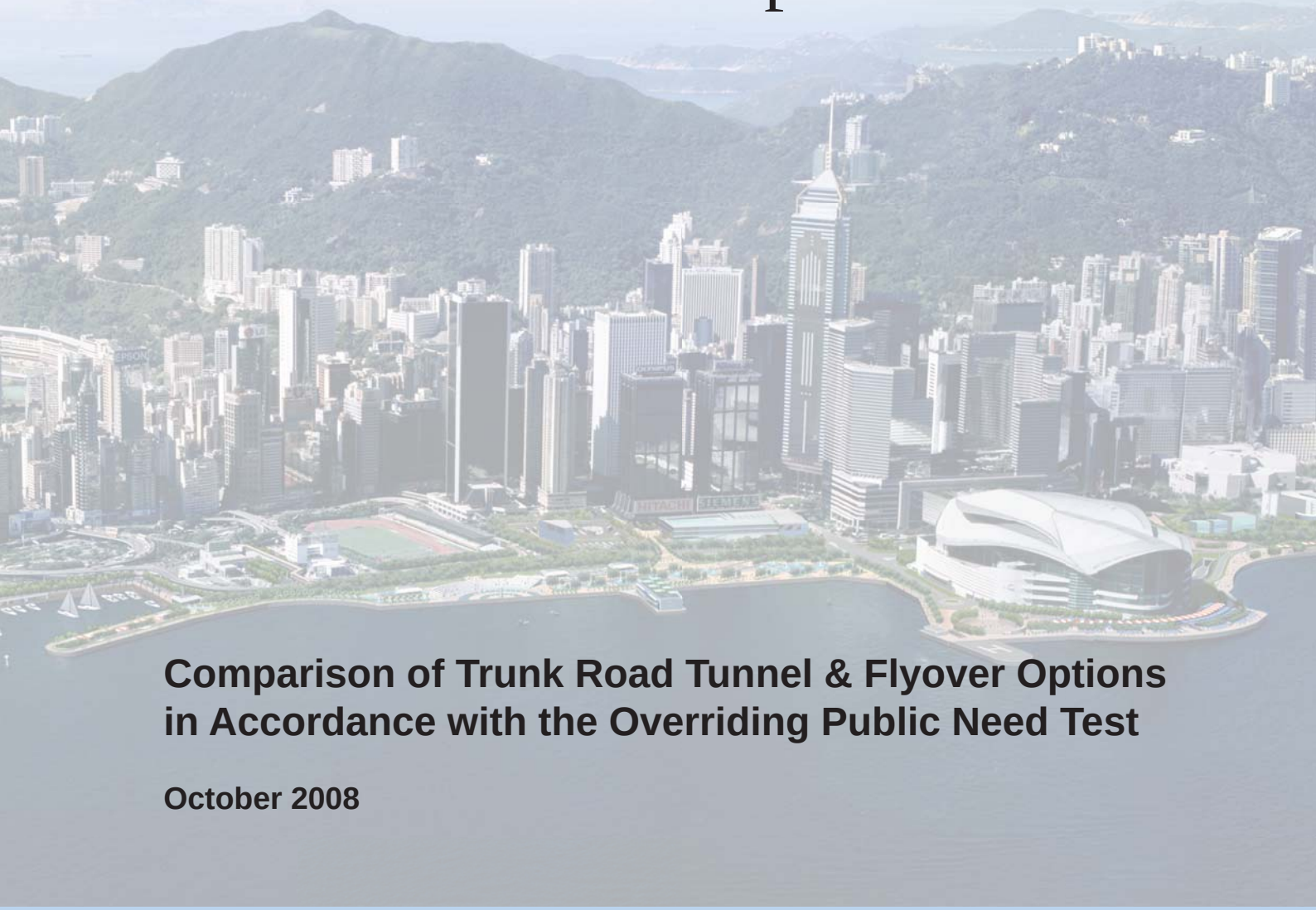
Annex C

土木工程拓展署
CEDD Civil Engineering and Development Department

SA2 to Agreement No. 54/2001 (CE)

Wan Chai Development Phase II Design and Construction for Trunk Road Tunnel Option



Comparison of Trunk Road Tunnel & Flyover Options in Accordance with the Overriding Public Need Test

October 2008

MAUNSELL | AECOM

Maunsell Consultants Asia Ltd

土木工程拓展署
CEDD Civil Engineering and Development Department

SA2 to Agreement No. CE 54/2001 (CE)

Wan Chai Development Phase II Design and Construction for Trunk Road Tunnel Option

COMPARISON OF TRUNK ROAD TUNNEL & FLYOVER OPTIONS IN ACCORDANCE WITH THE OVERRIDING PUBLIC NEED TEST

October 2008

Document Ref. CCM_FL3 (081015)

MAUNSELL CONSULTANTS ASIA LTD

SA2 to Agreement No. CE 54/2001(CE)
WAN CHAI DEVELOPMENT PHASE II
DESIGN & CONSTRUCTION FOR TRUNK ROAD TUNNEL OPTION

COMPARISON OF TRUNK ROAD TUNNEL & FLYOVER OPTIONS IN ACCORDANCE WITH THE OVERRIDING PUBLIC NEED TEST

LIST OF CONTENTS

1 INTRODUCTION

1.1 The Trunk Road Scheme

1.1.1 A comprehensive planning and engineering review of development and reclamation proposals for the Wan Chai Development Phase II project ("the WDII Review") has been conducted to assess individually the purpose and extent of each proposed reclamation by reference to the Overriding Public Need Test in accordance with the Court of Final Appeal ("CFA") judgment handed down on 9 January 2004 in respect of the judicial review on the Draft Wan Chai North Outline Zoning Plan No. S/H25/1 ("the draft OZP"). The WDII Review also makes recommendations on the revised alignment for the Trunk Road (comprising the Central-Wan Chai Bypass ("CWB") and Island Eastern Corridor Link ("IECL")) and at-grade roads, the extent of reclamation and the land uses for the review area covered by the assignment.

