusty material should be covered entirely by impervious sheeting or sprayed with water to maintain the entire surface wet, and then removed, backfilled or reinstated where practicable within 24 hours of the excavation or unloading	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A12	Dusty materials remaining after a stockpile is removed should be wetted with water and cleared from the surface of roads	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A13	Properly fitted side and tail boards are necessary for any vehicle with open load area	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A14	While transporting materials that potentially create dust (e.g. debris), materials should not be loaded higher than side and tail boards, and should be fully covered by tarpaulin or similar materials which extent at least 300 mm over the edges of the side and tail boards to prevent leakage.	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A15	Limit the maximum vehicle speed within the site to 10km/hr	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A16	Haulage and delivery vehicles should be confined to designated roads	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A17	Every main haul road should either be: 1.) paved with concrete and kept clear of dusty materials, or 2.) sprayed or watered to maintain the entire road surface wet	Whole construction site	Contractor		✓			EIAO-TM, APCO

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location/Duration of measures/ Timing of completion of measures	Implementation Agent	Implementation Stage **				Relevant Legislation & Guidelines
					Des	C	O	Dec	
3.7	A18	All on-site unpaved roads should be compacted and kept free of lose materials as possible	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A19	Provide vehicle washing (e.g. wheel washing bay & high pressure water jet where practicable) at every vehicle exit point for cleaning vehicle body and wheels	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A20	The vehicle washing area and the road between washing area and site exit should be paved with concrete, bituminous or other hardcores	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A21	The portion of any road leading only to construction site that is within 30m of a vehicle entrance or exit should be kept clear of dusty materials	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A22	Dusty materials on every vehicle's body and wheels should be removed in washing area before leaving the site	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A23	Regular maintenance of all plant equipment	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A24	Throttle down or switch off unused machines or machine in intermittent use	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A25	If the site is adjacent to area where accessible to the public (e.g. road and service lane etc.), hoarding of not less than 2.4 m high from ground level should be erected along the adjoining the entire length of that portion of the site boundary, except for a site entrance or exit. The hoarding should be well maintained throughout the construction period.	Whole construction site	Contractor		✓			EIAO-TM, APCO

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location/Duration of measures/ Timing of completion of measures	Implementation Agent	Implementation Stage **				Relevant Legislation & Guidelines
					Des	C	O	Dec	
3.7	A26	Where a scaffolding is erected around the perimeter of a building under construction, effective dust screens, sheeting or netting should be provided to enclose the scaffolding from the ground floor level of the building, or a canopy should be provided from the first floor level up to the highest level of the scaffolding	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A27	Exposed earth should be properly treated by compaction, turfing, hydroseeding, vegetation planting or sealing with latex, vinyl, bitumen, shortcrete or other suitable surface stabiliser within six months after the last construction activity on the construction site or part of the construction site where the exposed earth lies	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A28	Carry out air quality monitoring throughout the construction period	Selected representative monitoring stations	Contractor		✓			EIAO-TM
3.7	A29	Carry out weekly site inspection to audit the implementation of mitigation measures	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.7	A30	Regular watering once per hour on exposed worksites and haul road with an equivalent intensity of not less than $1.3L/m^3$ to achieve 91.7% dust removal efficiency.	Whole construction site	Contractor		✓			EIAO-TM, APCO
3.8	A31	Locate air intake point of hotel outside the exceedance zone of air pollutant NO_2 (at least 5m above ground).	Parking spaces of MPSC	Future operator			✓		EIAO-TM, APCO
3.8	A32	Adopt the lower limits of parking provisions for retail area, office and hotel in the HKPSG as far as practicable to discourage use of cars. The car parking for coaches, goods vehicles and working/services/emergency vehicles should be less than 300.	Parking spaces of MPSC	Project Proponent/ Contractor	✓				EIAO-TM, APCO, HKPSG

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location/Duration of measures/ Timing of completion of measures	Implementation Agent	Implementation Stage **				Relevant Legislation & Guidelines
					Des	C	O	Dec	
3.8	A33	Provision of electrical vehicle (EV) charging facilities in at least one-third of the car parking spaces for private cars. Provision of EV charging enabling facilities in all car parking spaces provided for private cars.	Parking spaces of MPSC	Project Proponent/ Contractor/Future operator	✓	✓	✓		EIAO-TM, APCO
3.8	A34	The entry of heavy goods vehicles should avoid peak hours, weekdays from 7 am to 10 am and from 4 pm to 7 pm, except for major events (i.e. more than 20,000 persons).	Parking spaces of MPSC	Future operator			✓		EIAO-TM, APCO
3.8	A35	Give priority to EV to use the car parking spaces as far as practicable.	Parking spaces of MPSC	Future operator			✓		EIAO-TM, APCO
3.8	A36	Electric vehicles (EV) should be used under normal operation for vehicles such as electric saloon cars/coaches, if the operator provides transport services for the staff and/or guests.	Vehicles managed by operator of MPSC	Future operator			✓		EIAO-TM, APCO
Hazard to Life									
No mitigation measure is required									
Noise									
5.9	N1	Adopt good site practice, such as throttle down or switch off equipment unused or intermittently used between works	Whole construction site	Contractor		✓			NCO, EIAO-TM
5.9	N2	Regular maintenance of equipment to prevent noise emission due to impair	Whole construction site	Contractor		✓			NCO, EIAO-TM
5.9	N3	Position mobile noisy equipment in locations away from NSRs and point the noise sources to directions away from NSRs	Whole construction site	Contractor		✓			NCO, EIAO-TM
5.9	N4	Use silencer or muffler for equipment	Whole construction site	Contractor		✓			NCO, EIAO-TM
5.9	N5	Make good use structures for noise screening	Whole construction site	Contractor		✓			NCO, EIAO-TM

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location/Duration of measures/ Timing of completion of measures	Implementation Agent	Implementation Stage **				Relevant Legislation & Guidelines
					Des	C	O	Dec	
5.9	N6	Use Quality Powered Mechanical Equipment (QPME) and quiet equipment which produces lower noise level	Whole construction site	Contractor		✓			NCO, EIAO-TM
5.9	N7	Erect movable noise barrier of 3m height to shed large plant equipment (e.g. breaker, backhoe & mobile crane) or hand-held items (e.g. poker, wood saw, power rammer & compactor) near low-rise NSR. Where necessary, special design (e.g. with noise absorbing material or bend top) should be adopted. The barrier's length should be at least five times greater than its height, and the minimum surface density is 10 kg/m^2. Alternatively, acoustic shed, enclosure or silencer (for generator, air compressor and concrete pump) or acoustic mat (for piling) can be adopted.	Whole construction site	Contractor		✓			NCO, EIAO-TM
5.9	N8	Carry out regular site inspection to audit the implementation of mitigation measures	Whole construction site	Contractor		✓			EIAO-TM
5.9	N9	Carry out noise monitoring throughout the construction period	Selected representative monitoring stations	Contractor		✓			EIAO-TM
5.7	N10	No organized events should be held concurrently in the Main Stadium and the Public Sports Ground.	Main Stadium/ Public Sports Ground	Future operator			✓		

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location/Duration of measures/ Timing of completion of measures	Implementation Agent	Implementation Stage **				Relevant Legislation & Guidelines
					Des	C	O	Dec	
5.6.1-5.6.4 and 5.9	N11	<u>Operational Fixed Noise from Main Stadium</u> - The structure of the stadium shall be soundproofing and complete. The entrances of the stadium shall have special acoustic design (e.g. double acoustic door) such that the soundproofing performance of the structure is not compromised. - There should be no air-gap between the base structure of the stadium and the fixed roof to avoid noise leakage. A retractable roof, which forms part of the design of the Main Stadium, will be closed when needed. Rubber bearing or other devices with similar function shall be used to avoid the noise leakage between the fixed roof and the retractable roof. - A distributed public address system shall be adopted with the loudspeakers directed towards spectator stand. - Acoustic panels shall be attached underneath the fixed roof of the main stadium.	Main Stadium	Project Proponent	✓				NCO, EIAO-TM, Noise Control Guideline for Music, Singing and Instrument Performing Activities
5.9	N12	<u>Operational Fixed Noise from Public Sports Ground</u> - A cover shall be built over the spectator stand. - Sound absorption panels shall be attached underneath the entire cover.	Public Sports Ground	Project Proponent	✓				NCO, EIAO-TM
5.9	N13	<u>Operation Noise from Fixed Plants</u> - Partial enclosures and silencers should be installed at the building services and ventilation systems.	Building services and ventilation systems	Project Proponent	✓				NCO, EIAO-TM

