2. Project Description

2.1 Existing Site Conditions

The West Kowloon Cultural District (WKCD) site is located on the West Kowloon Reclamation south of Austin Road West and the Western Harbour Crossing Toll Plaza as shown in **Figure 1.1**. The site is currently zoned as "West Kowloon Cultural District Development Plan Area" under the approved South West Kowloon Outline Zoning Plan (No. S/K20/28) gazetted on 8 January 2013, and comprises approximately 40ha of land bordering the Jordan/Tsim Sha Tsui area. The site reserved for the WKCD development is currently occupied by works sites, local roads, temporary storage / parking facilities, a temporary promenade at the Waterfront and a number of existing infrastructure and utility facilities such as ventilation buildings for the Western Harbour Crossing and the MTR railway line, a sea water pumping station, etc. Parts of the WKCD site are also currently occupied by the Tsim Sha Tsui Fire Station and by the works site and temporary works areas for the Hong Kong Section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL) project.

2.2 Project Components

Following from recommendations by the Consultative Committee on the Core Arts and Cultural Facilities (CACF) of WKCD in 2006, a number of CACF were proposed, including both performing arts and visual arts venues. Other facilities including hotel, offices and residential (HOR) and Government, Institution or Community facilities (GIC) were also recommended. Plans to imbed sustainability into these core facilities and the WKCD area include adoption of green building designs, renewable energy technologies, water and energy conservation measures, and green transportation.

The proposed WKCD development will comprise the following major facilities.

Core Arts and Cultural Facilities (CACF)

The CACF will consist of:

- A Mega Performance Venue, an enclosed facility designed for popular amplified music events, with the flexibility to accommodate other art forms and large-scale entertainment events;
- Exhibition Centre Complex, designed for large-scale cultural, entertainment and commercial events with facilities to support entrepreneurial arts related events and cultural activities – extending from art fairs and book fairs to fashion shows, performance installations, product launches and celebrations and galas;
- A Great Theatre, designed for large-scale productions optimised for a wide range of amplified music theatrical performances with supporting facilities such as spacious foyer designed to accommodate small-scale informal performances and temporary exhibitions, VIP rooms, box lounges, integrated retail and dining facilities, and ample rehearsal spaces;
- A Musical Theatre, intended primarily for broadway-style musicals and performances of other art forms, including western and Chinese opera and dance;
- A Lyric Theatre, a facility with an orchestra pit for dance, ballet, opera, musicals and theatrical performances, which is designed principally for operatic and dramatic performances, various forms of dance and a wide range of art forms, incorporating unamplified and amplified music accompaniment;

- A Centre for Contemporary Performance (CCP) comprising three flexible performing spaces of different sizes (blackbox theatres) and additional workshop/classrooms for educational programs. The CCP will be a facility for contemporary performing arts, mulit- and cross disciplinary, multimedia theatre, music and dance;
- Thrust Theatre, primarily designed to meet the needs of larger contemporary dance ensembles and spoken-word drama with amplified music;
- Proscenium Theatre, designed for medium-scale theatrical and dance performances with amplified music, primarily to meet the needs of spoken word theatre and various forms of dance;
- Outdoor Theatre, integrated within the landscape design of the Great Park, designed as a space primarily for both free and ticketed amplified or electronically reinforced music performance;
- A Music Centre comprising a Concert Hall and a Recital Hall, designed for the acoustics and performance requirements of large scale unamplified instrumental and vocal music, of both western and Chinese origin;
- A Xiqu Centre with Large Theatre and Small Theatre as well as a commercially operated teahouse – showcase and education venue for Chinese opera, and a single balcony courtyard type venue with integrated catering facilities;
- An enclosed Freespace with Music Box – a physical cluster of two indoor venues. The two indoor venues are namely Music Box and Freespace Theatre. Music Box is intended for the presentation of pop culture events with a focus on music, and is highly flexible for stage position and seating configuration. Freespace theatre is intended for popular and experimental performances such as music, theatre and dance. This venue is highly flexible and offers an opportunity for the presentation of broad range of performance types with stalls format; and
- A museum (Museum Plus) for visual culture – contemporary art, design, architecture, moving image and popular culture – looking at the world from a Hong Kong perspective.

Other Arts and Cultural Facilities (OACF)

The CACF will be supported by the OACF which include Resident Company Centres, Arts and Craft Studios, Pavilions and Literary Arts Centre.

Infrastructure and Support Facilities

The WKCD will also involve the following infrastructure and support facilities:

- Government, Institution or Community (GIC) facilities including electricity substation, police post etc.;
- Various retail, dining and entertainment (RDE) facilities; and hotel, office and residential (HOR) developments. All residential buildings inside WKCD will be mixed with commercial components such as RDE and office at lower floors to support the leisure lifestyle and minimize the environmental impacts at residential floors;
- A district cooling system to provide chilled water for WKCD facilities for substantial energy saving, with possible extension to Government, Institution or Community facilities and hotel, office and residential developments subject to technical, financial and implementation mechanisms;
- On-site renewable energy systems e.g., wind turbines and photovoltaics for local electricity supply;

- A green transportation system in the form of travellators and eco-buses (operating in the underpass road), coupled with substantial pedestrianisation within the WKCD;
- Local road networks comprising a main underpass of approximately 1400m in length, a flyover bridge of approximately 200m in length across the Western Harbour Crossing toll plaza, at-grade link roads, lay-bys and emergency vehicular access;
- Other accessibility features including possible external footbridge connections from WKCD to Kowloon Park, China Ferry Pier, the International Commerce Centre, Elements mall, and pedestrian links (e.g. subway and landscape deck) to West Kowloon Terminus and Austin Station;
- One optional viewing platform and two possible piers for water access subject to the Protection of the Harbour Ordinance (Cap. 531). The viewing platform is an extension of the waterfront promenade, possibly composed of cantilever structure on top of seabed and foreshore. The two possible piers aims to enable marine connectivity for visitor to the MPV/EC and the Great Theatre;
- Park – extensive areas of grass and open space with trees offering shade for open air leisure, recreation, refreshment and walking, allow people to relax and find quiet spaces together;
- Modification of seawalls for the construction of seawater discharges/outfalls and landing steps near south or south-west boundary of the WKCD site;
- Optional water reuse facilities – options to be considered include green building initiatives such as rainwater harvesting and/or reuse of condensate from air conditioning systems;
- Optional automatic refuse collection system, if technically feasible and financially viable. The system aims to enhance recycling and to minimize nuisance to be caused from typical waste collection. Should the automatic refuse collection system be implemented, the piping network will be installed underground and rely on transport of waste by vacuum, replacing the traditional refuse room and waste container;
- Possible relocation of the existing Tsim Sha Tsui Fire Station located at the south east boundary of the WKCD site in stages; and
- Associated utilities, drainage, sewerage, sewage pump sumps, waterworks, engineering works, landscaping and environmental mitigation measures.

2.3 Need of the Project

2.3.1 Purpose and Objective of the Project

The idea of developing part of the West Kowloon Reclamation into a Cultural District began in the late 1990s, with the following objective:

"To enhance Hong Kong's position as Asia's premier centre of arts, culture and entertainment and create a new look for Victoria Harbour".

WKCDA's vision is to develop the WKCD into an integrated arts and cultural district that will:

- Provide quality culture, entertainment and tourism programmes with a must-visit appeal to both local residents and visitors from around the world;
- Meet the long-term infrastructure needs of Hong Kong's arts and cultural development; and

- Become a cultural hub for attracting and nurturing talents, an impetus to improve quality of life, as well as a cultural gateway to the Pearl River Delta.