1.1.2 Under the WDII Review and through an extensive public engagement process, a Trunk Road scheme (known as the Trunk Road Tunnel Variation 1, or "Trunk Road Tunnel") has been developed that satisfies the traffic and functional requirements for the Trunk Road. The Trunk Road scheme also accommodates harbour-front enhancement ideas that have been proposed by the public, and the scheme with the Trunk Road in tunnel is supported by the public.

1.2 Cogent and Convincing Materials for the Trunk Road Scheme

1.2.1 The CFA ruled that the presumption against reclamation in the Protection of the Harbour Ordinance ("PHO") can only be rebutted by establishing an overriding public need for reclamation ("the Overriding Public Need Test"), and that there must be cogent and convincing materials available to enable the decision-maker to be satisfied that the test is fulfilled for rebutting the presumption against reclamation.

1.2.2 A report that was prepared in February 2007 sets out the process by which the Trunk Road scheme and its associated reclamation were derived and presents the "cogent and convincing materials" in support of the proposed reclamation required for such scheme under the PHO. That report, namely, the Cogent and Convincing Materials Report ("CCM Report") provided a full package of materials which explained how the presumption against reclamation was intended to be rebutted by an overriding public need for reclamation for the purposes of the PHO as clarified in the CFA judgment. The CCM Report sought to explain how the Overriding Public Need Test was intended to be complied with, why the extent of reclamation was justified, and provided an account of the process of identifying the alignment that would best serve to protect and preserve the Harbour.

1.3 Judicial Review on Temporary Reclamation

1.3.1 In October 2007, Society for Protection of the Harbour sought, through a judicial review, a declaration from the Court that the PHO and the presumption against reclamation contained therein apply to the proposed temporary reclamation works referred to in the road scheme for the Trunk Road gazetted under the Roads (Works, Use and Compensation) Ordinance on 27 July 2007. The ruling of the Court of First Instance ("CFI"), delivered on 20 March 2008, is that the PHO and the presumption against reclamation contained therein do apply to the proposed temporary reclamation works referred to in the road scheme for the Trunk Road gazetted under the Roads (Works, Use and Compensation) Ordinance on 27 July 2007.

1.4 Purpose of this Report

1.4.1 Whilst the Trunk Road feasible options have been evaluated in Chapter 4 of the CCM Report issued in February 2007, details on temporary reclamation were not specifically elaborated in the comparison of feasible Trunk Road options i.e. the Tunnel Option and the Flyover Option (at that time on the grounds of the temporary nature of those works). This report supplements Chapter 4 of the CCM Report with additional materials to address separately the reclamation requirements of the feasible Trunk Road options, including the temporary reclamation requirements, and then the comparison of the Tunnel and Flyover Options with some further elaboration on their relative performance in all relevant aspects for the purposes of assessing both Options by reference to the Overriding Public Need Test.

2 TRUNK ROAD OPTIONS

2.1 Introduction

2.1.1 Before determining compliance with the Overriding Public Need Test for the two feasible options, i.e. Tunnel Option and Flyover Option, the background on feasible Trunk Road routeing and alignments, alternative construction methods and the derivation of the feasible Trunk Road Tunnel Option as well as the Flyover Option is first briefly set out. The assessment on the derivation of the feasible Trunk Road options, including the screening out of those options found not feasible or not compliant with the PHO, is set out more fully in the CCM Report, which should be referred to in conjunction with this report.

2.2 Alternative Trunk Road Alignments

2.2.1 A detailed examination of the Trunk Road's needs and constraints, including an exhaustive investigation into the need for reclamation for the Trunk Road construction and of alternative schemes that might do away with reclamation or, at least, minimise reclamation, has been carried out. This process has been presented in the Report on Trunk Road Alignments and Harbour-front Enhancement, April 2006. These findings were incorporated in Chapter 3 of the CCM Report, as part of the package of materials which explained how the presumption against reclamation was intended to be rebutted by an overriding public need for reclamation for the purposes of the PHO as clarified in the CFA judgment.

2.2.2 All possible alignments for the Trunk Road, including "offshore corridor", "inland corridor" and "foreshore corridor", and including suggestions from the public, have been examined, taking into account land use and infrastructural constraints, with a view to determining if there are any that do not require any reclamation for the Trunk Road construction. It is found that the feasible Trunk Road routeing is along the foreshore of Wan Chai and Causeway Bay. However, foreshore alignments do require reclamation for Trunk Road tunnel construction at the western end of WDII where the Trunk Road tunnel crosses over the MTR Tsuen Wan Line and, for tunnel schemes, at the eastern end of WDII where the Trunk Road tunnel must rise to ground level for the connection with the elevated Island Eastern Corridor ("IEC"), at least.

2.2.3 Alternative Trunk Road ideas have been examined to determine if there are any that would constitute a feasible "no reclamation" option. A deep bored tunnel idea which requires the tunnel portal to be located further to the east along the North Point shoreline will require a greater area of reclamation where the tunnel rises up to the ground level portal than a shallow cut-and cover tunnel with the tunnel portal located to the east of the Causeway Bay Typhoon Shelter ("CBTS"), and therefore would not comply with the PHO (i.e. it is not a feasible alternative to the Tunnel Option in respect of the PHO). Double decking over

Gloucester Road is considered not feasible in view of severe visual and traffic impacts. A full flyover idea with flyover from Central Reclamation Phase III ("CRIII") all the way to the connection with the IEC is not feasible because the flyover cannot rise to a high enough level to pass over the physical barriers of the Hong Kong Convention and Exhibition Centre ("HKCEC") and/or the Atrium Link. A total offshore tunnel idea is also not feasible because it is not able to pass beneath the MTR Tsuen Wan Line immersed tube tunnel with sufficient clearance. The idea of maintaining a shallow water area, where the top of the Trunk Road tunnel structure is above the existing seabed level and the top of the structure is still below sea level, instead of constructing the tunnel in reclamation (i.e. the "shallow water idea") has also been examined, but is not a "no-reclamation" idea. Indeed, the shallow water idea, with its protective breakwaters, would result in a greater area of reclamation than the shallow cut-and-cover tunnel in reclamation and therefore would not comply with the PHO; this alternative is also not a feasible alternative to the Tunnel Option in respect of the PHO. After examining alternative Trunk Road ideas, Chapter 3 of the CCM Report concludes that there is no feasible "no-reclamation" alignment for the Trunk Road.