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location/Duration of measures/ Timing of completion of measures	Implementation Agent	Implementation Stage **				Relevant Legislation & Guidelines
					Des	C	O	Dec	
5.9	N14	Crowd Noise from Dispersion- Crowd management measures should be adopted for major events (i.e. more than 20,000 persons) which finish at or later than 2230 hours.- Crowd shall be managed and confined to pre-determined routes, which lead the crowd towards the future Kai Tak Station & To Kwa Wan Station. For the crowd moving toward the Kai Tak Station, people will be directed to leave through or along the ISCB. For the dispersal routes toward To Kwa Wan Station, the exit from the Project site is designed near the Sung Wong Toi Park.- The operator should arrange staff members to marshal the dispersion of crowds in an orderly manner from the Main Stadium all the way to the future Kai Tak Station & To Kwa Wan Station. Placards should be used to advise attendees of the events to keep the noise down. No loudspeakers should be used. If any attendees are found to raise the voice or make any noise beyond control even after verbal advice by the marshalling staff, the Police should be called in to restore the situation.	Main Stadium and pre-determined routes which lead the crowd towards the future Kai Tak Station & To Kwa Wan Station	Future operator			✓		NCO, EIAO-TM
5.11	N15	Operational Noise Monitoring - The operator should appoint an appropriate person to monitor the noise situation during the activities. - The organiser should provide a manned complaint hotline to respond to complaints from nearby NSRs immediately. - Real time noise monitoring at selected locations shall be conducted for any music event held in the Main Stadium during daytime or evening time periods for the first 3 years of operation. After the 3-year monitoring period, a review of the findings of the monitoring will be conducted to determine whether further monitoring will be required. The corresponding actions shall follow the Event and Action Plan in the EM&A Manual.	Main Stadium/ Public Sports Ground	Future operator/ Project Proponent			✓		EIAO-TM

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location/Duration of measures/ Timing of completion of measures	Implementation Agent	Implementation Stage **				Relevant Legislation & Guidelines
					Des	C	O	Dec	
5.9	N/A	Planned NSRs (TPN12, TPN13)Planning applications are required for developments on CDA sites and are subject to Town Planning Board approval. The future developers of the CDA sites would need to carry out an Environmental Assessment (EA) to support the planning application. The EA would include the required mitigation measures so that all noise sensitive receivers at the sites would not be exposed to road traffic noise levels above the respective criterion.	The CDA sites facing Sung Wong Toi Road	Applicants of the Planning Application	✓				HKPSG
5.9	N/A	Planned NSRs (TPN14) The Housing Department would carry out an environmental assessment study (EAS) for the proposed development at the detailed design stage. The EAS would include the required mitigation measures so that all residential flats at the site would not be exposed to road traffic noise levels above the 70 dB(A) criterion.	The planned Housing Site facing Sung Wong Toi Road	The Housing Department	✓				HKPSG
Water Quality									
6.7	WQ1	Practices outlined in ProPECC PN 1/94 Construction Site Drainage should be adopted.	Whole construction site	Contractor		✓			WPCO, EIAO-TM
6.7	WQ2	Install perimeter channels in the works areas to intercept runoff from boundary prior to the commencement of any earthwork	Whole construction site	Contractor		✓			WPCO, EIAO-TM
6.7	WQ3	To prevent storm runoff from washing across exposed soil surfaces, intercepting channels should be provided.	Whole construction site	Contractor		✓			WPCO, EIAO-TM
6.7	WQ4	Drainage channels are required to convey site runoff to sand/silt traps and oil interceptors. Provision of regular cleaning and maintenance to ensure the normal operation of these facilities throughout the construction period.	Whole construction site	Contractor		✓			WPCO, EIAO-TM

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location/Duration of measures/ Timing of completion of measures	Implementation Agent	Implementation Stage **				Relevant Legislation & Guidelines
					Des	C	O	Dec	
6.7	WQ5	Any practical options for the diversion and realignment of drainage should comply with both engineering and environmental requirements	Whole construction site	Contractor		✓			WPCO, EIAO-TM
6.7	WQ6	Minimum distances of 100 m should be maintained between the discharge points of construction site runoff and the existing WSD saltwater intake and EMSD cooling water intake.	Whole construction site	Contractor		✓			WPCO, EIAO-TM
6.7	WQ7	The following good site measures should be adopted for the use of the existing barging facilities being operated by the MTR SCL Project: - All vessels should be sized so that adequate clearance is maintained between vessels and the seabed in all tide conditions, to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash. - All hopper barges should be fitted with tight fitting seals to their bottom openings to prevent leakage of material. - Construction activities should not cause foam, oil, grease, scum, litter or other objectionable matter to be present on the water within the site. - Loading of barges and hoppers should be controlled to prevent splashing of material into the surrounding water. - Barges or hoppers should not be filled to a level that will cause the overflow of materials or polluted water during loading or transportation.	Whole construction site	Contractor		✓			WPCO, EIAO-TM
6.7	WQ8	The runoff and wastewater generated from the works areas should be treated so that it satisfies all the standards listed in the TM-DSS.	Whole construction site	Contractor		✓			WPCO, EIAO-TM
6.7	WQ9	Reuse and recycling of the treated effluent from construction site runoff.	Whole construction site	Contractor		✓			WPCO, EIAO-TM

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6.7	WQ10	Weekly site audit should be carried out to check the implementation status of the recommended water quality impact mitigation measures throughout construction period.	Whole construction site	Contractor		✓			WPCO, EIAO-TM
6.7	WQ11	The construction programme should be properly planned to minimise soil excavation, if any, in rainy seasons.	Whole construction site	Contractor		✓			WPCO, EIAO-TM
6.7	WQ12	Any exposed soil surfaces should be properly protected to minimise dust emission.	Whole construction site	Contractor		✓			WPCO, EIAO-TM
6.7	WQ13	In areas where a large amount of exposed soils exist, earth bunds or sand bags should be provided.	Whole construction site	Contractor		✓			WPCO, EIAO-TM
6.7	WQ14	Exposed stockpiles should be covered with tarpaulin or impervious sheets at all times.	Whole construction site	Contractor		✓			WPCO, EIAO-TM
6.7	WQ15	The stockpiles of materials should be placed at locations away from any stream courses so as to avoid releasing materials into the water bodies.	Whole construction site	Contractor		✓			WPCO, EIAO-TM
6.7	WQ16	Final surfaces of earthworks should be compacted and protected by permanent work.	Whole construction site	Contractor		✓			WPCO, EIAO-TM
6.7	WQ17	Haul roads should be paved with concrete and the temporary access roads protected using crushed stone or gravel, wherever practicable.	Whole construction site	Contractor		✓			WPCO, EIAO-TM
6.7	WQ18	Wheel washing facilities should be provided at all site exits to ensure that earth, mud and debris would not be carried out of the works areas by vehicles.	Whole construction site	Contractor		✓			WPCO, EIAO-TM
6.7	WQ19	Good site practices should be adopted to keep the site dry and tidy, such as clean the rubbish and litter on the construction sites.	Whole construction site	Contractor		✓			WPCO, EIAO-TM