On a regional level, the WKCD project aims to facilitate the long-term development of Hong Kong as an international arts and cultural metropolis that enhances cultural exchange and cooperation among Mainland China, Hong Kong and other places, as well as enhance cooperation among government and non-government organisations and providers of the arts and strengthen Hong Kong's position as a tourist destination. On a community level, the project will encourage wider participation and community, commercial and corporate support and sponsorship of arts and culture, while promoting and providing arts education and free and accessible open space to the general public. The open space offers an opportunity to create an extensive network of open spaces through the Kowloon Peninsula linking Kowloon Park to the WKCD parks and squares and generates opportunities to develop extensive outdoor spaces conducive to the practice of passive activities such as cycling, strolling and picnics. The WKCD will serve to provide artists with freedom of artistic expression and creativity and nurture local talents in the arts. It will also provide opportunities to develop new and experimental works in arts and culture as well as development of cultural and creative industries. Visitors to the WKCD will enjoy enhanced diversity and pluralistic range of the arts and the WKCD will be a centre for promoting excellence, innovation, creativity and diversity in arts and culture.

2.3.2 Environmental Benefits of the Project

The major environmental benefits that can be attained directly from the project are the creation of the Park and the provision of a green transportation system within the WKCD.

- The Park will be a large, planted open space supporting numerous trees as well as providing grassy areas and various other landscape and amenity planting. This park will form a permanent major addition to the natural environment surrounding West Kowloon and Victoria Harbour and will significantly enhance the amount of green space within the urban Hong Kong environment. In addition, many of the roof and podium structures for the buildings will incorporate green roof elements to maximise the provision of green space as well as contribute to beneficial thermal control of the buildings, thereby reducing energy consumption and associated emissions.
- A green transportation system will be adopted within the WKCD to minimise carbon and air pollutant emissions. The design of the WKCD will focus on pedestrianisation, and where appropriate, will be augmented by additional modes such as eco-buses and travellators. Locating the vehicular network within the site to the basement level will substantially reduce the traffic noise impact, and also free up more space at ground level for provision of landscaping and planting.
- Aside from the park, the built features of the WKCD will bring about additional landscape and visual enhancements through the provision of new and aesthetic structures that complement the immediate surrounding developments. Many of the CACF will go through a design competition to generate the optimum design for these future signature buildings, and these will be appropriately balanced with landscaping elements to create a visual attraction from both near and afar.

In addition, sustainability is a parallel vision of this project and can bring about environmental benefits from the core facilities of the WKCD through innovative design and state-of-the-art systems that minimise energy consumption and improve environmental performance.

- A district cooling system (DCS) will be adopted for providing chilled water to WKCD facilities. This is a proven technology for providing substantial energy savings compared to conventional air-cooled chillers, and depending on the technical, financial and implementation mechanisms, this system may be

extended to cover Government, Institution or Community facilities as well as hotel, office and residential developments.

- The use of renewable energy systems will form part of the design of the major built elements, with particular focus on the use of solar photovoltaic systems to augment the electricity or heated water requirements of the buildings, and, the use of wind turbines to contribute to other energy uses such as streetlamps.
- Water conservation features such as rainwater harvesting and reuse of condensate from air conditioning systems will be incorporated to reduce the potable water demand from the WKCD facilities.

2.3.3 Scenario with the Project

The WKCD is an important strategic project that will support Hong Kong's development as a creative economy and global metropolis, and is a major initiative to meet the long-term infrastructure needs of Hong Kong's arts and cultural development. The development of the WKCD can foster organic growth and development of cultural and creative industries, attract and nurture talents, promote international exchange and co-operation, enhance the quality of life for citizens and make Hong Kong the cultural gateway to the Pearl River Delta. It also provides an opportunity for incorporating a variety of green features (see **Section 2.3.2**) to improve the environmental performance of the development.

The establishment of the CACF will form the heart of the arts and cultural community in Hong Kong and will provide and strengthen the platform for showcasing all forms of art and culture as well as promote the creation, communication and exchange of arts and cultural ideas. These facilities will also provide a focal point for arts and cultural enthusiasts to immerse in both locally and internationally recognised arts and cultural entertainment.

The OACF will complement the signature arts and cultural facilities by providing related supporting facilities including various studios and centres for the preparation and compilation of a diverse range of arts and cultural programmes. There will also be educational institutions for arts and culture to nurture future talents and build up Hong Kong's ability to compete on the international arts and culture arena.

The Park will form a centrepiece for the WKCD and will create a large open space planted with numerous trees and overlooking the magnificent views of Victoria Harbour, which will significantly increase the amount of quality green space in the urban area and will also provide a key attraction for both locals and tourists. The large open space with trees and landscape features will have potential contribution to ecological enhancement as the current Project site predominantly consists of artificial habitats of low ecological value. The landscape and visual environment will be improved by blending in with the surrounding environment and existing facilities such as the Kowloon South Salt Water Pumping Station. It will provide a location for outdoor leisure and small-scale, impromptu arts and cultural performances and exhibits.

The WKCD will form a major destination and attraction for local residents as well as visitors from the Mainland and other parts of the world. Many of the completed railway networks adjacent to the site, such as Kowloon Station and Austin Station, have been built to accommodate the projected increase in passenger demand that will arise from operation of the WKCD. In addition, the adjacent road and rail networks currently undergoing planning or construction, such as the Express Rail Link West Kowloon Terminus, road improvement works at West Kowloon and Central Kowloon Route, are being developed (by others) with the WKCD as one of the main driving factors. The WKCD development will form a major anchor that binds these transportation networks together and create the synergy between travel and

destination that is crucial for optimising the tourism potential at West Kowloon. A green transportation system will also be adopted within the WKCD to minimise carbon and air pollutant emissions.

The non-cultural facilities within the WKCD including the residential, commercial and retail sectors will provide the sustainable mix of activity required to ensure the WKCD becomes a liveable community that integrates with the existing surrounding communities. These non-cultural facilities provide additional opportunities for meeting the strong commercial and residential demand in the Kowloon harbourfront area, will help to boost the economy of the surrounding neighbourhood, and may also speed up regeneration of the older parts of the Western Yau Tsim Mong District.

Overall, development of the WKCD will not only bring value-added contribution to the Gross Domestic Product (GDP) of the economy, visitor spending and employment opportunities, but also various intangible benefits for the development of a creative economy, nurturing local talents, attracting and retaining investors and talents, raising quality of life, reinforcing economic integration with the Pearl River Delta and branding Hong Kong as a world-class city.

2.3.4 Scenario without the Project

According to the recommendation report published by the Consultative Committee on the Core Arts and Cultural Facilities of the West Kowloon Cultural District (CC) in 2007, no new public performance venue has been built in Hong Kong since 2000, and no major territory-wide, purpose-built performing arts venue has been built since the completion of the Hong Kong Cultural Centre in 1989. There has also been no significant development of new performance venues from the private sector (a recent search identified only one new venue since the publication of the CC report). The CC report also stated that the local arts and cultural sectors have remained vibrant and pluralistic in the past 10 years despite the ups and downs in the economy, with increasing number of performing arts groups, programmes and audiences. As a result, there has been an acute shortfall in supply relative to increasing demand for centrally located performing arts venues. This shortfall has adversely affected the availability of renowned overseas long-run stage performances in Hong Kong and made it difficult for good productions to become financially viable. This in turn has affected the versatility and healthy growth of creative industries in Hong Kong and the development of new, budding and small-scale arts groups. Museums also face a similar problem as there is currently insufficient museum space and a lack of 'flagship' museums to showcase the cultural characteristics of Hong Kong and the region, particularly on modern/contemporary arts and culture.

In the absence of the project, the aforementioned issues will continue to have an increasingly adverse impact on the arts and cultural sector in Hong Kong. The lack of suitable infrastructure for arts and culture will continue to inhibit the healthy growth of the arts and cultural sector in Hong Kong, and in particular, the CC report identified that the shortage of venues for the Cantonese opera sector is threatening the survival of the Cantonese opera profession in Hong Kong.

In addition to direct impacts on the arts and cultural sector, the lack of an integrated arts and cultural district will reduce the tourism appeal of Hong Kong, and the tourism sector has already indicated that Hong Kong is at risk of losing its competitive edge as a tourist attraction/destination in the absence of (or undue delay in) implementation of the WKCD project. The people of Hong Kong will also be affected by a lack of new facilities for attending performances and exhibitions, and have already voiced their opinions early on in the public consultations for the WKCD development that the project should not be abandoned, and that they are keen to see the project implemented as soon as possible.