2.2.4 Instead, the feasible Trunk Road alignment has its routeing along the foreshore of Wan Chai and Causeway Bay, with the Trunk Road in tunnel crossing over the MTR Tsuen Wan line, and staying in shallow tunnel through the HKCEC water channel and along the Wan Chai shoreline. An at-grade alignment through this area is not feasible as this would conflict with the ground level road system and cut off access to the HKCEC Extension, and an elevated road would clash with the Atrium Link bridge of the HKCEC. To the east of the Wan Chai shoreline, the Trunk Road can pass either below the Cross Harbour Tunnel ("CHT") portal in tunnel or over the top of the CHT portal as flyover, continuing through the CBTS either as tunnel or flyover (at-grade construction through the CBTS is not considered as that would self-evidently require extensive reclamation) to a connection with the existing elevated IEC to the east of the typhoon shelter.

Foreshore Alignment Variations

2.2.5 The alignment through Wan Chai is fixed by the HKCEC water channel and, further eastwards along the Wan Chai shoreline, by the existing essential infrastructure, in particular the electricity substation and Wan Chai East Sewage Screening Plant which obstruct the Trunk Road from turning southwards.

2.2.6 However, alignment variations through the CBTS have been considered, including consolidation with harbour-front enhancement ideas proposed by the public for realising the objectives of this project.

2.2.7 The possible variations of tunnel options that have been proposed by the public have been examined together with alignment options developed under the WDII Review to determine their engineering feasibility and compliance with the PHO requirement for minimum reclamation. Tunnel Variation 1 follows the foreshore

alignment and passes beneath the CHT portal anchorage zone and then runs below the seabed of the CBTS, rising up above seabed level to a ground level tunnel portal to the east of CBTS where the Trunk Road then connects with the existing elevated IEC. Tunnel Variation 2 is similar to Tunnel Variation 1 along the Wan Chai shoreline, but turns southwards around the CHT to avoid the anchorage zone of the portal structure. The shallower tunnel through the south-western corner of the CBTS for this Tunnel Variation 2 requires reclamation in this area. Victoria Park Road is moved southwards so as to free up waterfront space along the southern edge of the typhoon shelter. Tunnel Variation 3 is similar to Tunnel Variation 2 but with a straightened road alignment to avoid the disruption that would be caused by construction across the entrance of the CHT (that is associated with Tunnel Variation 2). Reclamation at the south-eastern corner of the CBTS is also required for Tunnel Variation 3.

2.2.8 Neither Tunnel Variation 2 nor 3 perform as well as Tunnel Variation 1: the major drawbacks of Tunnel Variations 2 and 3 include additional reclamation for filling in of the corners of the CBTS, major traffic disruption, demolition of a large part of Victoria Park, demolition and then reconstruction of major highway structures, and greater air quality concerns at the tunnel portal area in North Point. Further, as it has been demonstrated that Trunk Road Tunnel Variation 1 requires a lesser extent of reclamation than that associated with Tunnel Variations 2 or 3, and as such would comply with the requirements of the PHO, this tunnel option has been taken on board as the "Tunnel Option" for further assessment.

2.2.9 For flyover options, the Trunk Road emerges from below ground at the Wan Chai waterfront, to the north of the Wan Chai Sports Ground, rising onto flyover structure over the ex-Wan Chai Public Cargo Working Area ("ex-PCWA") basin, then passes over the top of the CHT portal and continues through southern part of the CBTS as flyover structure to a connection with the existing elevated IEC to the east of the CBTS.

2.2.10 A variation of the flyover option alignment has been proposed in a public submission to the Town Planning Board, where the alignment through the HKCEC and Wan Chai areas follows that of the Tunnel Option, rising to a portal north of the Wan Chai Sports Ground and then running on elevated structure over the ex-PCWA and CBTS, connecting with the existing IEC in front of Victoria Centre. The flyover alignment is shifted southwards through the CBTS to run along the edge of the CBTS seawall, and slip road connections have been modified to suit this more southerly alignment. However, variations such as this, involving shifting of the alignment further south through the CBTS, would result in conflict of the flyover foundations with the existing seawall and conflict of the new flyover structures with the existing roads including the Victoria Park Road and Hing Fat Street connections with the IEC, and have been found to be not feasible. Rectifying the deficiencies of the proposed flyover variation results in straightening out the flyover alignment through the CBTS and, in effect, reverting to the flyover alignment developed under the WDII Review.

2.3 Public Engagement

2.3.1 The derivation of feasible Trunk Road tunnel as well as flyover options, and the process by which ultimately the Trunk Road Tunnel Option has been selected as the basis for the statutory gazettals under the relevant ordinances, has taken full account of the outcome of an extensive public engagement process. Through this public engagement, a clear preference for the Trunk Road in the form of tunnel has been identified, especially where this can incorporate suggested harbour-front enhancement ideas while at the same time provide for the functional requirements of the Trunk Road.

2.3.2 However, a flyover option is also technically feasible. Notwithstanding that there is little public support for any flyover option, this option does need to be given further consideration insofar as it may represent a scheme requiring a lesser area of reclamation.

2.4 The Feasible Trunk Road Options

2.4.1 Following the examination of alternative Trunk Road alignments and methods of construction, including consideration of public views, as described above, two feasible schemes for the Trunk Road have been determined: a Tunnel Option (that is based on the Tunnel Variation 1) and a Flyover Option.

The Tunnel Option

2.4.2 For the Tunnel Option, the Trunk Road starts off at the connection with CRIII in cut-and-cover tunnel, crosses over the MTR Tsuen Wan Line tunnel and continues through the HKCEC water channel and along the Wan Chai shoreline, in cut-and-cover tunnel, in reclamation.