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6.7	WQ20	Adequate temporary site drainage and pumping should be provided, if necessary.	Whole construction site	Contractor		✓			WPCO, EIAO-TM
6.7	WQ21	Provide sufficient temporary toilets in the works areas. The toilet facilities should be more than 30 m from any watercourse. A licensed waste collector should be deployed to clean the temporary toilets on a regular basis.	Whole construction site	Contractor		✓			WPCO, EIAO-TM
6.7	WQ22	Notices should be posted at conspicuous locations to remind the workers not to discharge any sewage or wastewater into the nearby environment during the construction phase of the Project.	Whole construction site	Contractor		✓			WPCO, EIAO-TM
6.7	WQ23	Contractor must register as a chemical waste producer if chemical wastes would be produced from the construction activities. The Waste Disposal Ordinance (Cap 354) and its subsidiary regulations in particular the Waste Disposal (Chemical Waste) (General) Regulation should be observed and complied with for control of chemical wastes.	Whole construction site	Contractor		✓			WPCO, EIAO-TM
6.7	WQ24	Any service shop and maintenance facilities should be located on hard standings within a bunded area, and sumps and oil interceptors should be provided. Maintenance of vehicles and equipment involving activities with potential for leakage and spillage should only be undertaken within the areas appropriately equipped to control these discharges.	Whole construction site	Contractor		✓			WPCO, EIAO-TM
6.7	WQ25	Clean the construction sites on a regular basis.	Whole construction site	Contractor		✓			WPCO, EIAO-TM
6.7	WQ26	Oil interceptor in car parking area shall be designed and constructed according to Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers, APP-46 (PNAP 124)	Car parking Area	Project Proponent	✓	✓	✓		WPCO, EIAO-TM, PNAP 124

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6.7	WQ27	The chemicals/fuels to be stored on site will be limited to small essential quantities at any one time. Any chemicals that may be carried away by water shall be contained in specific containers and cabinets under shelter and protected from weather. Any liquid chemical or fuel shall be contained in hard standing bunded area. The operator shall ensure that only staff trained in the use and handling the specific chemicals for specific tasks are allowed to handle the relevant chemicals.	Whole site	Future operator			✓		WPCO, EIAO-TM
6.7	WQ28	Good practice should be adopted to clean the rubbish and litter on the sites so as to prevent rubbish and litter from spreading from the site area. It is recommended to clean the Project Site on a regular basis. Management guidelines shall be provided to the management team practically to separate and remove solids from discharging stormwater system.	Whole Project site	Future operator			✓		WPCO, EIAO-TM
6.7	WQ29	For use artificial turf, subject to design and operation considerations, practically no mitigation measures are required. The duration of the natural turf on the pitch should be minimized in case of using occasional natural turf during major events and no pesticides and fertilizers should be used during the period under normal circumstances. Intercept the surface water from the turf that may contain residual fertilizers and pesticides for reuse or treatment if usage of fertilizers and pesticides is needed.	Area with Turf	Future Operator			✓		WPCO, EIAO-TM

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6.7	WQ30	The future management of the MPSC should follow Pesticide Ordinance (Cap 133), Pesticide Regulations (Cap 133A), A Guide to Labeling of Pesticides, and Safety Guidelines for Storage of Pesticides issued by AFCD and the LCSD horticultural guidelines on use of turf management and consult AFCD on pesticides used.	Area with Natural Turf	Future operator			✓		Pesticide Ordinance (Cap 133), Pesticide Regulations (Cap 133A), A Guide to Labeling of Pesticides, and Safety Guidelines for Storage of Pesticides issued by AFCD and the LCSD horticultural guidelines on use of turf management
6.7	WQ31	Application of chemicals, if necessary, will be confined to the approved list and the dosage as well as the frequency and intensity should be well justified according to genuine operational needs.	Area with Natural Turf	Future operator			✓		WPCO, EIAO-TM
6.7	WQ32	The dosage of pesticides and fertilizers shall be controlled to limit any residual dosage to less than 10%.	Area with Natural Turf	Future operator			✓		WPCO, EIAO-TM
6.7	WQ33	Provide two sequential storage tanks to contain surface water with residual fertilizers and pesticides and third holding tank for incidental rainstorm	Area with Natural Turf	Project Proponent, Contractor, Future operator	✓	✓	✓		WPCO, EIAO-TM

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6.7	WQ34	A Stormwater Re-use Management Plan is recommended for the operator including: 1) Healthy use of fertilizers and pesticides, and safe operation of the chemical disposal. 2) Operation and maintenance of water storage/holding tanks. 3) Frequency of testing and sampling, and appropriate testing parameters. 4) Alert levels and action limit levels. 5) Emergency measures.	Area with Natural Turf	Future operator			✓		WPCO, EIAO-TM
6.7	WQ35	The storage and holding tanks shall be emptied prior to application of fertilizers and pesticides. In general, the intercepted surface water may be recycled by irrigation into the football pitch.	Area with Natural Turf	Future operator			✓		WPCO, EIAO-TM
6.11	WQ36	Encourage recycling of stormwater for irrigation and flushing	Sewerage and Stormwater System	Future operator			✓		WPCO, EIAO-TM
6.11	WQ37	Cleansing detergents shall not be used for washing the spectator seats.	Spectator Seats	Future operator			✓		WPCO, EIAO-TM
Sewerage and Sewage Treatment Implications									
7.2	SS1	Implementation of Sewer No. 1 and Sewer No.2 as proposed in Sections 7.2.2 - 7.2.3 of the EIA Report	As per Figure 7-2-2 of EIA Report	Contractor		✓			EIAO-TM
Waste Management									
8.5	WM1	Inert C&D materials (or public fills) will be used to form the ramps and other filling area as far as civil engineering design permits.	Whole construction site	Contractor		✓			Waste Disposal Ordinance, EIAO-TM
8.5	WM2	Prepare a Construction and Demolition Material Management Plan (C&DMMP) to encourage C&D material recycling and waste minimization and submit the Plan to the Public Fill Committee for approval.	Whole construction site	Contractor	✓				Waste Disposal Ordinance, EIAO-TM

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8.5	WM3	The contractor should formulate waste management measures on waste minimization, storage, handling and disposal in a Waste Management Plan as part of Environmental Management Plan.	Whole construction site	Contractor		✓			Environment, Transport and Works Bureau Technical Circular (Works) No. 19/2005
8.5	WM4	Adopt good site practice as follows: - Provide training to workers on site cleanliness, waste management (waste reduction, reuse and recycle) and chemical handling procedures - Provide sufficient waste collection points and regular removal - Cover waste materials with tarpaulin or in enclosure during transportation - Maintain drainage systems, sumps and oil interceptors - Sort out chemical waste for proper handling and treatment onsite or offsite	Whole construction site	Contractor		✓			Waste Disposal Ordinance, EIAO-TM, Practice Note for Registered Contractors No. 17

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8.5	WM5	Adopt waste reduction measures as follows: - Allocate area/containers for sorting, recovering and storing waste for reuse, recycle or disposal (e.g. demolition debris and excavated materials, general refuse like aluminium cans.) Remove waste from the Site for sorting once generated if no suitable space can be identified. - Allocate area for proper storage of construction materials to prevent contamination - Minimize wastage through careful planning and avoiding over-purchase of construction materials	Whole construction site	Contractor		✓			Waste Disposal Ordinance, EIAO-TM, Practice Note for Registered Contractors No. 17
8.5	WM6	Store waste materials properly as follows: - Avoid contamination by proper handling and storing waste - Prevent erosion by covering waste - Apply water spray on excavated materials - Maintain and clean storage area regularly - Sort and stockpile different materials at designated location to enhance reuse	Whole construction site	Contractor		✓			ProPECC PN 1/94, EIAO-TM, Practice Note for Registered Contractors No. 17

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8.5	WM7	Apply for relevant waste disposal permits in accordance with the Waste Disposal Ordinance (Cap. 354), Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 345) and the Land (Miscellaneous Provisions) Ordinance (Cap. 28), Dumping at Sea Ordinance (Cap. 466).	Whole construction site	Contractor		✓			Waste Disposal Ordinance (Cap. 354), Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 345) and the Land (Miscellaneous Provisions) Ordinance (Cap. 28), Dumping at Sea Ordinance (Cap. 466), EIAO-TM
8.5	WM8	Hire licensed waste disposal contractors for waste collection and removal. Dispose waste at licensed waste disposal facilities	Whole construction site	Contractor		✓			Waste Disposal Ordinance, EIAO-TM
8.5	WM9	Implement trip-ticket system for recording the amount of waste generated, recycled and disposed, including chemical wastes	Whole construction site	Contractor		✓			Waste Disposal (Chemical Waste) (General) Regulation, Waste Disposal Ordinance, EIAO-TM
8.5	WM10	Reduce water content in wet spoil generated from piling work by mixing with dry materials. Only dispose treated spoil with less than 25% dry density to Public Fill Reception Facilities	Whole construction site	Contractor		✓			Waste Disposal Ordinance, EIAO-TM