Given the strategic location of the WKCD site in relation to existing and planned rail networks; particularly the Express Rail Link project already undergoing construction, the absence of the WKCD will have a direct impact on the operational and financial forecasts on which these new rail facilities are based, thereby creating knock-on effects for adjacent and concurrent major infrastructure projects.

The CC has expressed that public expenditure on culture and the arts should be regarded as an investment as important as any other major forms of investment, as it contributes to freedom and diversity of expressions, creativity and innovation, community building and development, as well as social harmony and cohesiveness. The WKCD is such an investment in culture and the arts, without which, the benefits of such investment cannot be realised.

Furthermore, WKCD is intended to incorporate open space, tree plantings and landscape features, increasing the greenery spaces for members of the public to relax. Without the Project, these features will not be developed.

2.4 Consideration of Alternative Development Options

2.4.1 Introduction

With the mission to turn the vision of the WKCD into reality, a decision was made by the WKCDA to explore how the WKCD should be built by undertaking a three-stage public engagement (PE) exercise. The stages of the PE exercise comprised the following:

- Stage 1 - Gauge the public and stakeholders' views on their aspirations and expectations of the WKCD as well as users' requirements for the arts and cultural facilities.
- Stage 2 – Presentation of three Conceptual Plan Options for the WKCD by three different consultants commissioned by the WKCDA.
- Stage 3 – Presentation of the proposed Development Plan (DP) before refinement and submission of the final DP to the Town Planning Board for approval.

2.4.2 Alternative Development Options

2.4.2.1 Summary of the Stage 1 and Stage 2 PE Exercise

The Stage 1 PE exercise was conducted between 8 October 2009 and 7 January 2010. Based on the responses received, a number of important concepts were identified which include:

- Green Setting and Environmental Friendliness;
- Hong Kong Characteristics;
- A Relaxing Atmosphere;
- More Open Space;
- Connectivity and Convenience;
- Well-planned Ancillary Facilities, Universal Accessibility and the Use of Advanced Information and Communication Technologies;
- Catering to the Needs of Different Users; and

- The Importance of Arts Education and Nurturing Talents.

The findings from the Stage 1 PE exercise were taken into consideration by the Conceptual Plan Consultants for formulation of the Conceptual Plan (CP) Options to be presented to the public under the Stage 2 PE. Three master planning teams each prepared CPs showing the proposed distribution of the arts and cultural facilities as well as various other land uses, including commercial, retail, hotel, residential and public open space (shown in **Figure 2.1a** to **2.1c**). The three CPs are:

1. "*City Park*" – by Foster + Partners
2. "*Cultural Connect: Key to Sustained Vitality*" – by Rocco Design Architects Ltd.
3. "*Project for a New Dimension*" – by Office for Metropolitan Architecture

The Stage 2 PE exercise was conducted between 20 August 2010 and 20 November 2010. The results of the public survey from the Stage 2 PE exercise suggests that the public generally favours the "*City Park*" Option for most of the questions asked. In particular, the "*City Park*" Option appeared to be most favoured by the public from an environmental perspective, due to the highest ranking it has received from questions on 'Green Setting', 'Environmental Friendliness', 'Public Open Space' and 'Open Space' categories. Following completion of the Stage 2 PE exercise, "*City Park*" was recommended as the preferred option to take forward.

2.4.2.2 Modified Conceptual Plan

The purpose of the modified CP stage is to refine the preferred CP (the "*City Park*" option) to allow incorporation of the feedback obtained during the Stage 2 PE exercise as well as further consideration of environmental and technical issues, and to translate it into an implementable Development Plan. The changes include modification of originally proposed CP elements from the "*City Park*" option as well as addition of desirable features from the other CPs where practicable. A number of features proposed by different CPs were particularly supported by the public. These desirable features and their influence on the modified CP is summarised in **Appendix 2.1**.

Based on the consideration of desirable features and other modifications to the preferred CP, the preliminary layout of the WKCD was revised as shown in **Figure 2.2**. A summary of the major changes and the environmental benefits / dis-benefits arising from the layout changes between the preferred CP and the modified CP is provided in **Table 2.1**.

Table 2.1: Summary of Major Differences between the Conceptual Plan Option: "City Park" and the Modified Conceptual Plan

Feature	Conceptual Plan Option: "City Park"	Modified Conceptual Plan	Reason for Change	Environmental Benefit / Dis-Benefit
CACF				
M+	Located on south east side of WKCD	Located on western side of WKCD adjacent to the Park	This was part of the general re-shuffling of land use parcels to further improve efficiency of layout within WKCD	No significant difference
Xiqu Centre	Located at the centre of the 'Theatre District'	Located at the eastern boundary of WKCD	This was part of the general re-shuffling of land use parcels to further improve efficiency of layout within WKCD	No significant difference

Feature	Conceptual Plan Option: "City Park"	Modified Conceptual Plan	Reason for Change	Environmental Benefit / Dis-Benefit
Outdoor Theatre	Located adjacent to the eastern side of the Western Harbour Crossing	Located near the tip of the Western Harbour Crossing portal	As part of the general re-shuffling of land use parcels within WKCD, the outdoor theatre was relocated further within the Park to enhance the integration of this theatre with the park environment	Reduces potential operation phase noise impact from the Outdoor Theatre on nearby planned and existing NSRs
Transportation Elements				
Ferry piers	One ferry pier located at south-facing waterfront	Two possible piers, one located at south-facing waterfront and another located at west-facing waterfront, both subject to the Protection of Harbour Ordinance	To improve the dynamics of pedestrian flow throughout the WKCD, it was considered preferable to have two possible piers to serve as entry points from other parts of Hong Kong	Additional marine works may potentially cause noise and water quality impacts during construction phase, but can be mitigated with appropriate protection measures
Automated People Mover / Travellator System	Elevated APM	Ground based pedestrian (e.g. travellator) systems	Further engineering analysis revealed that it was not feasible to construct an elevated APM given the site constraints. A review of alternatives was made and generally, ground based pedestrian systems (e.g. travellator) was identified as the preferred alternative due to its flexibility of implementation and better integration with the surrounding pedestrian network	Avoidance of potential railway noise source, therefore reducing potential operation phase noise impacts. Also avoids potential visual intrusion due to elevated APM structures
Ancillary Facilities				
Elements Footbridge	One footbridge located at western side of 'Theatre District'	A potential additional footbridge connecting the north western side of WKCD with 'Elements' mall	To improve the dynamics of pedestrian flow throughout the WKCD and particularly to serve the Mega Performance Venue, it was considered preferable to have two pedestrian footbridges to serve as entry points from 'Elements' mall	Implementation of the additional footbridge would extend the project boundary and associated construction works area, however, additional environmental impacts are likely to be minor
Floating structures	None	An optional viewing platform located at the south-facing waterfront, subject to the Protection of Harbour Ordinance	Such features were not originally proposed in the 'City Park' scheme, but the findings from the Stage 2 PE exercise identified these to be desirable features from other conceptual plans, hence they have been added to the scheme	Additional marine works may potentially cause water quality impacts during construction phase, but can be mitigated with appropriate protection measures

Aside from the comparative environmental benefits / dis-benefits due to changes in the preliminary layout of the WKCD shown in **Table 2.1**, a preliminary environmental assessment was undertaken by Foster + Partners for the original "*City Park*" option. A summary of the findings from the original preliminary environmental assessment for the "*City Park*" option (Original PEA) and the major changes to the preliminary environmental assessment findings due to the updated Modified CP (Modified PEA) are

presented in **Appendix 2.2**. In general, most of the findings from the Modified PEA show either no significant change, or an improvement on the findings from the Original PEA.

2.4.2.3 Stage 3 PE Exercise

The purpose of the Stage 3 PE exercise was to showcase the Modified CP to the public for final comment prior to finalisation of the Modified CP into a detailed Development Plan (DP) for submission to the Town Planning Board (TPB). The Stage 3 PE exercise started on 30 September 2011 and was concluded on 30 October 2011. During this time, a total of 1,172 comments and views via the PE 3 pamphlets, online and media reports were received from members of the public. The WKCDA also held a total of 12 public engagement events including one youth forum, two public presentations, nine focus group meetings/forums, and one conference.