2.4.3 The Trunk Road Tunnel drops below seabed at the eastern end of the Wan Chai shoreline, immediately to the west of the ex-PCWA, staying below seabed beneath the ex-PCWA basin, and then passing beneath the CHT portal and approach ramp at a level below –30mPD to avoid conflict with the existing rock anchors of the CHT portal structure. Continuing eastwards, the Trunk Road Tunnel stays beneath the seabed of the CBTS. As the tunnel structure lies entirely below the seabed of the ex-PCWA basin and the CBTS, permanent reclamation in these areas is not essential. While temporary works will be required (including temporary reclamation for tunnel construction purposes) these can be removed afterwards and the existing seabed and water area reinstated.

2.4.4 The Trunk Road Tunnel rises up above seabed to a ground level tunnel portal to the east of the CBTS, where the Trunk Road then rises up on flyover structure to connect with the existing elevated IEC. Connection to the IEC is made to the northern side of the existing IEC elevated road structure, which is considered to be the least disruptive form of connection. The existing IEC links back into Causeway Bay (to Victoria Park Road and Hing Fat Street) are retained.

2.4.5 The Tunnel Option (Trunk Road Tunnel) layout is shown in **Figure 2.1**.

2.4.6 Alternative construction methods that have been examined for the construction of the Trunk Road Tunnel include immersed tube construction, bored tunnel construction and cut-and-cover tunnel construction. The only feasible and safe form of construction for the Trunk Road Tunnel, and indeed the only suitable form of construction, is by cut-and-cover.

The Flyover Option

2.4.7 For the Flyover Option, the Trunk Road starts off at the connection with CRIII in cut-and-cover tunnel, crosses over the MTR Tsuen Wan Line tunnel and continues through the HKCEC water channel and along the Wan Chai shoreline, in cut-and-cover tunnel, in reclamation, same as the Tunnel Option. The Trunk Road needs to stay in tunnel through the HKCEC water channel to avoid conflict with the existing HKCEC atrium link bridge and to allow for ground level road access. The Trunk Road can only rise up to ground level along the Wan Chai shoreline.

2.4.8 Towards the eastern end of the Wan Chai waterfront, the Trunk Road tunnel rises up to a ground level tunnel portal and then onto an elevated road structure to cross over the ex-PCWA basin, then over Kellett Island and the CHT portal, and stays on the elevated structure over the full length of the CBTS and connects to the existing elevated IEC at the eastern side of the CBTS at a level of around +14mPD.

2.4.9 The flyover alignment runs through the southern part of the typhoon shelter to minimise physical intrusion into the mooring areas and disruption to the marine users. For this alignment, the new elevated road must tie directly into the IEC at the location of the Hing Fat Street slip roads, with new connections to Victoria Park Road replacing the existing elevated roads through the south-eastern corner of the CBTS.

2.4.10 The same slip road connections to the local road network in Wan Chai North and in Causeway Bay are provided as for the Tunnel Option, and the Trunk Road maintains the same overall dual 3-lane configuration.

2.4.11 The Flyover Option layout is shown in **Figure 2.2**.

3 COMPARISON OF FEASIBLE TRUNK ROAD OPTIONS

3.1 Comparison on Extent of Reclamation

Extent of Permanent Reclamation for Tunnel Option

3.1.1 For the Tunnel Option, details of the extent of reclamation in respect of the engineering requirements for the construction of the Trunk Road tunnel, reclamation and seawalls, are presented in a Minimum Reclamation Report which forms Annex O of the CCM Report. A brief description of the determination of the extent of permanent reclamation for the Tunnel Option is given below.

3.1.2 It should be noted that references made in the Minimum Reclamation Report in respect of the temporary reclamation issue under the PHO have been superseded by the CFI ruling of 20 March 2008 on temporary reclamation, and temporary reclamation is now properly identified hereunder in this report. Also, the Minimum Reclamation Report makes reference to the affected area of the Harbour when considering the area of flyover structures over water at North Point for the connection of the Trunk Road to the elevated IEC; this area overlaps with the area of pile caps and dolphins of this elevated connection, which was not separately identified in the Minimum Reclamation Report. For the avoidance of doubt, the reclamation associated with these flyover structures, in respect of the PHO, is now identified separately in this report and explained in more detail below.

HKCEC West and Water Channel

3.1.3 In the area to the west of HKCEC, where the Trunk Road crosses over the MTR Tsuen Wan Line tunnel, the Trunk Road tunnel structure lies above the seabed and remains above seabed level through the whole of the HKCEC water channel. The extent of reclamation in the area to the west of the HKCEC is set by the extent of seawall protection in front of the tunnel structure, while the HKCEC water channel will need to be filled in to enable the Trunk Road construction.

3.1.4 The separation between the edge of the Trunk Road structure and the seawall copeline is determined by the width of the seawall structure and its foundations. It is found that a distance of 32.5m needs to be maintained between the outer edge of the Trunk Road tunnel and its slip roads, and the seawall copeline, in general and this distance will increase to around 37m at the eastern end of CRIII where the dredge depth increases.

3.1.5 At the MTR Tsuen Wan Line crossing, a wave absorbing and tunnel protection structure will be incorporated in the piled deck over the MTR tunnel. This wave wall structure, of minimum width around 7m, means that the seawall copeline can be pulled back closer to the Trunk Road tunnel structure, and hence reduce the extent of reclamation at the MTR tunnel crossing point.

3.1.6 The area of WDII reclamation in the HKCEC West area, as defined by this seawall copeline, is 3.7ha.

3.1.7 In the HKCEC water channel, the Trunk Road tunnel structure occupies most of the area of the channel. The whole of the water channel will need to be filled in for the Trunk Road construction. The area of WDII reclamation in the HKCEC water channel is 1.6ha.

Wan Chai Shoreline

3.1.8 The Trunk Road tunnel structure lies above the seabed until immediately to the west of the ex-PCWA, and requires reclamation for the cut-and-cover tunnel construction. The extent of reclamation along the Wan Chai shoreline is determined primarily by the extent of seawall protection in front of the Trunk Road tunnel structure. For a typical dredge level of –14mPD in this area, a distance of 31m needs to be maintained between the outer edge of the Trunk Road tunnel and the seawall copeline. The seawall copeline follows the curvature of the Trunk Road tunnel edge. A splay is incorporated in the seawall at the corner with Expo Drive East to accommodate the extension of drainage culvert M, while at the eastern end of this shoreline, the seawall is cut back to the existing seawall where the Trunk Road tunnel structure drops below the seabed.