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8.5	WM11	Dispose dry waste or waste with less than 70% water content by weight to landfill	Whole construction site	Contractor		✓			Waste Disposal Ordinance, EIAO-TM
8.5	WM12	Follow the *Code of Practice on the Packaging, Labelling and Storage of Chemical Waste* as follows: - Store chemical wastes with suitable containers. Seal and maintain the container to avoid leakage or spillage during storage, handling and transport - Label chemical waste containers in both English and Chinese with instructions in accordance to Schedule 2 of the Waste Disposal (Chemical Waste) (General) Regulation - The container capacity should be smaller than 450 litres unless agreed by the EPD	Whole construction site	Contractor		✓			Waste Disposal (Chemical Waste) (General) Regulation, EIAO-TM
8.5	WM13	Comply with the requirement of the chemical storage area: - Store only chemical waste and label clearly the chemical characters of the waste - Have at least 3 sides enclosed and protected from rainfall with cover - Provide sufficient ventilation - Have impermeable floor and has bunds to contain 110% of the capacity of the largest container or 20% of the total volume of the stored waste in the area, whichever is larger - Adequately spaced incompatible materials	Whole construction site	Contractor		✓			Waste Disposal (Chemical Waste) (General) Regulation, EIAO-TM

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8.5	WM14	Transfer used lubricants, waste oils and other chemicals to oil recycling companies, if possible, and empty oil drums for reuse or refill. No direct or indirect discharge is permitted	Whole construction site	Contractor		✓			Waste Disposal (Chemical Waste) (General) Regulation, EIAO-TM
8.5	WM15	Hire licensed chemical waste disposal contractors for waste collection and removal. Dispose chemical waste at the approved Chemical Waste Treatment Centre at Tsing Yi or other licensed facility	Whole construction site	Contractor		✓			Waste Disposal (Chemical Waste) (General) Regulation, EIAO-TM
8.5	WM16	Hire reputable waste collector to separately collect and dispose general refuse from other wastes. Cover the waste to prevent being blown away	Whole construction site	Contractor		✓			Waste Disposal (Chemical Waste) (General) Regulation, EIAO-TM
8.5	WM17	The hauling of C&D materials shall follow established environmental mitigation measures as stated in Practice Note for Registered Contractors No. 17 “Control of Environmental Nuisance from Construction Sites” issued by the Buildings Department	Whole construction site	Contractor		✓			Practice Note for Registered Contractors No. 17 “Control of Environmental Nuisance from Construction Sites”, BD
8.5	WM18	Provide recycling bins for sorting out recyclables for collection by recycling companies. Non-recyclables should be removed to designated landfills every day by licensed collectors to prevent environmental and health nuisance.	Whole construction site	Contractor		✓			Waste Disposal Ordinance, EIAO-TM

<table>
<tr><th rowspan="2">EIA* Ref.</th><th rowspan="2">EM&A Log Ref.</th><th rowspan="2">Environmental Protection Measures*</th><th rowspan="2">Location/Duration of measures/ Timing of completion of measures</th><th rowspan="2">Implementation Agent</th><th colspan="4">Implementation Stage **</th><th rowspan="2">Relevant Legislation & Guidelines</th></tr>
<tr><th>Des</th><th>C</th><th>O</th><th>Dec</th></tr>
<tr><td>8.5</td><td>WM19</td><td>Organize training and reminders to site staff on waste minimization through avoidance and reduction, reusing and recycling</td><td>Whole construction site</td><td>Contractor</td><td></td><td>✓</td><td></td><td></td><td>EIAO-TM</td></tr>
<tr><td>8.5</td><td>WM20</td><td>Bentonite slurry which will not be reused shall be disposed of from the Site as soon as possible. Residual used dewatered bentonite slurry should be disposed to a public filling area and liquid bentonite slurry if mixed with inert fill material should be disposed to a public filling area.</td><td>Whole construction site</td><td>Contractor</td><td></td><td>✓</td><td></td><td></td><td>EIAO-TM</td></tr>
<tr><td rowspan="5">8.5</td><td rowspan="5">WM21</td><td>If chemical wastes were to be produced at the construction site, the Contractor would be required to register with the EPD as a Chemical Waste Producer, and to follow the guidelines stated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes.</td><td rowspan="5">Whole construction site</td><td rowspan="5">Contractor</td><td rowspan="5"></td><td rowspan="5">✓</td><td rowspan="5"></td><td rowspan="5"></td><td rowspan="5">Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes, Waste Disposal (Chemical Waste) (General) Regulation</td></tr>
<tr><td>Good quality containers compatible with the chemical wastes should be used, and incompatible chemicals should be stored separately.</td></tr>
<tr><td>Appropriate labels should be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the waste such as explosive, flammable, oxidizing, irritant, toxic, harmful, corrosive, etc.</td></tr>
<tr><td>The Contractor shall use a licensed collector to transport the chemical wastes.</td></tr>
<tr><td>The licensed collector shall deliver the waste to the Chemical Waste Treatment Centre at Tsing Yi, or other licensed facility, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation</td></tr>
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8.5	WM22	Carry out weekly site inspection to check the implementation status of the recommended waste management measures.	Whole Construction site	Contractor		✓			Waste Disposal Ordinance, EIAO-TM
8.5	WM23	Minimize unnecessary waste generation by means of promotion materials, such as wider use of information technology and announcements	Whole Project Site	Future operator			✓		Waste Disposal Ordinance, EIAO-TM
8.5	WM24	Encourage spectators to bring along personal containers for food and drinks	Whole Project Site	Future operator			✓		Waste Disposal Ordinance, EIAO-TM
8.5	WM25	Sufficient recycling containers will be provided at suitable locations to encourage recycling of such waste aluminium cans, plastics and waste paper.	Whole Project Site	Future operator			✓		Waste Disposal Ordinance, EIAO-TM
8.5	WM26	Adequate solid waste storage facilities shall be provided	Whole Project Site	Future operator			✓		Waste Disposal Ordinance, EIAO-TM, PNAP No.98
Land Contamination									
No mitigation measure is required									
Ecology									
10.11	E1	Erection of hoarding, fencing or provision of clear demarcation of work zone	Whole construction site	Contractor		✓			EIAO-TM
10.11	E2	Designate areas for placement of equipment, building materials and wastes away from drainage channels	Whole construction site	Contractor		✓			EIAO-TM
10.11	E3	Carry out weekly site inspection to check the implementation status and the effectiveness of the proposed mitigation measures	Whole construction site	Contractor		✓			EIAO-TM

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Landscape and Visual									
Table 11-22	LV1	Construction Lighting Control - All security floodlights for construction sites should be equipped with adjustable shields, frosted diffusers and reflective covers, and be controlled to minimize light pollution and night-time glare to the visual sensitive receivers (VSRs).	Whole construction site	Contractor		✓			BS EN 12464-2:2007
Table 11-22	LV2	Temporary Landscape Treatments - Including vertical greening, pot planting and application of green roofing to site offices, Hydroseeding of site formation areas and short term greening of site boundaries and land not immediately developed.	Whole construction site	Contractor		✓			EIAO-TM
Table 11-22	LV3	Decoration of Hoarding - Erection of screen hoardings should be designed appropriately to be compatible with the existing urban context, either brightly and imaginatively or with visually unobtrusive design and colours where more appropriate.	Whole construction site	Contractor		✓			EIAO-TM
11.9.47	LV4	All security floodlights for construction sites shall be equipped with adjustable shield, frosted diffusers and reflective covers, and be carefully controlled to minimize light pollution and night-time glare to nearby receivers	Whole construction site	Contractor		✓			EIAO-TM
11.4.3	LV5	Site inspection should be undertaken once every two weeks.	Whole construction site	Contractor		✓			EIAO-TM
Table 11-23	LV6	Greening of Walkways, Ramps and Decks - Greening shall be incorporated into at-grade areas and as raised planting areas on pedestrian walkways, ramps and decks.	Landscape deck and connections to surrounding footpath network	Project Proponent/ Future operator	✓		✓		Greening Guidelines, GLTMS of DEVB