Following completion of the Stage 3 PE, a "Report on the Analysis of Views for the Stage 3 PE exercise for the WKCD" was published in December 2011 to summarise and present the findings. A summary of the results from the report is presented in **Appendix 2.3**.

2.4.3 Development Plan

Taking into account the views obtained from the Stage 3 PE exercise, the Modified CP was further reviewed from an environmental and other technical perspective and refined into a proposed Development Plan (shown in **Figure 1.2**). **Table 2.2** summarises the approach adopted in approved West Kowloon Cultural District Development Plan No. S/K20/WKCD/2 and associated environmental benefits / dis-benefits. As the Modified CP had already optimised the CP from Stage 2 PE exercise, most of the changes that form the Development Plan consist of minor refinements, including relocation of the Outdoor Theatre to the south part of the Park (which further minimises potential air quality impact from the Western Harbour Crossing on the visitors of Outdoor Theatre while also reducing the potential operation phase noise impact from the Outdoor Theatre on nearby NSRs) and make the planned noise mitigation deck proposed by the Road Works at West Kowloon (AEIAR – 141/2009) over Austin Road West become pedestrian accessible linking WKCD and MTR Austin Station.

Table 2.2: Summary of Development Plan Approach and Environmental Benefits / Dis-benefits

Major Categories	Approach Adopted in Development Plan	Environmental Benefits / Dis-Benefits
Overall Layout / Development Plan	The overall layout and design has been significantly based on public aspirations identified since the Stage 1 PE Exercise and has sought to create the right balance of green space versus development to achieve the optimum availability and utilisation of both. The efficiency of space allocation was a major planning consideration for the district, leading to a complex utilities and basement road network to increase availability of usable space aboveground. Specific and iconic architectural features for individual buildings and structures will follow in the later stages once the Development Plan is approved.	The complex basement structure will increase the amount of excavated materials requiring disposal during the construction phase, but will also bring a reduction of air quality and noise impacts during the long-term operation phase. The height and density of buildings are in line with the visual context of the surrounding urban environment and the increased amount of greenery will also be beneficial from a landscape and visual impact perspective
Arts and Cultural Facilities	The types of CACF to be provided at the WKCD has been set and agreed by stakeholders in the arts and cultural community. The location of individual CACF took many factors into consideration including building facilities and capacity requirements,	The CACF in general will not generate any direct environmental impact except for the Outdoor Theatre, which is a potential noise source. This has been located away from nearby NSRs. The CACF may be affected by noise and vibration from nearby roads

Major Categories	Approach Adopted in Development Plan	Environmental Benefits / Dis-Benefits
	site constraints, user convenience and other factors that are important for district planning. Many of the CACF will be dynamic enough to support a wide variety of arts and cultural events, and some of the CACF will go through design competitions to capitalise on innovative ideas from the public and private sectors.	and railways which is difficult to avoid within the boundaries of the WKCD site but can be minimised and mitigated with the adoption of appropriate measures.
Phasing	Public preference for early implementation has been recognised and the current programme aims for construction to commence in 2013 with completion in phases starting from 2015 and extending to beyond 2020.	Fast implementation may increase the magnitude of construction phase environmental impacts, but will limit the duration of impact.
Public Open Space	The Park has been designed to fit with the surrounding urban environment and maintain flexibility to cater for a variety of recreational uses. The scale and dimensions of the Avenue was modelled on existing popular streets in Mong Kok and Tsim Sha Tsui in order to retain a Hong Kong identity while supporting the efficient allocation of usable space within the WKCD. Specific details regarding the facilities to be provided at the Avenue and the Promenade will follow in the later stages once the Development Plan is approved.	The overall layout and design has allowed for a significant amount of green space that will positively contribute to the environment within the WKCD. Large amounts of landscaping and planting will be beneficial from a landscape and visual impact perspective, and may also bring improvements to the ecological value of the WKCD.
Commercial and Residential Facilities	Residential developments are considered necessary within the WKCD to create a self sustaining community that balances the flux of transient visitors to the CACF. The retail, dining and entertainment facilities (RDE) will aim to support the operation of the CACF and the commercial and residential developments and ensure that the WKCD is maintained as a vibrant and lively neighbourhood. Specific details regarding the types and operations of the RDE will follow in the later stages once the Development Plan is approved.	Residential developments within WKCD are planned sensitive receivers and may be subject to adverse air quality and/or noise impacts. Planning of the future locations of residential developments has taken into consideration the major sources of air and/or noise emissions in order to, as far as practicable, avoid any adverse impacts, and where unavoidable, mitigation measures will be applied to minimise potential adverse environmental impacts.
Transportation, Connectivity and Accessibility	In line with public aspirations, the WKCD will focus on pedestrianisation and provide efficient access to existing public transport surrounding the WKCD via the provision of various pedestrian links to the north and east of the site. The provision of possible piers is also envisaged provided that they do not conflict with the Protection of the Harbour Ordinance.	The absence of significant roads aboveground within the WKCD reduces the potential operation phase air quality and road traffic noise impact to nearby ASRs/NSRs. Construction of the possible piers may induce water quality impacts to Victoria Harbour during construction phase, but can be mitigated with appropriate measures. During operation phase, the possible piers are anticipated to be used for leisure purposes without any planning for routine uses and night-time activities will be restricted. Therefore, the potential marine traffic to be generated at the possible piers would be insignificant.
Sustainability	Sustainability initiatives form a key part of the WKCD and have been incorporated where practicable.	Some sustainability initiatives (e.g. district cooling system) may create potential noise and water quality impacts, while others (e.g. green roofs) may create beneficial landscape and visual impacts.

2.5 Consideration of Alternative Construction Methods and Sequences of Works

For the WKCD project, the major construction activities comprise the following:

- Deep excavation for the basement;
- Foundation works for the buildings, basement and bridges;
- Site formation and road construction works, including utilities laying and landscaping works; and
- Superstructure for CACF facilities, hotels and RDE etc.

Consideration of different construction methods that can be adopted will need to take into account the following factors:

- Severity and duration of the construction impacts on nearby environmental sensitive receivers;
- Land and marine traffic impact on existing / adjacent network;
- Satisfaction to the design and functional requirements of the WKCD developments, such as loading requirements and the space requirement for the CACF facilities;
- Site constrains, such as high water level, limited working space, potential impacts to adjacent facilities such as Airport Express Line, West Harbour Tunnel, MTR railway tunnel etc.; and
- Coordination with concurrent interfacing projects and the future developments within and/or adjacent to the WKCD area.

2.5.1 Alternative Construction Methods

2.5.1.1 Excavation

The main excavation works required for the project is for formation of the basement. Two basement levels are proposed to accommodate various facilities including parking, vehicular access and electrical and mechanical (E&M) plant. The anticipated excavation levels for the bulk excavation of the major basement will be approx. -6.5mPD, which is approx. 11.5m below ground level (at 5mPD), except for the basement under the proposed Mega Performance Venue and Exhibition Centre, which will be approx. -17.0 mPD. As the site is adjacent to the harbour, high groundwater levels are anticipated. Other constraints on the excavation works include the composition of the excavated materials and the presence of existing underground utilities and railway facilities.

By the nature of the basement design, the superstructures to be supported aboveground, and the soft ground that comprises the WKCD site, excavation will need to be via open cut method. Two options for open cut excavation are available: open cut with temporary cut slopes, or via excavation lateral support (ELS) system. The temporary cut slope option is the simplest method for open cut excavation, however this requires extensive working space surrounding the excavation to provide stable temporary cut slopes. As the WKCD basement extends close to the site boundary which is bounded by Victoria Harbour to the south and trunk roads to the north and east, this option would not be feasible. The ELS system method is considered appropriate as it allows excavation with vertical sides using lateral support by either diaphragm walls or similar ELS system, which can meet the site constraints. From an environmental perspective, the ELS system method minimises the excavation area and may reduce the potential construction dust release compared with the cut slope option. Excavation via ELS system by bottom-up open cut method is

recommended as details of the superstructures above the basement are not available at this stage, hence this construction method would be technically more straightforward than other methods (such as top-down excavation). A permanent diaphragm wall is required to provide lateral support to the ground and limit groundwater inflow during construction. In view of the deep excavation, a stiff lateral support system is required to control the lateral movement as well as prevent potential settlement to adjacent ground, structures and property. Variations to this recommended method, such as use of open cut battered side slopes within the basement footprint, may be adopted by the Contractor, and will be verified during detailed design stage.