3.1.9 The extent of reclamation along the Wan Chai shoreline is also determined by the water area occupied by the reprovisioned Wan Chai ferry pier.

3.1.10 The area of reclamation along the Wan Chai shoreline, as defined by the seawall copeline, is 3.9ha. The area of the reprovisioned ferry pier structure is around 0.2ha. Therefore, altogether, the area of reclamation at Wan Chai is 4.1ha.

North Point Shoreline

3.1.11 To the east of the CBTS, the Trunk Road rises up above seabed level to a ground level tunnel portal, and then rises on elevated road structure to connect with the existing IEC. Although use of the existing formed land in the area immediately to the east of the CBTS is maximised by keeping the Trunk Road alignment as close as possible to the existing IEC foundations, the tunnel structure will nevertheless extend beyond the existing seawall and the existing area of land will therefore need to be widened. Similar to the Wan Chai shoreline, a distance of 31m needs to be maintained between the outer edge of the Trunk Road tunnel and the seawall copeline.

3.1.12 The area of reclamation along the North Point shoreline, as defined by this seawall copeline, is 3.3ha.

Flyover Foundations at North Point

3.1.13 Beyond the area of new land formation at North Point, the elevated connection to the IEC will require foundations to support the bridge columns for this elevated road connection. Over water, the foundations would be constructed by steel tubular piles in the seabed, with concrete pile caps on top of the steel piles that will support the bridge piers and bridge superstructure; these pile caps would be constructed at around water surface level. Bridge protection would be by dolphins that are also constructed with steel piles in the seabed and a concrete capping at water surface level. These substructures of the elevated Trunk Road will physically occupy the water area of Harbour at the North Point shoreline.

3.1.14 Whilst the pile caps and protective dolphin structures are not land formed with soil, they can be viewed as solid structures rising up from the seabed to above water level, and these will permanently occupy the water area of the Harbour. The pile caps form a solid platform (in effect, "land") in the water on which the road structure rests; they are therefore considered as reclamation in respect of the PHO. The total area of the pile caps and dolphins of the elevated Trunk Road at the water surface at North Point is less than 0.1ha.

Summary of Extent of Permanent Reclamation for Tunnel Option

3.1.15 In total, an area of 12.7ha[1] of reclamation (land formation) is needed to meet essential engineering requirements for construction of the Trunk Road Tunnel Option. These areas of permanent land formation are shown in **Figure 2.1**. In addition, an area taken to be 0.1ha[2] of permanent reclamation (pile caps and dolphins) is needed for the construction of the elevated Trunk Road connection to the IEC at North Point.

Extent of Permanent Reclamation for Flyover Option

3.1.16 For the Flyover Option, details of the extent of reclamation have been based on similar engineering requirements as presented for the Tunnel Option in the Minimum Reclamation Report, and these are further elaborated in a report on Reclamation for the Flyover Option, which is appended at **Appendix A**. The permanent reclamation requirements of the Flyover Option are described briefly below.

[1] An indicative area of around 15ha of permanent reclamation was found in preliminary studies to be required for the Tunnel Option, as reported in the Report on Trunk Road Alignments and Harbour-front Enhancement and in the CCM Report. The reduction from that previous estimate of reclamation area arises mainly from more precise engineering determination of seawall requirements and reprovisioning provision, modification of the interface with CRIII, and by cutting back the seawall at the eastern end of the Wan Chai shoreline reclamation.

[2] In the CCM Report, this area overlaps with the 0.4ha area of "flyover structures over water" and thus was not separately counted. For the avoidance of doubt, it is identified separately in this report.

HKCEC West and Water Channel

3.1.17 The alignment and form of construction of the Trunk Road in the area to the west of HKCEC and through the HKCEC water channel is the same for both the Tunnel and Flyover Options. Therefore, the extent of reclamation in these areas, which is determined by the extent of seawall protection in front of the tunnel structure to the west of the HKCEC (3.7ha) and the filling in of the HKCEC water channel (1.6ha), will be the same for the Flyover Option as for the Tunnel Option.

Wan Chai Shoreline

3.1.18 Along the Wan Chai shoreline, the Flyover Option will run in tunnel structure from the HKCEC water channel to the tunnel portal towards the eastern end of this shoreline, along the same horizontal alignment and with the same structural form as the Tunnel Option. The extent of reclamation along the Wan Chai shoreline is again determined primarily by the extent of seawall protection in front of the tunnel structure; this reclamation is required for the cut-and-cover tunnel as it rises to ground level, and for the ground level tunnel portal. The tunnel structural width and the extent of seawall protection in front of the tunnel will be the same for both Tunnel and Flyover Options. There is a small difference in extent of permanent reclamation between the Tunnel and Flyover Options at the eastern end of the Wan Chai shoreline: where the Tunnel Option dips below the seabed just before reaching the existing seawall of the ex-PCWA, the new permanent seawall and reclamation can be cut back to leave a small basin and, in so doing, minimise the extent of reclamation. This is not possible for the Flyover Option, where the tunnel structure rises to the ground level portal at this area, and the new seawall copeline will continue eastward to the ex-PCWA breakwater.

3.1.19 Same as for the Tunnel Option, the extent of reclamation along the Wan Chai shoreline is also determined by the water area occupied by the reprovisioned Wan Chai ferry pier.

3.1.20 The area of reclamation along the Wan Chai shoreline for the Flyover Option, as defined by the seawall copeline and by the area of the reprovisioned ferry pier structure, is 4.5ha.

3.1.21 In total, an area of 9.8ha[3] of reclamation (land formation) is needed at the HKCEC and Wan Chai shoreline for construction of the Trunk Road Flyover Option. This permanent land formation area is shown in **Figure 2.2**.