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Table 11-23	LV7	Green Roofs and Vertical Greening - Green roofs and vertical greening should be provided to all built structures where feasible and opportunities should be maximised for incorporation on covered walkways and shade structures.	External walls and roofs of built structures	Project Proponent/ Future operator	✓		✓		DEVB TC No.3/2012 – Site Coverage of Greenery for Government Building Projects
Table 11-23	LV8	Compensatory Tree Planting- A new parkland area is created in the project development to be used for the implementation of compensatory tree planting to offset the net loss of key landscape resources. It is recommended that 340 trees be planted in this regard and a compensatory tree planting proposal outlining the locations of tree compensation will be submitted separately in seeking relevant government department’s approval in accordance with DEVB TC No.7/2015.	Designated planting areas	Project Proponent/ Contractor	✓	✓			DEVB TC No.7/2015
Table 11-23	LV9	Responsive Building Design - All above ground structures, including, stadia, hotel and ancillary buildings, shall be sensitively designed in a manner that responds to the existing and planned urban context in terms of scale, height and bulk (visual weight) as well as use of appropriate building materials and colour to create a cohesive visual mass. Subdued tones should be considered for the colour palette with non-reflective finishes to reduce glare effect.	All structures	Project Proponent	✓				EIAO-TM

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Table 11-23	LV10	Integration of Development Boundaries - The project boundaries shall be without fences or barriers, providing seamless physical and visual integration with the surrounding public spaces. Careful consistency of levels and materials shall create and indefinite development edge, integrating the development into the future Song Wong Toi Park, the Station Square Open Space Corridor and the Metro Park.	Project boundaries	Project Proponent/ Future operator	✓		✓		EIAO-TM
Table 11-23	LV11	Integration with Dining Cove and Waterfront Promenade - Careful design consideration of the interface of the raised stadium deck at 13mPD with that of the Waterfront Promenade at 5mPD shall be undertaken. Visual articulation and physical penetration of the development at promenade level shall be created by avoiding a continuous boundary wall. Furthermore integrated design of the adjacent proposed retail development shall ensure visual cohesion and an improved character setting.	Promenade interface and Hotel	Project Proponent/ Future operator	✓		✓		EIAO-TM
Table 11-23	LV12	Light Penetration Under Deck- The landscape deck shall be cut back and light wells incorporated to maximise natural light penetration to at-grade covered areas under the deck, to allow for enhanced visual amenity, improved utilisation of ground space and significant incorporation of both horizontal and vertical greening at ground level.	Landscape deck	Project Proponent	✓				EIAO-TM

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Table 11-23	LV13	Urban Park - Incorporation of a new park within the development area shall facilitate the visual corridors outlined by the urban design framework to create an urban light well, protecting longer views and providing visual amenity to nearby receivers. The park shall maximise tree and shrub planting with emphasis on incorporating native species and integrate facilities primarily for the regular use of adjacent residential communities.	Designated area	Project Proponent/ Future operator	✓		✓		Greening Guidelines, GLTMS of DEVB
Table 11-23	LV14	Bespoke Amenity Area Lighting - Development of a bespoke project amenity area lighting scheme shall be incorporated that minimises general area light pollution, provides thematic lighting, responds to user demand intensity and minimises pavement obstruction and visual clutter. The following shall be practically considered: • mounting height and direction of fixtures to avoid sensitive receivers; • reflectance so as to avoid glare effect; • incorporation of low level down lighting integrated onto building facades, walls and structures; • utilising area movement sensors; • programming of operation for minimised utilisation.	Site wide	Project Proponent/ Future operator	✓		✓		EIAO-TM

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11.9.42	LV15	Responsive Lighting Design and Disposition- Carry out the external landscape lighting design with reference to (1) Lighting Guide 4: Sports Lighting, Chartered Institution of Building Services Engineers; (2) BS EN 12193:2007 Light and Lighting-Sports Lighting, British Standards Institution and (3) Guidance Notes for the Reduction of Obtrusive Light, The Institution of Lighting Professionals as recommended in the Building Services Branch Circular No. 10 of 2011 by Architectural Services Department - Design Considerations for Outdoor Sports Venues Lighting and other applicable relevant international standards. - Select luminaries and fittings type to minimise direct view of the light source (from the sides) and restrict side dispersion. - Adopt a strategy to use lamp posts of lower height and with less interval spacing to reduce the lighting output from each lamp while maintaining the minimum luminance requirement for the open space. - Lowering of the lighting output (i.e. luminous flux) - All proposed hard structures should be sensitively designed in a manner that responds to the existing and planned landscape context, and minimizes potential adverse glare impacts. - The structural design should seek to reduce the apparent visual mass through the use of natural materials such as wooden frame and semi-transparent panels. - subdued tones should be considered for the colour palette with non-reflective finishes - Reduce the direct sight of the luminaries from the observers, e.g. through planting of trees within the MPSC.	Site wide	Project Proponent/ Future operator	✓		✓		EIAO-TM

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Table 11-23	LV16	Submit detailed landscape proposals and details of architectural design, chromatic treatment and lighting, for all above ground structures, including pedestrian links, stadium connections and ancillary buildings to Planning Department for review to demonstrate that they would be sensibly designed in a manner that responds to the existing urban context and minimize any residual landscape and visual impact.	Site wide	Project Proponent/ Future operator	✓		✓		EIAO-TM
11.11.5	LV17	Site inspection should be undertaken once every two months during the 12 month establishment period.	Site wide	Project Proponent/ Future operator			✓		EIAO-TM
Cultural Heritage									
No mitigation measure is required									

* All recommendations and requirements resulted during the course of EIA Process, including ACE and/or accepted public comment to the proposed project.

** Des=Design; C=Construction; O=Operation; Dec=Decommissioning

15 ENVIRONMENTAL OUTCOMES

15.1 Environmental Designs Recommended and Environmentally Friendly Options Considered

15.1.1 This EIA study has been carried out for the proposed Multi-purpose Sports Complex at Kai Tak in accordance with the EIA Study Brief (No. ESB-274/2014). **Table 15-1** shows a summary of environmental designs recommended and environmentally friendly measures considered for the Project.

Table 15-1 Summary of Environmental Designs and Environmental Friendly Measures

Issues	Environmental Outcomes/Benefits
Environmental Designs Recommended and Environmentally Friendly Measures Considered	Acoustic Design in Minimizing Noise Transmission - The structure and fixed roof of the Main Stadium will be soundproofing and complete in order to minimize sound leakage - The entrances of the Main Stadium will have special acoustic design to minimize noise leakage (e.g. double acoustic doors) - The retractable roof, which forms part of the design of the Main Stadium, will be closed when needed - Acoustic panels will be attached underneath the fixed roof of the main Stadium to improve the acoustic performance of the roof - A distributed public address system will be adopted with the loudspeakers distributed over and directed towards the spectator stand - The Public Sports Ground will have a cover over the spectator stand with noise absorption panels to mitigate the noise from the spectators. Operation Management in Minimizing Human Noise - Crowd dispersion routes have been designated for spectators to disperse under the podium deck and along covered routes which will partially screen the dispersal route from the nearby noise sensitive receivers for major events in the Main Stadium after 10:30 p.m - The future operator is recommended to manage the crowd dispersal by marshalling the spectators to leave the stadium in an orderly and quiet manner for the crowd dispersal via the designated routes.