For disposal of the excavated materials, two options are considered: disposal by trucks, or disposal by barges. Construction of the WKCD basement is anticipated to generate large quantities of excavated materials that require off-site disposal on a daily basis. Disposal by trucks must make use of the existing road network and may generate additional dust and noise impacts. The trucks will also add to the already high traffic volumes on Canton Road and the adjacent urban road network, which may induce disturbance to traffic flows and simultaneously hamper the efficiency of the disposal process. As the WKCD site is on the harbourfront, disposal by barge is recommended. There are 4 existing barging points situated within the WKCD site which is being operated by MTRC for construction of the West Kowloon Terminus. It is proposed that the WKCD project will make use of the barging points for disposal of excavated materials as far as practical to match the construction programs, and trucks will mainly be transporting the excavated materials from the excavation area to the barging point. As the barging points are located within the WKCD site, the use of public roads and associated impacts will be minimised. For imported fill required for formation of the Park, transport by barge is also recommended, subject to confirmation of the source, quantities and programme for imported fill requirement during detailed design stage.

2.5.1.2 Foundation Works

Foundation works are required for formation of the basement structure and for the future WKCD buildings. The selection of foundation schemes are based on the following criteria:

- Types of structure to be supported and load carrying capacity required;
- Availability of materials and plants;
- Local experience;
- Site constraints; and
- Construction schedule.

It is anticipated that the foundation works will take the form of reinforced concrete columns and pile caps founded on bored piles. The piling options that are considered include:

- Option A – Large diameter bored piles;
- Option B – Pre-bored rock socket steel H-piles; and
- Option C – Driven Steel H-piles.

Of the three options for piling, Option C has a relatively low loading capacity which necessitates a greater number of piles compared to Options A and B, and will also generate the greatest noise and vibration impacts, hence this option is not recommended. The environmental impacts of Option A and Option B are similar, however Option A provides larger loading capacity to meet the design requirements for the future WKCD facilities. Hence Option A is the preferred piling option.

2.5.1.3 Site Formation

The construction methods to be employed for site formation and roadworks are all conventional methods which include site clearance, excavation and filling, construction of access road and utilities laying, and finally the landscape works. For these works, the methods are well established and there are limited alternative options.

For construction of the possible piers and intakes/outfalls for the WKCD drainage and district cooling systems along the harbourfront which involves minor seawall modification, no dredging is required. Construction of the possible piers will require installation of marine piles, which will be driven into the seabed. Silt curtain will be deployed to enclose the marine works. Construction of the outfalls and landing steps will involve excavation and modification of the existing seawall, followed by installation of the landing steps and intakes/outfalls. The surrounding seawall will then be reconstructed and backfilled. Further details are provided in **Section 5.6.1.2**.

2.5.1.4 Superstructures

Construction of the superstructures for buildings will likely take the form of one of the following:

- Conventional in-situ reinforced concrete construction;
- Precast concrete construction; or
- Steelwork construction much of which will be in the form of prefabricated steelwork elements.

In general, the aforementioned superstructure construction options will not present significant differences in terms of the environmental impacts to nearby sensitive receivers. Specific construction methods will be determined once the structural form of the buildings has been developed. A concrete batching plant (CBP) with a silo capacity of less than 10,000 tonnes is proposed to be located onsite. There is an existing concrete batching plant situated within the WKCD site which is being operated by MTRC for construction of the West Kowloon Terminus. It is proposed that the WKCD project will make use of the existing concrete batching plant to minimise unnecessary dismantling/installing works. The capacity of the concrete batching plant to be handed over to WKCD by MTRC is approximately 110 tonnes pulverised fuel ash silo and 30 tonnes of cement silo. However, pulverised fuel ash silo will not be used under the WKCD Project. MTRC's CBP (CBP Phase 1 of the XRL project) located in the east (east BCP) will be handed over to WKCD in 2014 to begin operation by WKCD. The east CBP is expected to be operated by WKCD at the same location from 2015 to 2016, as shown in **Figure 3.3d**. WKCD will demolish the east CBP and relocate the CBP to the west of WKCD site (west BCP) in 2017, as shown in **Figure 3.3g**. The West BCP will be demolished in 2021. Potential environmental impacts associated with construction of superstructures will be dependent on the construction programme and will be subject to environmental monitoring and audit.

The WKCD will also contain a vehicular bridge (the proposed Austin Road Bridge over the Western Harbour Crossing) and several pedestrian bridges linking WKCD to external areas such as 'Elements' mall and Kowloon Park. For construction of the superstructures for vehicular and pedestrian bridges, the following methods may be adopted:

- Cast in-situ deck – scaffolding/falsework is erected for the placement of formwork before in-situ concreting of deck structure;
- Single span lifting method – the entire span precast deck will be lifted into position;

- Steel truss with concrete deck – this method involves lifting the prefabricated steel truss followed by construction of the concrete deck; and
- Precast segmental method - the bridge deck will be constructed as precast segments (each a few metres long), which are lifted into position and then tied together with pre-stressing cables. This method has been extensively adopted in Hong Kong in the past.

The pedestrian bridges are generally short and form a relatively small component of the WKCD project, hence the potential environmental impact associated with construction of these bridges, and the difference between construction methods adopted, will have limited environmental significance. Construction of the Austin Road Bridge is severely constrained by the Western Harbour Crossing (WHC) and the location of the existing piled foundations and stub columns. It is anticipated that construction of the vehicular bridge will adopt the precast segmental method in the form of box girders subject to detailed design. Details of the construction methods for the flyover are presented in **Section 15.2.5**. There may also be constraints on the construction programme due to the need to minimise traffic disruption to WHC.

2.5.2 Sequence of Works

Options for construction sequencing are influenced by a number of considerations including the following:

- Public wish for implementation of the WKCD as soon as possible;
- Scheduled handover of temporarily occupied WKCD sites by MTRC for construction of the West Kowloon Terminus under the XRL project; and
- Other sequencing constraints, e.g. excavation and foundations for the basement must come before construction of the building superstructures, etc.

A description of the considerations for the construction sequence for major elements of the WKCD project is provided as follows.

2.5.2.1 Basement

There are two sequencing options for construction of the basement:

- Construction as one whole entity at the same time; or
- Construction as subdivided zones at different times.

To construct the basement as one whole entity would require a huge number of construction plant and equipment working in synchronisation. While this is technically feasible, from an environmental perspective, this option would potentially generate the greatest magnitude of construction phase impacts due to the huge extent and number of plant operating on the WKCD site at the same time. Construction as subdivided zones provides greater flexibility for construction of the basement as it allows different parts of the basement to be constructed at different times according to a more optimised schedule, which is technically preferred as it reduces the construction of the basement to more manageable units and the magnitude of environmental impacts, particularly construction dust and noise impacts, can be reduced. A summary of the benefits and dis-benefits of the two basement construction options is presented in **Table 2.3**.