[3] An indicative area of around 11.5ha of permanent reclamation was found in preliminary studies to be required for the Flyover Option, as reported in the Report on Trunk Road Alignments and Harbour-front Enhancement and in the CCM Report. The reduction from that previous estimate of reclamation area arises mainly from more precise engineering determination of seawall requirements and reprovisioning provision, and modification of the interface with CRIII.

Flyover Foundations

3.1.22 The flyover across the ex-PCWA basin and through the CBTS does not require any land formation in these areas, and the elevated connection to the IEC at the eastern side of the CBTS means that no new land needs to be formed along the North Point shoreline.

3.1.23 However, substructures of the elevated Trunk Road inside the ex-PCWA basin and CBTS, including bridge piers, pile caps and protective dolphins, will physically occupy the water area of the ex-PCWA basin and CBTS. In view of the similarity of road form and the geometrical and locational context of the flyover, and visual aspects, the form of elevated road structure and construction method for the Trunk Road through the CBTS are reasonably assumed, for the purpose of this review, to be similar to the existing elevated IEC structure that runs along the North Point shoreline and across the south-eastern corner of the CBTS, with the road deck supported on bridge piers which in turn are founded on foundation pile caps. However, whereas the existing IEC bridge deck is constructed using pre-stressed u-beams with spans of around 30m, in order to minimise the number of pile caps in the water (bearing in mind the PHO implications), pre-stressed segmental box girder construction is now assumed for the new flyover section across the ex-PCWA basin and through the CBTS, with a longer span of around 60m, where this span is considered to approach the limit of cost effective and efficient bridge design. Of course, while there would be a lesser number of pile caps for this longer bridge span, the size of the pile caps will be larger than those of the existing IEC bridge structure.

3.1.24 Similar to the case for the flyover foundations at North Point for the Tunnel Option connection to the IEC, whilst the pile caps and protective dolphin structures are not land formed with soil, they are solid structures fixed rigidly and permanently to the seabed (or, they can be viewed as solid structures rising up from the seabed to above water level), and these will permanently occupy the water area of the Harbour. The pile caps form a solid platform in the water on which the road structure rests. To all intents and purposes they can be considered as 'forming land' (this view is reinforced if one were to look at this area of the Harbour before and after construction of the Trunk Road, to see first open water and then solid mass replacing what was water), and they are therefore considered as reclamation in respect of the PHO.

3.1.25 The total area of these substructures of the elevated Trunk Road at the water surface in the ex-PCWA basin and in the CBTS is about 0.4ha[4].

Summary of Extent of Permanent Reclamation for Flyover Option

3.1.26 An area of 9.8ha of permanent reclamation comprising land formation at the HKCEC and along the Wan Chai shoreline is needed to meet essential

[4] In the CCM Report, this area overlaps with the 3ha area of "flyover structures over water" and thus was not separately counted. For the avoidance of doubt, it is identified separately in this report.

engineering requirements for the construction of the Trunk Road Flyover Option. In addition, an area of about 0.4ha of permanent reclamation comprising pile caps and dolphins that physically occupy water area of the Harbour in the ex-PCWA basin and in the CBTS is needed for the construction of the elevated road section of the Flyover Option.

Comparison of Permanent Reclamation for Tunnel and Flyover Options

3.1.27 In summary, the extents of permanent reclamation for the Tunnel Option and Flyover Option are estimated to be as follows:

	Tunnel Option	**Flyover Option**
Permanent Reclamation		
- land formation	12.7 ha	9.8 ha
- pile caps and dolphins	0.1 ha	0.4 ha

Extent of Temporary Reclamation for Tunnel Option

3.1.28 Details of the requirements for temporary reclamation for the Tunnel Option, together with the cogent and convincing materials for demonstrating the overriding public need for this temporary reclamation, are presented in a Report on Construction of the Trunk Road Tunnel in Causeway Bay Typhoon Shelter and ex-Wan Chai Public Cargo Working Area, prepared by Highways Department. The salient aspects of the temporary reclamation are outlined below.

3.1.29 For the Tunnel Option, reclamation would be minimised by having the Trunk Road Tunnel running beneath the seabed of the CBTS and ex-PCWA, which means that permanent reclamation in these areas would not be required. However, to achieve this end result, temporary works (with temporary reclamation being considered to be the practically feasible and safe form of temporary works) would be required in order to construct the sub-seabed tunnel.

3.1.30 Alternative forms of construction have been examined for the construction of the Trunk Road Tunnel beneath the seabed of the CBTS and ex-PCWA to determine if there is any reasonable form of construction that would not require temporary works, in particular temporary reclamation. The only feasible form of construction for the Trunk Road is by cut-and-cover with diaphragm walls. This will require temporary reclamation to provide a dry working platform for the construction of the diaphragm walls and the cut-and-cover tunnel.

3.1.31 In meeting an overriding public need, the use of temporary reclamation is found to be the practically feasible approach to constructing the Trunk Road Tunnel.

Temporary reclamation is the only feasible, cost effective and safe form of construction, that will adequately protect adjacent key infrastructure from damage or disruption during construction, and will allow staged construction that will, in turn, minimise environmental impacts and impacts to the community.

3.1.32 A minimum extent of temporary reclamation has been determined, that will serve solely to facilitate the Trunk Road construction. Through a staged construction approach (**Figure 3.1** broadly illustrates the envisaged construction staging in the CBTS, further details can be found in the Report on Construction of the Trunk Road Tunnel in Causeway Bay Typhoon Shelter and ex-Wan Chai Public Cargo Working Area), the maximum affected area of the Harbour in respect of temporary reclamation in the CBTS will range from 1.8ha to a maximum of 3.7ha at any one time, for a period of 1 to just over 3 years for any given temporary reclamation area, whilst at the ex-PCWA the area of temporary reclamation will range from 0.7ha to a maximum of 1.2ha, with the durations of these temporary reclamation stages varying from 2.5 years to just over 3 years. These are the minimum extents of temporary reclamation required to facilitate the construction of the Trunk Road Tunnel Option.