Issues	Environmental Outcomes/Benefits
	Design for Minimizing Traffic Emissions - The Project has been designed with minimal car parking spaces to encourage the use of mass transport system which is within walking distances. This would minimize road emissions from private cars and public transport. Green Measures for Minimizing Traffic Emissions - Electric vehicle (EV) charging facilities will be provided for at least one-third of the car parking spaces for private cars - EV charging enabling facilities will be provided for all car parking spaces for private cars - Priority will be given to EV to use the car parking spaces as far as practicable - If the future operator provides transport services for the staff and/or guests, electric saloon cars, coaches, etc. should be used under normal operation - Entry of heavy goods vehicles to MPSC should avoid peak hours, weekdays from 7 am to 10 am and from 4 pm to 7 pm, except for major events (i.e. with more than 20,000 persons). Beneficial Water Reuse for Minimizing Water Wastage - Intercepting and storage system will be provided to collect surface runoff if natural turf is adopted and fertilizers/pesticides are used so as to ensure no residual fertilizers and pesticides from the turf surface run-off are discharged. Beautification of Project Site for Public Enjoyment - The Project site including the public open space will be extensively landscaped. Reduction of Glare Impact of Future Lighting Provision - The lightings will be positioned and adjusted to avoid pointing directly to sensitive receivers - Anti-glare shields will be provided to all lighting. - Paving materials with low reflectance will be adopted to minimize glare impact.

Issues	Environmental Outcomes/Benefits
	Green Measures in Waste Reduction - Prefabricated construction methods should be adopted as far as practicable to minimize construction waste - Sufficient recycling containers will be provided at suitable locations to encourage recycling of such waste aluminum cans, plastics and waste paper - Waste minimization will be promoted through various means, such as wider use of information technology and announcements - The Project Proponent will incorporate appropriate contract provisions to arrange the proposed re-use of excavated materials in their site clearance and site formation and excavation works sites.

15.2 Documentation of Key Assessment Assumptions, Limitation of Assessment Methodologies and Related Prior Agreement(s) with the Director

15.2.1 The key assessment assumptions, limitation of assessment methodologies and all relevant prior agreements with EPD are summarized in **Appendix 15.1**.

15.3 Individual Environmental Concerns and Key Environmental Problems Avoided/Minimized

15.3.1 A summary of individual environmental concerns for the Project and the key environmental problems avoided/minimized for each aspects in this Project are listed in **Table 15-2** below:

Table 15-2 Environmental Concerns and Key Environmental Problems Avoided/Minimized

Issues	Environmental Outcomes/Benefits
Air Quality	**Benefits of Environmental Protection Measures Recommended** During the construction phase, dust control measures stipulated in the Air Pollution Control (Construction Dust) Regulation (e.g. watering of exposed grounds every hour and proper stockpiling) are proposed to minimize TSP, RSP and FSP emissions. No adverse residual air quality impact is anticipated during the construction phase. During the operation phase, the proposed transport management measures and green initiatives will reduce vehicle emissions from the traffic induced from the Project and contribute towards improving the air quality in the region.

Issues	Environmental Outcomes/Benefits
	Environmentally Sensitive Areas and Estimated Population Protected Existing and planned residential buildings, offices in government institutions and commercial buildings, recreation areas and places of public worship in the vicinity of the Project site. **Compensation Areas Included** N/A
Hazard to Life	**Benefits of Environmental Protection Measures Recommended** The Project site is outside the Consultation Zone / study area of the identified hazardous sources. **Environmentally Sensitive Areas and Estimated Population Protected** N/A **Compensation Areas Included** N/A
Noise	**Benefits of Environmental Protection Measures Recommended** Construction noise will be generated from use of powered mechanical equipment. With the implementation of the recommended mitigation measures such as adoption of good site practice and use of quieter PMEs and mobile noise barriers, construction noise levels at all the representative noise sensitive receivers will comply with the daytime noise criterion. During operational phase, no significant change in traffic noise levels is expected and the overall traffic noise levels will comply with the stipulated noise criteria. The proposed acoustic design including the soundproofing structure and fixed roof in the Main Stadium and extended fixed roof in the Public Sports Ground will ensure no unacceptable noise impact on receivers during events at the MPSC. The retractable roof, which forms part of the design of the Main Stadium, will be closed when needed. Specific dispersal routes will be used for the crowd

Issues	Environmental Outcomes/Benefits
	dispersion after 10:30 p.m. The future operator is recommended to direct the crowd after leaving the Main Stadium immediately to the ground level of MPSC instead of on the podium level in order to minimize the exposure of the dispersal route to the nearby sensitive receivers. **Environmentally Sensitive Areas and Estimated Population Protected** Existing and planned residential buildings, places of public worship, and education institutions in the vicinity of the Project site. **Compensation Areas Included** N/A
Water	**Benefits of Environmental Protection Measures Recommended** The Project site is currently occupied by exposed construction sites that encourage soil erosion, causing muddy surface runoff under heavy rain conditions. Also, the existing concreted-paved car parks are impermeable to water, causing accumulation of rainwater. Upon completion of the MPSC, the landscaped area will be grown with vegetation that would prevent soil erosion. The site will be fully installed with a drainage system. During the construction phase, good site practices outlined in ProPECC PN 1/94 Construction Site Drainage will be adopted to minimize wastewater generation that would contaminate the drainage systems and nearby water bodies. During the operational phase, separate sewerage and stormwater systems will be properly maintained. All manholes, sand traps and oil interceptors will be cleaned and maintained regularly. Fertilizers and pesticides will be applied according to the LCSD’s prevailing code of practice and the Pesticides Ordinance (Cap. 133) if natural turf is used. Surface water from natural turf areas of the Main Stadium and Public Sports Ground will be collected and stored in storage tanks for reuse according to a Stormwater Re-use Management Plan.

Issues	Environmental Outcomes/Benefits
	Environmentally Sensitive Areas and Estimated Population Protected Water bodies including To Kwa Wan Typhoon Shelter, Kai Tak Approach Channel, Victoria Harbour and Kai Tak Nullah. **Compensation Areas Included** N/A
Sewerage and Sewage Treatment	**Benefits of Environmental Protection Measures Recommended** New sewers will be laid to direct the sewage from MPSC to To Kwa Wan Preliminary Treatment Works for treatment without overloading the system. No discharge into nearby water bodies will be permitted. **Environmentally Sensitive Areas and Estimated Population Protected** Water bodies including To Kwa Wan Typhoon Shelter, Kai Tak Approach Channel, Victoria Harbour and Kai Tak Nullah. **Compensation Areas Included** N/A
Waste Management	**Benefits of Environmental Protection Measures Recommended** Mitigation measures are proposed for minimizing waste generation and off-site disposal via land or marine routes. Precast and prefabricated construction will be adopted. Construction and Demolition Materials will be reused and recycled as much as possible. During the operational phase, adequate solid waste storage facilities will be provided for proper storage disposal after events. Visitors are encouraged to minimize waste generation by means of promotional materials, e.g. wider use of IT and announcement. **Environmentally Sensitive Areas and Estimated Population Protected** Air and water sensitive receivers within and near the Site and along transportation routes.

Issues	Environmental Outcomes/Benefits
	Compensation Areas Included N/A
Land Contamination	**Benefits of Environmental Protection Measures Recommended** Land contamination identified in the North Apron had been cleaned up and the site is considered suitable for the intended use for this Project. **Environmentally Sensitive Areas and Estimated Population Protected** N/A **Compensation Areas Included** N/A
Terrestrial Ecology	**Benefits of Environmental Protection Measures Recommended** The Project site is located on a developed area with human activities such as construction works and car parking. No site or species of conservation importance will be directly affected by the proposed development. Indirect impacts will be minimized by implementing air, noise and water quality mitigation measures. **Environmentally Sensitive Areas and Estimated Population Protected** Vegetation and wildlife within the Study Area **Compensation Areas Included** N/A
Landscape and Visual	**Benefits of Environmental Protection Measures Recommended** Construction sites and open car parks within the Project Site will be converted to the extensively landscaped MPSC. The design of MPSC will be coherent with the surrounding Kai Tak Development Area in the future. The Main Stadium will be a landmark viewed from across the Victoria Harbour. **Environmentally Sensitive Areas and Estimated Population Protected** Landscape resources, landscape character areas and visual sensitive receivers surrounding the Project Site.