Table 2.3: Comparison of the Benefits and Dis-Benefits of Basement Construction Sequencing

Considerations	Construction as Whole Entity	Construction as Subdivided Zones	Preferred Option
Environment			
Benefit	The interim scenario where some facilities completed at early stage would be subject to dust or noise impacts from the yet-to-be completed construction works can be avoided	Construction dust and noise impacts can be separated by location and spread over time, thereby reducing potential magnitude of impacts. Greater flexibility in coordination of plants operating together, with potential to minimise cumulative noise impacts.	Construction as Subdivided Zones
Dis-benefit	Maximum number of construction plant and equipment operating at the same time. Considerably greater construction dust and noise impacts.	Some abortive works in temporary works construction by phasing may occur. There will be interim scenario where some facilities completed at early stage would be subject to dust or noise impacts from the yet-to-be completed construction works	Construction as Subdivided Zones
Programme/Technical			
Benefit	Less construction interface.	Greater flexibility in programming construction. Allows earlier implementation of some CACF. Utilize on-site facilities installation.	Construction as Subdivided Zones
Dis-benefit	Large basement extent - structural and geotechnical design difficulties. Lower excavation efficiency due to barging volume limit.	No major dis-benefits	Construction as Subdivided Zones

2.5.2.2 The Park

For construction of the Park, simultaneous construction of the entire park area is not possible as part of the future park site will be occupied by construction of the basement structure for the Mega Performance Venue and Exhibition Centre, and it is anticipated that the current temporary barging facilities and associated access roads towards the southern part of the WKCD site will need to be retained to facilitate removal of excavated materials from the basement construction. It is also anticipated that a temporary tree nursery is required to be set up in order to meet the provision of the recommended trees for the future area in the Park. The temporary tree nursery will be located within the future Park site and unaffected by excavation works. It also serves as a testing ground for the exotic and/or native tree species recommended, in order to test the species adaptability, acclimatization and survival rate in the conditions of the WKCD and allow for sufficient time for proposing alternative. Given that early implementation of the park is of public interest and will also help to mitigate some of the visual impacts generated by the WKCD construction activities, it is practical to construct the Park in phases. This will reduce the active construction area of the Park (and the associated potential construction dust and noise impacts) while allowing early establishment of certain sections of the park to provide associated landscaping, visual and aesthetic benefits.

2.5.2.3 CACF

Construction of the CACF is largely constrained by completion of the basement structure beneath, hence its sequencing is closely linked to that for the basement construction. Some CACF such as the Xiqu Centre and the Centre for Contemporary Performance have been identified as being of greater priority for early implementation, hence construction resources may be focused on completion of these CACF, with progressive completion of other CACF subject to resource and funding constraints. With a phased construction of CACF (see **Section 2.7**), the environmental impacts associated with such superstructure construction are anticipated to be localised and of lesser magnitude than if all the CACF were constructed at the same time. It is also anticipated that in the interim stages upon completion of the basement and prior to commencement of specific CACF, the site of the future CACF will be provisioned with temporary landscaping to further reduce the visual impact associated with inactive parts of the WKCD.

2.5.2.4 Hotel and Other Facilities

Construction of the proposed hotel and other non-CACF buildings are subject to land sale, hence they are likely to be independently implemented after completion of the basement. While many of the non-CACF buildings are located close to adjacent sensitive receivers, each building is small in comparison to the CACF and their construction activities will be of smaller scale and more localised. Similarly, construction of other infrastructure including the bridges and possible piers will form a relatively small component of the WKCD construction activities, hence the environmental difference due to construction sequencing is unlikely to be significant.

2.6 Summary of Selection of Preferred Scenario

2.6.1 Development Options

As described in **Section 2.4**, the Development Plan for the project has gone through both public consultation and technical assessments of development options which has culminated into the selection of the current preferred scenario for development (shown in **Figure 1.2**). This Development Plan is thus the recommended option for development of WKCD as it is considered to best meet the aspirations of the public while maintaining technical feasibility and incorporation of environmental considerations. Throughout the options selection process, environmental considerations have played an important part in setting limits, boundaries, and some of the core requirements of the project. The following summarises the key environmental considerations that have been incorporated into the Development Plan to improve the environmental performance of the project.

2.6.1.1 Key Environmental Benefits

As described in **Section 2.3.2**, the key environmental benefits that will be generated from the project include the following:

- Creation of a Park with trees and various landscape and amenity planting. This park will significantly enhance the environmental setting and increase the amount of green space in West Kowloon. The roof and podium structures for the WKCD buildings will also incorporate green roof elements to maximise the provision of green space within the WKCD;
- Landscape and visual enhancement will be achieved via provision of new aesthetic structures that complement the surroundings with many of the CACF forming future signature buildings and provision of landscaping elements to create a visual attraction from both near and afar; and

- Adoption of a green transportation system that focuses on pedestrianisation and augmented by additional modes such as eco-buses and travellators.

2.6.1.2 Key Environmental Impacts Avoided or Minimised

The three different consultants commissioned by the WKCDA in preparing the Conceptual Plan had also carried out preliminary technical assessments on the options as part of the submission. The technical assessments were conducted with the aim of identifying environmental impacts and alternative strategies in advance. As a result of this process, a number of environmental impacts have been avoided or minimised in the Development Plan. These include the following:

- Locating the vehicular network within the site to the basement level to avoid the traffic noise impact, and increase ground level space for landscaping and planting;
- Consideration of air or noise-sensitive uses (e.g., residential developments) within the WKCD and locating these away from nearby sources of air or noise emissions wherever practicable;
- Relocation of the planned ASRs (e.g. Outdoor Theatre) away from the Western Harbour Crossing to minimise the potential air quality impact;
- Relocation of potential noise sources (e.g. Outdoor Theatre) away from existing and planned NSRs to avoid potential operation phase noise impact;

Other design options that were proposed during the Conceptual Plan stages and were discarded due to non-environmental reasons but have nevertheless contributed to the avoidance or minimisation of potential adverse environmental impacts include the following:

- Removal of proposed aircraft and helicopter landing facilities and thus avoidance of potential adverse aircraft noise impacts to existing and planned NSRs;
- Removal of elevated APM and thus avoidance of potential adverse railway noise and visual impact to existing and planned NSRs, while also increasing ground level space for landscaping and planting; and
- Removal of proposed sewage treatment plant which avoids potential odour impacts.

2.6.1.3 Key Environmentally Friendly Designs Incorporated

Sustainability is also a part of the vision for the project; hence the following key environmentally friendly designs have been incorporated into the preferred scenario:

- Renewable energy systems including use of solar photovoltaics and wind turbines;
- A district cooling system for providing chilled water to WKCD facilities (with substantial energy savings compared to conventional air-cooled chillers);
- Green roofs as part of the thermal control for WKCD buildings;
- Water conservation features such as rainwater harvesting and reuse of condensate from air conditioning systems where practicable; and
- Provision of cycling tracks and extensive pedestrian network to complement the green transportation system.

2.6.2 Construction Method and Sequence

As described in **Section 2.5**, a number of alternative construction methods and sequence of works has been reviewed and compared prior to recommending the preferred option. Consideration of environmental impacts during construction stage has been one of the main factors affecting the choice of construction method and construction sequence. The current recommended option has aimed to provide the optimum balance between environmental concerns and non-environmental considerations such that the WKCD project can be efficiently and sensitively implemented.

A summary of the major construction activities and the comparison of alternative options including justification for the recommended option are provided in **Table 2.4**.

Table 2.4: Summary of Alternative Construction Methodologies and Environmental Benefits/Dis-benefits

Construction Activity	Technical Requirements	Constraints	Environmental Benefit / Dis-benefit
Excavation			
Temporary cut slopes	Requires extensive working space for provision of temporary cut slopes	Basement area extends close to Victoria Harbour and trunk roads – insufficient space for temporary cut slopes	Larger excavation area may increase potential construction dust release
Excavation lateral support system	Requires lateral support by diaphragm wall or similar ELS system. The ELS System should effectively avoid ingress of water to the works area.	Construction duration will be increased due to the construction of ELS System	Excavation extent and potential groundwater intrusion is minimised by use of vertical diaphragm wall
Disposal by trucks	None	High traffic volumes on existing urban road network surrounding WKCD	Potential increased dust and road traffic noise impact to adjacent ASRs/NSRs
Disposal by barges	Designated barging point required –use the existing MTRC barging point on WKCD site	Interface with MTRC's use of the barging point prior to handover of the site back to WKCD	Potential water quality impacts from barge loading operation
Recommended Option Excavation via ELS and disposal by barges (with trucks used for transporting the excavated materials from the excavation area to the barging point) is the preferred scenario as environmental impacts are minimised compared to other options.			
Foundation Works			
Large diameter bored piles	Comparatively larger working spaces are required due to larger piling plants. It is relatively easy to overcome underground obstructions. This pile type has largest structural capacities to cater for lateral and vertical loads and less numbers of piles are required.	May be susceptible to bulging or necking during pile concreting in unstable ground due to the larger pile size.	More C&D material will be generated comparing with driven H-piles.
Pre-bored rock socket steel H-piles	Working spaces required are smaller and flexible to suit the design of the structures, in particular for areas which require temporary traffic	May be susceptible to bulging or necking during pile concreting in unstable ground. Possible collapse of the	More C&D material will be generated comparing with driven H-piles.