Extent of Temporary Reclamation for Flyover Option

3.1.33 Details of the temporary reclamation requirements for the Flyover Option are presented in the report on Reclamation for the Flyover Option, in **Appendix A**, and these are described briefly below.

Temporary Works in the CBTS and ex-PCWA for Flyover Option

3.1.34 Construction of the Trunk Road Flyover requires first the construction of foundations to support the bridge columns which, in turn, support the elevated deck structure. Over water, the foundations would be constructed by bored steel tubular piles in the seabed, with concrete pile caps on top of the steel piles that will support the bridge columns; these pile caps would be constructed at around water surface level (partly above and partly below water level). Bridge protection would be by dolphins that are also constructed with steel piles in the seabed and a concrete capping at water surface level.

3.1.35 Temporary works are required for the concrete pile cap and dolphin construction, under a conventional approach. These are the surrounding formwork and, in this case because the concrete construction would be partially under water, containment of the pile cap and formwork within what could best be described as a ‘cofferdam’ structure to keep the water out of the concreting area. These temporary structures would lie partially submerged at the water surface, and they would provide temporary working platform or ‘land’ access for construction workers and equipment, displacing the water in the area; they would therefore be considered as temporary reclamation in the context of the PHO.

3.1.36 An alternative method of construction for the pile caps and dolphins would be to use prefabricated concrete formwork, which would be lifted into place on the foundation piles and within which the concrete pile cap is constructed; the prefabricated concrete formwork would become part of the permanent pile cap structure. With this system, temporary works that may be considered as temporary reclamation under the PHO, as described in paragraph 3.1.35 above, would not be required. In view of the requirements of the PHO to seek reasonable alternatives to reclamation, it is assumed that, providing the necessary construction access is available, a prefabricated formwork system would be used (this would need to be specified in the construction contract) and therefore no temporary reclamation for the construction of the pile caps and dolphins is assigned to the Flyover Option.

Temporary Works in the CBTS for Temporary Traffic Arrangements

3.1.37 For the Flyover Option, the new elevated Trunk Road has to connect to the IEC at the location of the Hing Fat Street slip roads. The section of the existing IEC structure joining Victoria Park Road and the slip road from Hing Fat Street to the IEC have to be demolished and rebuilt for such connection. Temporary traffic diversions have to be arranged during the construction work to maintain the traffic flow. Temporary works, including temporary reclamation in the south-eastern corner of the typhoon shelter, will be required to facilitate these road diversions during the construction period.

3.1.38 **Figure 3.2** shows the temporary traffic arrangements and the associated extent of temporary reclamation. Due to space limitation and the constraints of existing development in the vicinity of the tie-in to the IEC that make inland traffic diversions not feasible, most of the road diversions would have to be provided at the south-eastern corner of the CBTS. Alternative traffic diversions, in particular for the more efficient diversion of Hing Fat Street traffic, have also been considered but would result in greater intrusion into the CBTS.

3.1.39 The only reasonable and practically feasible manner in which the temporary traffic arrangement could be implemented, in order to maintain traffic flows through this area of construction and to facilitate the construction and demolition works of the Flyover Option, would be by temporary filling in of the south-eastern corner of the CBTS. The resultant temporary reclamation required for temporary traffic arrangements will fill in the south-eastern corner of the typhoon shelter, with an area of about 3.3ha.

3.1.40 The Tunnel Option requires the installation of noise barriers along the new roads at the tie-in to the IEC to around City Garden, as a noise mitigation measure identified generally in accordance with the requirements of the Environmental Impact Assessment Ordinance. For the purpose of comparative appraisal of temporary reclamation areas for the Tunnel and Flyover Options, installation of noise barriers is also assumed for the Flyover Option along the existing IEC to a similar extent as would be provided for the Tunnel Option, so that both Trunk Road options would provide a similar level of benefit to North Point residents.

However, it should be borne in mind that the actual extent of noise barriers required along the North Point shoreline beyond the physical tie-in of the Flyover Option to the existing IEC, in the event that the Flyover Option were to be implemented, would be subject to further detailed assessment including noise assessment under the Environmental Impact Assessment Ordinance. Along the North Point shoreline, a temporary diversion of the elevated IEC will be required to enable the reconstruction of the existing flyover structure with noise barriers. This traffic diversion would entail the construction of a temporary elevated flyover adjacent to the existing IEC. Similar to the explanation given in paragraph 3.1.24, concrete pile caps would need to be constructed in the Harbour and, in this case, these would be regarded as temporary reclamation. Assuming prefabricated formwork is used for the pile cap construction, this area of temporary reclamation would be about 0.1ha.

3.1.41 This temporary reclamation could not, practically speaking, be implemented in stages, as the whole of the temporary traffic arrangements scheme would be required for the whole time. Moreover, the temporary traffic arrangements at the south-eastern corner of the CBTS would be concurrent with those at North Point, so the temporary reclamation associated with the temporary bridge foundations would need to be in place at the same time as the temporary reclamation for traffic diversions in the CBTS.

Summary of Extent of Temporary Reclamation for Flyover Option

3.1.42 The temporary reclamation area required for the construction of the Flyover Option that will be in place at any one time would be approximately 3.4ha, and this would be in place for a period of around 4 years. This is considered to be the minimum overall extent of temporary reclamation required to facilitate the construction of the Trunk Road Flyover Option across the seabed of the ex-PCWA, CBTS and along the North Point shoreline.

Comparison of Temporary Reclamation for Tunnel and Flyover Options

3.1.43 In summary, the extents of temporary reclamation for the Tunnel Option and Flyover Option are estimated to be as follows:

	Tunnel Option	**Flyover Option**
Temporary Reclamation [1] (during construction)	CBTS: 3.7 ha ex-PCWA: 1.2 ha	CBTS & ex-PCWA: 3.3 ha North Point: 0.1 ha

[1] at the stage when the area of temporary reclamation is the largest

3.2 Conclusion of the Comparison on Extent of Reclamation

3.2.1 It is found that the Flyover Option will result in a lesser extent of permanent reclamation than the Tunnel Option of around 2.6ha, and the Flyover Option will require a lesser extent of temporary reclamation during construction than the Tunnel Option of around 1.5ha.