Issues	Environmental Outcomes/Benefits
	Compensation Areas Included Compensatory planting for felled trees
Cultural Heritage	**Benefits of Environmental Protection Measures Recommended** The Project Site is located on reclaimed land with no archaeological significance. No built heritage is found within the Project Site. **Environmentally Sensitive Areas and Estimated Population Protected** N/A **Compensation Areas Included** N/A
Key Environmental Problems avoided	- Kai Tak has been vacated after the former Kai Tak Airport was relocated to Chek Lap Kok in 1997. No site formation is necessary. - The Project Site is currently a large chunk of land with exposed construction sites and open parking area. No major demolition works are required. - The Project site will be divided into smaller works zones and construction works will be carried out in phases to minimize concurrent polluting activities. - Precast construction materials (e.g. concrete elements and truss) will be used as far as practicable to avoid onsite production.

16 CONCLUSIONS

16.1 General

16.1.1 An EIA report has been prepared for the proposed Kai Tak Multi-purpose Sports Complex. This report has provided an in-depth assessment of the potential environmental impacts associated with the construction and operation of the Project, based on the best available information at this stage of the EIA.

16.1.2 The assessment has been conducted, in accordance with the EIA Study Brief (No. ESB-274/2014) under the EIAO for the Project, covering the following environmental issues: -

- Air quality impact
- Hazard to life
- Noise impact
- Water quality impact
- Sewerage and sewage treatment implications
- Waste management implications
- Land contamination
- Terrestrial ecological impact
- Landscape and visual impact
- Impact on cultural heritage

16.1.3 A summary of environmental impacts identified in this EIA and the proposed mitigation measures, if any, are described in the following sections.

16.2 Air Quality Impact Assessment

Construction Phase

16.2.1 Potential air quality impacts from the construction works of the Project would mainly be related to construction dust from site clearance, excavation, foundation and site formation works. Construction dust impact arising from this Project with consideration of concurrent projects has been assessed for both the unmitigated and mitigated scenarios. With proper implementation of the recommended mitigation measures in **Sections 3.7.19** to **3.7.22**, it has been concluded that all dust concentrations at ASRs would comply with the TSP criterion as well as the relevant AQO for RSP and FSP. Hence, no adverse residual air quality impacts are anticipated during the construction phase.

Operation Phase

16.2.2 Air emission sources during the operational phase include open road traffic emissions, marine emissions from the Kai Tak Cruise Terminal, emissions from To Kwa Wan Typhoon Shelter, industrial emissions from nearby chimneys within 1km of the Project site, and the background pollutant concentration predicted by PATH.

16.2.3 The Project itself is not an air pollution source. The only air emission source due to the Project is the induced traffic along the traffic routes. Based on the modelling results, it is predicted that the cumulative 10-min. SO_2, hourly SO_2, daily average RSP, annual average RSP, daily average FSP, annual average FSP, and hourly NO_2 at all the identified ASRs would comply with the AQOs for both "Without Project" and "With Project" Scenarios.

16.2.4 Exceedance of the annual average NO_2 criterion was identified at some selected ASRs in localized areas along major roads such as Prince Edward Road East and Kowloon City Road (near the Kai Tak Tunnel West Portal). The AQO exceedance of the annual NO_2 under the "With Project" scenario is dominated by the background air pollution level.

16.2.5 Various options of mitigation measures have been explored and practical measures have been recommended to be implemented and are shown in **Section 3.8.47**.

16.2.6 Residual environmental impacts have been evaluated in accordance with Section 4.4.3 of EIAO-TM. Assessment results show that the exceedance of annual average NO2 is mainly caused by the relatively high concentrations of background air pollution in Kowloon City and To Kwa Wan Districts, and the impact magnitude for changes in ambient pollutant concentrations due to the Project is considered minimal in the assessment area. With the implementation of the air quality improvement schemes currently being undertaken by the Government, continuous air quality improvement in the territory is expected. The small affected population in Year 2023 will further be reduced to a limited size in Year 2036. Based on the assessment results, similar population would be affected even without the Project.

16.2.7 Through the evaluation of the residual environmental impacts in **Sections 3.8.50** to **3.8.58**, it is considered that the Project will not cause long term serious environmental implications.

16.2.8 In conclusion, the Project would not impose adverse air quality impact on the assessment area and the residual impacts are insignificant.

16.3 Hazard to Life Assessment

16.3.1 Hazard to Life Assessment in KTD area was fully addressed in the approved Kai Tak Development EIA Report (Register No.: AEIAR-130/2009). Based on the latest available information, no new PHI is proposed in KTD area and all existing/planned hazardous sources within or in vicinity of KTD were considered in the approved KTD EIA report. The Project site is outside all the Consultation Zones / study areas of the identified hazardous sources. Hence the finding of the hazard to life assessment related to the Project in the approved EIA report for the KTD remain valid, i.e. adverse potential hazard to life impact arising from the construction and operation on the Project is not anticipated.

16.3.2 No further hazard to life assessment is required.

16.4 Noise Impact Assessment

Construction Phase

16.4.1 Construction noise would be generated from the use of powered mechanical equipment (PME). With the implementation of mitigation measures such as adoption of good site practice and use of quieter PME and mobile noise barriers, the mitigated construction noise from the Project at all the representative noise sensitive receivers (NSR) would comply with the criterion.

Operation Phase

16.4.2 During the operational phase of the Project, potential traffic noise impact on surrounding NSRs caused by the traffic induced has been predicted and evaluated. The assessment results indicated that insignificant additional traffic noise impact would be caused by the traffic induced by the Project or the overall traffic noise levels would comply with the noise criterion, except for some planned NSRs. For the planned NSRs where a significant additional traffic noise impact caused by the Project is anticipated, it has been shown that the potential traffic noise impact caused by the Project would not create unacceptable constraints to the proposed development, whilst the future developers of these developments sites would carry out environmental assessments (EA) for the proposed developments at the detailed designed stage. The EA would include the required mitigation measures for traffic noise impact in order to ensure that all NSRs at the subject sites would not be exposed to road traffic noise levels above criteria as stipulated in the Hong Kong Planning Standards and Guidelines (HKPSG).

16.4.3 The potential noise impact arising from the operation of the Main Stadium, including sports and musical events, as well as the potential noise impact from human activities in public places has been assessed and found to comply with the noise criterion in the daytime/evening period with the acoustic design in place. Also, the potential noise impact for sports events in the Public Sports Ground has been evaluated and similarly found to comply with the noise criterion in the daytime/evening period with the acoustic design in place. Fixed plant noise would exceed the noise criterion; however, with noise mitigation the mitigated fixed plant noise levels would comply with the noise criterion at the worst-affected receivers.

16.4.4 Based on the mode of operation for the Project, no organized event shall be conducted simultaneously in the Main Stadium and the Public Sports Ground. The mitigated cumulative noise levels due to sports events in the Main Stadium and all the fixed plant, and the mitigated cumulative noise levels due to sports events in the Public Sports Ground and all the fixed plant would comply with the noise criteria at all NSRs. No adverse cumulative operation noise impact is anticipated.

16.4.5 Music events held in the Main Stadium would generate noise. With the implementation of the recommended mitigation measures in **Sections 5.6.1** to **5.6.4**, the potential noise impact arising from the musical events at the Main Stadium during daytime/evening period (i.e. 7 a.m. to 11 p.m.) would comply with the noise criteria in Noise Control Guidelines for Music, Singing and Instrument Performing Activities. Should the future operator plan to implement any music events at the Main Stadium during night-time period (i.e. 11 p.m. to 7 a.m.), the operator is obliged to comply with the requirements under the NCO.

16.4.6 Noise from human activities in public places would arise mainly from crowd dispersal after events. In general, crowd dispersion is not a source of annoyance especially during daytime/evening. The crowd from the Main Stadium may disperse on the podium level during daytime/evening. It is recommended that for dispersion after 10:30 p.m. the crowd after leaving the Main Stadium should be directed immediately to the ground level of MPSC instead of on the podium level for minimizing the exposed sections of the dispersal routes. The future operator should arrange its staff to marshal the dispersion of crowds after 10:30 p.m. in an orderly manner from the exits of the Main Stadium all the way to the two nearby MTR stations. No adverse potential noise impact arising from crowd dispersion within the Project site is expected.