Construction Activity	Technical Requirements	Constraints	Environmental Benefit / Dis-benefit
	diversion and are congested with utilities. It is relatively easy to overcome underground obstructions.	annulus space (over-cut) between the side wall and temporary casing before pile concreting would reduce the skin friction. The design loading is smaller comparing with bored piles.	
Driven steel H-piles	Lower loading capacity therefore greater number of piles required. Working space required are smaller and flexible to suit the design of the structures, in particular for areas which require temporary traffic diversion.	Higher ground borne vibration and movement induced from the driving operation may cause damage to the adjacent piles, structures and utilities installations. Pre-boring may be required to overcome underground obstructions and require longer construction period.	Generates the greatest noise and vibration which may impact nearby NSRs. Installation is generally unaffected by groundwater conditions
Recommended Option Use of large diameter bored piles is recommended as it has less environmental impact than some other options and is able to provide the larger loading capacity to meet the design requirements for the future WKCD facilities.			
Site Formation			
Utilities, roadworks and landscaping	Conventional methods	No specific constraints	No difference
Possible piers, intakes/outfalls and landing steps	Installation of marine piles, removal and re-provision of existing seawall	No specific constraints	No dredging will be required
Recommended Option The standard construction methods for utilities, roadworks and landscaping will be adopted as there is no significant implication on environmental impact. Use of marine piles for pier / marine structures construction avoids the need for dredging and is not associated with significant environmental impact, hence it is preferred.			
Superstructures (Buildings)			
Conventional in-situ reinforced concrete	Simple construction method, extensive experience in this type of construction among local contractors. Suitable for complicated structural form of the structures.	No specific constraints	More C&D waste will be generated comparing with precast concrete. Noise generation due to concreting works.
Precast concrete	Suitable for structures when the dimension of the structural members are standardized.	Uneconomical if only a small number of units is required. Connection details may have to be specially designed and would therefore be expensive; The transportation of long units may be difficult.	Less C&D waste will be generated as formwork can be used more effectively. Construction of concrete panels is carried out off-site and potential environmental impact could be minimized.
Steelwork	Fast construction and suitable for long span structures.	The construction cost is generally more expensive than concrete, in particular for fire resistance and corrosion.	Steel members are fabricated off-site and connected on-site. The potential environmental impact could be minimized.

Construction Activity	Technical Requirements	Constraints	Environmental Benefit / Dis-benefit
Recommended Option Generally, the various methods for superstructure construction do not present significant differences in environmental impacts, hence the option to be adopted for individual buildings will be subject to the future building / facilities requirement to be determined in the detailed design stage.			
Superstructures (Bridges)			
Precast segmental	Conventional falseworks and formworks are not required and therefore extensive temporary road closures/diversions at the interchange can be avoided. Construction time is shorter and better construction planning can be achieved.	Construction cost is relatively high. The gantry girder cannot be very long thus restricting the span length to a maximum of around 60m currently in Hong Kong.	In-situ concreting works are significantly reduced compared with the other methods, minimizing the potential impacts to the environment, such as noise and air quality. In addition, the operation is quiet compared with other methods.
Precast span	Extensive experience in this type of construction among local contractors.	More movement joints and bearings may be needed for single span structures. This deteriorates the riding quality and poses future maintenance problems. Transportation of long beams in the nighttime, with implementation of Temporary Traffic Arrangement may be required. The maximum span length of precast concrete beams is relatively short (about 30m), the use of this method limits the span of the elevated structure and thus increases the number of piers and foundations. This means additional cost will be incurred.	The potential environmental impact is less comparing with cast-in-situ method.
Cast in-situ	Simple construction method, extensive experience in this type of construction among local contractors.	Span-by-span method requires longer construction time. Extensive working space is required for the erection of falsework, temporary traffic diversion is required.	Air and noise generation due to concreting works. More C&D waste will be generated comparing with other method.
Recommended Option Precast segmental method is considered to be preferable as it is associated with less environmental impacts compared to other options, and is able to meet the technical requirements and constraints.			

As identified in **Section 2.5.2**, the preferred construction sequencing for the basement construction is as subdivided zones as this sequencing allows for better scheduling of excavation activities such that the magnitude of environmental impacts can be reduced. Early construction of the Park is also preferred as this allows early implementation of some of the environmental benefits of the project, including provision of landscape amenity and reduction of visual impacts due to construction of other parts of the WKCD. The phased construction sequence for CACF is the preferred option for CACF construction as this enables a

reduction of the extent and magnitude of environmental impacts while allowing a more flexible programme for implementation of different facilities as needed.

Based on these preferred options identified in **Section 2.5.2**, a tentative construction programme and sequence of works has been compiled and is shown in **Appendix 2.4**. A summary of the proposed construction sequence for major construction elements and the environmental benefits/dis-benefits is provided in **Table 2.5**.

Table 2.5: Summary of Preferred Construction Sequence and Environmental Benefits/Dis-benefits

Major Construction Elements	Proposed Construction Period	Justifications / Constraints	Environmental Benefit / Dis-benefit
Basement	2013 to 2017		
Zone 1 (including underpass roads)	2013 to 2014	Partially constrained by the existing West Rail line, requires special approval for construction adjacent to and over the underground railway tunnel	Concurrent construction with MTRC XRL project with potential cumulative impacts
Zone 2 (including underpass roads)	2014 to 2017	Partly constrained by existing Airport Express / Tung Chung Rail line	Phased construction reduces number of construction plant operating at the same time. Some concurrent construction with MTRC XRL project with potential cumulative impacts
Zone 3 (including underpass roads)	2014 to 2016	Partly constrained by existing Airport Express / Tung Chung Rail line	Concurrent construction with MTRC XRL project with potential cumulative impacts
Zone 4	2016 to 2017	Delayed construction partly due to operation of the on-site tree nursery (to be located within Zone C of the Park) till late 2014, and to reduce the extent of concurrent basement construction with Zone 1 to 3	Delayed construction reduces cumulative impacts
Flyover	2014 to 2017	To provide second vehicular access to the MPV and EC and flexibility for event management.	Improve traffic flow condition with evenly dispersed vehicular traffic and better transportation efficiency, hence reducing the potential air quality/noise impacts from traffic emissions
The Park	2013 to 2019		
Zone A	2013 to 2015	To meet public wish for completion of the Park as soon as possible	Concurrent construction with MTRC XRL project with potential cumulative impacts
Zone B	2015 to 2017	Partly constrained by progress on the basement Zone 2 and 3	Less construction phase overlap with the basement construction thus reducing the number of concurrent plant in operation. Completion of Zone A reduces some of the visual impacts
Zone C	2017 to 2019	Partly constrained by construction of the basement and CACF at Zone 4 and the Hotel	Avoids cumulative impacts from concurrent construction with the basement. Completion of Zone A and B reduces the visual impacts

Major Construction Elements	Proposed Construction Period	Justifications / Constraints	Environmental Benefit / Dis-benefit
Hotel			
Zone 5	2017 to 2020	Subject to land sale and factors affecting utilisation, e.g. implementation of CACF	Avoids cumulative impacts from concurrent construction with the basement. Completion of Zone A and B reduces the visual impacts
CACF	2014 to 2020		
Zone 1	2014 to 2016	Dependent on completion of the basement Zone 1	Some cumulative impact from concurrent construction with basement and MTRC XRL project
Zone 2	2015 to 2020	Dependent on progress of the basement for Zone 2	Phased construction reduces number of construction plant operating at the same time. Completion of CACF Zone 1 may provide partial screening of noise impacts for NSRs at Canton Road
Zone 3	2016 to 2018	Dependent on completion of the basement Zone 3	Some cumulative impact from concurrent construction with basement
Zone 4	2017 to 2020	Dependent on completion of the basement Zone 4	Avoids cumulative impacts from concurrent construction with the basement. Completion of much of the CACF and the Park Zone A and B reduces the visual impacts