16.5 Water Quality Impact Assessment

Construction Phase

16.5.1 During the construction phase, potential water quality impact may arise from site run-off, sewage from workforce, accidental spillage of chemicals, and discharge of wastewater from various construction activities. With the implementation of the recommended mitigation measures including those stipulated in the EPD's Practice Note for Professional Persons, Construction Site Drainage (ProPECC PN1/94), no adverse water quality impact on the water sensitive receivers from the construction works for the Project is anticipated.

Operation Phase

16.5.2 During the operational phase, surface runoff from the Main Stadium and the Public Sports Ground may be contaminated by the residual fertilizers and pesticides from the maintenance of the natural turf. Mitigation measures have been proposed such as the adoption of artificial turf or hard surface as the default playing surface, which involve no pesticides nor fertilizers. If natural turf is used as the default playing surface, the use and application of fertilizers and pesticides will follow the normal practices. A staged intercepting system will be developed for storage of surface water for reuse and a Stormwater Re-use Management Plan will be prepared and implemented, so as to ensure no residual fertilizers and pesticides from the turf surface run-off are discharged. Hence, with the implementation of the recommended mitigation measures, the operation of the Project will unlikely result in unacceptable stormwater discharge problem.

16.6 Sewerage and Sewage Treatment Implications

Construction Phase

16.6.1 During the construction phase, the Project will not impact on the existing sewerage system.

Operation Phase

16.6.2 Sewage generated from the Project will be collected at the To Kwa Wan Preliminary Treatment Works (TKWPTW) and subsequently delivered to Stonecutters Island Sewage Treatment Works via deep tunnels for further treatment and disposal. The amount of sewage generated by visitors, spectators, permanent and temporary employee of all facilities in MPSC was estimated as per EPD Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning (GESF) (2005). Since the capacity of the current design capacity of the TKWPTW will be adequate to cater for the increased flow due to the Project, no additional sewerage treatment facilities are required.

16.6.3 Two new sewerages will be built to collect sewage generated from the Project and discharge into the downstream sewers, which will be subsequently discharged into the nearby sewage pumping stations for further disposal.

16.7 Waste Management Implications

Construction Phase

16.7.1 Potential waste management implications from the generation of waste during the construction phase have been evaluated. Mitigation measures are proposed for minimizing waste generation and off-site disposal. Precast and prefabricated construction shall be adopted as far as practicable. Reuse and recycle of construction waste should be implemented as much as possible and construction and operation waste should be minimized during the design, construction and operation phases.

16.7.2 It is estimated that totally 657,519 m^3 C&D material, including inert and non-inert would be generated from the Project. About 21% of C&D material would be re-used on site, 69% would be disposed of off site to public fill and 10% of construction waste would be disposed of to landfill. The inert materials that can be reused/recycled on site amounting to 141,945 m^3. 447,464 m^3 of the inert C&D materials would be transported to the public fill area by barge through trucks to the nearby barging point. The non-inert waste materials would be disposed of at the designated landfills. The waste materials accounting to 68,110 m^3 would be transported by barge similar to C&D materials.

Operation Phase

16.7.3 The types of waste that would be generated during the operational phase have been assessed. Recommendations have been made to ensure proper treatment and disposal of these wastes. The daily waste generation after full house events in the Project is about 35 tonnes per day (tpd) consisting of 27 tpd of domestic solid waste and 8 tpd of commercial solid waste.

16.8 Land Contamination Assessment

16.8.1 The land contamination issues in the Project have been reviewed and assessed. Basically, land contamination in the former Kai Tak Airport has been fully assessed in the approved EIA Report “Kai Tak Airport North Apron Decommissioning (NAKTA) (Register No.: AEIAR-002/1998)”. Land contamination identified in the North Apron had been cleaned up and the site is considered clean for the intended use for this Project. No update of the land contamination assessment is considered necessary. Furthermore, no use of the land in the Project with potential for land contamination is anticipated.

16.9 Terrestrial Ecological Impact Assessment

16.9.1 No site of conservation importance was identified in the Study Area. About 16.1 ha of construction sites, 5.0 ha of developed area and 6.9 ha of abandoned area in the project site will be lost. These habitats have only very low ecological value. Although 2 nos. of avifauna species of conservation importance and 1 uncommon avifauna species were recorded in the project footprint, only minor impact is expected as no nursery ground, breeding, foraging or roosting behavior was recorded in the Project footprint. Nevertheless, no site, flora or other fauna species of conservation importance would be impacted directly

16.9.2 Surrounding habitats and their communities may be subject to indirect impacts such as water contamination, noise, dust, and/or glare induced by construction and operation activities. Nevertheless, with proper implementation of water quality, noise, dust and glare mitigation measures, all indirect impacts in construction and operational phases would be acceptable as they would be insignificant or minor.

16.9.3 With proper implementation of the proposed mitigation measures, residual impact is considered acceptable. The overall impact on terrestrial ecology is considered as acceptable.

16.10 Landscape and Visual Impact Assessment

16.10.1 Under the proposed MPSC development, the cultural and historical features surrounding the project will be preserved and a new landscape design within the MPSC study area implemented that is considered appropriate to the planned context of the area and should produce long term landscape and visual benefits.

16.10.2 The current landscape resources and character within the site are of limited quality and value. The project provides a clear opportunity for enhancement by undertaking significant tree planting and public space creation. Approximately 160 trees will be lost during the construction of the project, but none of them are of any importance or with high amenity value. It is anticipated that the project will carry out planting of about 340 new trees.

16.10.3 With suitable mitigation measures taken to enhance the visual compatibility such as extensive greening and superstructure designs that respond to the existing and planned urban context in terms of scale, height and bulk (visual weight), the different facilities within the Project will have an overall enhanced visual effect on the area. The landscape deck will contribute as an attractive open space and integrating all the buildings within MPSC development. The landscape deck provides seamless linkage from the MTR stations to the Metro Park and surrounding development within the KTD. It offers people a visually stimulating environment and help to create a sense of place.

16.10.4 Glare impact on Visual Sensitive Receivers (VSRs) located near the MPSC and associated above ground structure have been reviewed. The predicted glare rating for all of the VSRs within the study boundary are below the Glare Rating Limit adopted. No significant discomfort glare condition is anticipated.

16.10.5 It is not anticipated that there will be any adverse residual impacts generated by the Project, whilst significant greening of the site, coupled with careful visual integration into the urban context through control of scale, massing and building disposition will provide a long term beneficial visual outlook.

16.11 Cultural Heritage Impact Assessment

16.11.1 Relevant cultural heritage impact assessments in previously approved EIA reports have been reviewed (*Kai Tak Development (Register No.: AEIAR-130/2009)* and *Shatin to Central Link (SCL) – Tai Wai to Hung Hom Section (Register No.: AEIAR-167/2012)*). Based on the site location and the survey plan in Year 1904, the Project site was formerly a sea area. It is unlikely ancestors have congregated at the Project Site. Hence, the project site has no archaeological value. Built Heritage Impact Assessment is not required as there is no built heritage within the Study Area of the Project and associated works.

16.11.2 The Project will not interfere with Lung Tsun Stone Bridge Site of Archaeological Interest. The southern portion of the former Sacred Hill and the southern portion of the archaeological survey-cum-excavation area of SCL – Tai Wai to Hung Hom Section for Sacred Hill (North) fall within the CHIA Study Area. Since no archaeological deposit was discovered from the southern portion of the archaeological survey-cum-excavation at Sacred Hill (North) and these two areas fall outside the project site, there is no cultural heritage impact arising from this Project and no mitigation measure is required.

16.12 Environmental Monitoring and Audit Requirement

16.12.1 It is recommended that an EM&A programme should be implemented during the construction and operation phases (i.e. regarding musical event noise, stormwater reuse, and landscaping) to monitor the environmental impacts on the neighboring sensitive receivers. A standalone EM&A Manual has been prepared to specify the monitoring requirements for the implementation of the environmental mitigation measures identified in the EIA process.

16.12.2 The Environmental Mitigation Implementation Schedule (EMIS) in Chapter 14 has also been included in the Appendix A of the EM&A Manual detailing the proposed mitigation measures, the implementation locations, timeframe, and implementation agent.