2.7 Proposed Project Programme

It is targeted to commence construction of the critical elements of the WKCD in 2013 so as to commission the Phase 1 arts and cultural facilities in stages starting from 2014/2015. A tentative construction programme is shown in **Appendix 2.4** and the tentative implementation plan for WKCD is summarised in **Table 2.6**:

Table 2.6: Summary of Tentative Construction and Implementation Programme for Key Facilities of WKCD

Key Facility	Tentative Construction Period	Tentative Implementation Period
The Park	Zone A – 2013 to 2015 Zone B – 2015 to 2017 Zone C – 2017 to 2019	Zone A – 2014 to 2015 Zone B –2016 to 2017 Zone C –2018 to 2019
Xiqu Centre	2013 to 2016	Main Theatre and Tea House - 2016 to 2017 Small Theatre – beyond 2020
Free Space (with Music Box)	2013 to 2015	2016 to 2017
Centre for Contemporary Performance	2015 to 2017	2017 and 2018 (subject to the construction programme of the Express Rail Link)
M+	2015 to 2018	Phase I – 2018 Phase II – beyond 2020
Lyric Theatre	2015 to 2017	2017 to 2018
Proscenium Theatre	2016 to 2020	2020

Key Facility	Tentative Construction Period	Tentative Implementation Period
Music Centre (Concert Hall and Recital Hall)	2018 to 2020	2020
Mega Performance Venue and Exhibition Centre	2017 to 2020	2020 (subject to alternative funding options)
Musical Theatre	2018 to 2020	2020 (subject to alternative funding options)
Great Theatre	2015 to 2020*	Beyond 2020
Thrust Theatre	2015 to 2020*	Beyond 2020

Note: The proposed construction periods for the facilities are based on the zones it falls in, with reference to the tentative construction programme in **Appendix 2.4**. The construction periods have included the construction of the basement.

* Foundation works are constructed from 2015 to 2016 with interim landscape area in place up to the construction of superstructure in 2020 or beyond.

The existing Tsim Sha Tsui Fire Station is scheduled to be relocated in phases and it will unlikely be relocated before 2020.

2.8 Concurrent Projects

The following major projects under planning and/or construction are likely to interface with the WKCD project:

- Hong Kong Section of the Guangzhou – Shenzhen – Hong Kong Express Rail Link;
- Road Works at West Kowloon;
- Road Improvement Works in West Kowloon Reclamation Development – Phases I and II; and
- Central Kowloon Route.

A summary of the concurrent projects for which potential cumulative impacts will be considered is shown in **Table 2.6**.

2.8.1 Express Rail Link

The Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL) is a railway service to connect Hong Kong, Shenzhen and Guangzhou via a high speed network from the boundary at Huanggang to West Kowloon Terminus (WKT). It is comprised of an approximately 26km long dedicated underground railway with 8 ventilation buildings, a stabling sidings plus emergency rescue station at Shek Kong, and a terminus station located adjacent to the WKCD site at West Kowloon. The EIA study for this project (EIA-169/2009) was approved on September 2009 and construction commenced in January 2010 with completion targeted for 2015.

The XRL construction site for the West Kowloon Terminus currently overlaps part of the WKCD project boundary and parts of WKCD site is being temporarily utilised by MTRC for XRL construction activities. These XRL temporary works areas are scheduled to be returned progressively to WKCDA tentatively from end 2013 onwards. As the WKCD project has direct interface with the XRL project and the construction activities for both projects will overlap, cumulative impacts will be assessed.

2.8.2 Road Works at West Kowloon

This project comprises the road works for Roads D1A, D1, Lin Cheung Road – Austin Road West Underpass and upgrading of Austin Road West as part of the road traffic capacity and network restructuring requirements needed to support the anticipated increase in road traffic that will arise due to opening of the West Kowloon Terminus (of the XRL project) and the developments for WKCD. The EIA study for this project (EIA-175/2009) was approved on September 2009 and construction commenced in 2011 with completion targeted by 2014.

The road works at West Kowloon project is entrusted to, and forms part of the construction activities for XRL at West Kowloon, while the construction activities along Austin Road West also lies along the northern boundary of the WKCD site, therefore, this project will also directly interface with the WKCD project and cumulative impacts will be assessed.

2.8.3 Road Improvement Works in West Kowloon Reclamation Development – Phases I and II

The West Kowloon Reclamation Development (WKRD) Traffic Study identified the need for a number of Core and Additional Road Schemes to enhance the road networks of the area and prevent traffic impacts and congestion in light of the various developments planned and underway within the WKRD. One of the Core Schemes is being implemented under the Road Works at West Kowloon project, while the Additional Schemes are to be implemented under this project. These additional schemes comprise of the following:

- Scheme H – Upgrading of the elevated Nga Cheung Road plus a new connection from Hoi Po Road to West Kowloon Highway northbound;
- Scheme I – Provision of a new elevated link road from the elevated Nga Cheung Road to Western Harbour Crossing;
- Scheme J – Provision of a new at-grade link from West Kowloon Highway southbound to Nga Cheung Road;
- Scheme Q – Provision of a local underpass along Canton Road at the junction of Canton Road / Austin Road; and
- Improvement Works at the Junction of Jordan Road / Ferry Street / Canton Road.

According to communications with the project proponent in November 2012, this project will be implemented in two phases:

- Phase 1 includes Scheme H (Parts A and B), I, J, Q (Interim Option) and Junction Improvement Works at Jordan Road / Ferry Street / Canton Road. This phase is currently targeted for construction by early 2014 for completion by end 2015.
- Phase 2 includes construction of an underpass along Canton Road at its junction with Austin Road / Austin Road West, and reconstruction of the associated subway / footbridge at the junction. No programme of implementation is available for this phase yet.

Phase 1 requires an EIA under the EIAO, and an EIA Study Brief for this project was issued on 22 September 2011. The proposed Scheme Q (Interim Option) and Junction Improvement Works will also directly interface with the WKCD project along its eastern boundary (Canton Road). Therefore, cumulative impacts will be assessed based on available information at the time of preparation.

2.8.4 Central Kowloon Route

The proposed Central Kowloon Route (CKR) is a mainly underground road running between the West Kowloon reclamation and the future Kai Tak development for the purpose of relieving traffic congestion on the existing east-west roads across Central Kowloon. The project is comprised of a dual 3-lane trunk road of approximately 4.7km length of which about 3.9km will be in tunnel, with access roads at the western and eastern end of CKR, reprovisioning of Government and Institutional facilities affected by the CKR and associated administration and ventilation buildings.

According to the EIA for CKR (EIA-208/2013), it is planned to commence construction of CKR in 2015 for completion in around end 2020. The general layout plan of the EIA for CKR indicated that the project boundary for the western section of CKR slightly overlaps the WKCD 500m study area. As this project is likely to be concurrently implemented with the WKCD project and there is some overlap with the WKCD study area, there may be cumulative impacts on air and visual quality, therefore, cumulative impacts from this project in terms of air and visual quality will be assessed based on available information at the time of preparation.

Table 2.7: List of concurrent projects for cumulative impact assessment

	Potential Cumulative Impacts	
Concurrent Project	**Construction Phase**	**Operation Phase**
Hong Kong Section of the Guangzhou – Shenzhen – Hong Kong Express Rail Link	Fugitive Dust Airborne Noise Landscape & Visual	Fixed Plant Noise Groundborne Noise Landscape & Visual
Road Works at West Kowloon	Fugitive Dust Airborne Noise Landscape & Visual	Vehicular Emissions Traffic Noise Landscape & Visual
Road Improvement Works in West Kowloon Reclamation Development – Phases I and II	Fugitive Dust Airborne Noise Landscape & Visual	Vehicular Emissions Traffic Noise Landscape & Visual
Central Kowloon Route	Fugitive Dust	Vehicular Emissions