3.2.2 The difference in extent of reclamation is associated both with the permanent reclamation, which will have a permanent effect on the Harbour, and the temporary reclamation, which will be short term and will have no permanent effect on the Harbour (indeed, its very purpose being to enable the extent of permanent reclamation to be reduced). These differences in the extent of reclamation between the Flyover Option and the Tunnel Option will have to be fully taken into account in the light of the CFA judgment.

3.3 Comparison on Performance of Tunnel and Flyover Options

3.3.1 In paragraph 48 of the CFA's judgment:

> "Where there is a reasonable alternative to reclamation, an overriding need for reclamation would not be made out. There would be no such overriding need since the need could be met by the alternative means. **In considering what is a reasonable alternative, all circumstances should be considered. These would include the economic, environmental and social implications of each alternative.** The cost as well as the time and delay involved would be relevant. The extent of the proposed reclamation should not go beyond the minimum of that which is required by the overriding need. If it does, the overriding need for the proposed reclamation could not be established, since there would be no need for the reclamation to the extent proposed. It is necessary that each area proposed to be reclaimed must be justified."
> *[emphasis added]*

3.3.2 Since the extent of reclamation required by the Tunnel Option is greater than that of the Flyover Option, it must, in line with the CFA judgment, be considered whether the Flyover Option is a "reasonable alternative" to the Tunnel Option, through consideration of all circumstances including "the social, environmental and economic implications".

3.3.3 The following key aspects are considered in assessing the social, environmental and economic implications:

(i) Social Implications
- protection of the Harbour
- planning and land use considerations
- public views
- impacts to existing traffic
- time of implementation

(ii) Environmental Implications
- environmental nuisance and impacts during construction
- operational environmental impacts

(iii) Economic Implications
- implementation costs.

(i) Social Implications

Protection of the Harbour

3.3.4 The PHO requires the Harbour to be protected and preserved as a special public asset and a natural heritage of the Hong Kong people, and establishes a presumption against reclamation in the Harbour. Notwithstanding that there is an overriding need for reclamation for the project, it is essential to find the option that will best serve to protect and preserve the Harbour, with the minimum area of the Harbour affected by reclamation. In this regard, the area of the Harbour affected by the Trunk Road Tunnel and Flyover Options is of concern. In this connection, it must be understood that the affected area of the Harbour is not "reclamation" within the meaning of the PHO.

3.3.5 Therefore, when examining the Trunk Road options, it is not only the land formation by reclamation that should be of concern, but also the water areas of the Harbour affected by the scheme, in order to determine which option would serve best to protect and preserve the Harbour. In considering the affected area of the Harbour, the following aspects have been examined for comparison, besides the reclamation which has been covered in Section 3.1 above:

(i) flyover structures over water (the plan area of elevated highway structures that cross over water);

(ii) affected water area (areas of the Harbour obstructed by Trunk Road structures, or where marine uses are restricted).

3.3.6 At the eastern end of the Tunnel Option, the Trunk Road will tie into the existing elevated IEC by elevated road connections. Part of these connections will extend beyond the existing land and new reclamation areas; the area of new flyover structures over water will be around 0.3ha (excluding the area of substructures (pile caps and dolphins) that has already been accounted for in the area of permanent reclamation in Section 3.1). **Figure 3.3** illustrates the area of new flyover structures over water for the Tunnel Option.

3.3.7 For the Flyover Option, flyover structures will cross over the ex-PCWA basin and across the southern part of the CBTS; these flyover structures over water will impinge upon the water area of the Harbour and the marine use of the water areas will be restricted due to the presence of these highway structures. The plan area of elevated highway structures over water for the Flyover Option is around 3ha. To avoid double counting the area of overlapping substructures, which has already been included in the reclamation area, the net area of flyover structures

over water is reduced to around 2.6ha. The new flyover structures will, in turn, restrict access to and use of the water areas behind the road structures. The water area of the Harbour so affected is around 4ha. **Figure 3.4** illustrates the area of flyover structures over water and the affected water area for the Flyover Option.

3.3.8 The Flyover Option will permanently occupy the ex-PCWA by bridge piers and a low level road deck structure. The use of this part of the Harbour both in terms of water area for marine use and the surrounding land areas as supporting land uses and promenade will be greatly reduced. Bridge piers will also be required in the CBTS and low level roads in the south-eastern corner of the CBTS for the reprovisioned connections between Victoria Park Road and the IEC (e.g. the eastbound connection from Victoria Park Road to IEC will have headroom clearances varying from zero to around 7m), will effectively isolate this part of the typhoon shelter. The existing function of the CBTS will be adversely and permanently affected.

3.3.9 In summary, the affected areas of Harbour for the Tunnel Option and Flyover Option, besides reclamation, are estimated to be as follows:

	Tunnel Option	**Flyover Option**
Affected area of the Harbour: (i) Flyover structures over water (exclude substructures) (ii) Affected water area	0.3 ha	2.6 ha 4.0 ha

3.3.10 The Flyover Option will permanently affect some 6.3ha of the Harbour more than will the Tunnel Option, even though the 6.3ha in question does not constitute "reclamation" within the meaning of the PHO. The Flyover Option structures will impinge upon the water area of the Harbour and restrict the marine use of these water areas. As such, these affected water areas will have to be taken into account in assessing the social and environmental implications of the Flyover Option for the purposes of the PHO.

Planning and Land Use Considerations

3.3.11 During the course of the public engagement process, a number of harbour-front enhancement ideas have been received from the public at public forums and charrettes and through written submissions, that are reasonable and worthwhile to pursue, and which should if at all possible be included in the Trunk Road scheme in order to meet public aspirations, including:

(i) making use of the land formation along the Wan Chai shoreline for harbour-front enhancement and providing pedestrian access to the waterfront;

(ii) developing the basin at the ex-PCWA into a vibrant marine recreational facility;

(iii) extending Victoria Park to the harbour-front by a landscaped deck over the roads;

(iv) preserving the existing CBTS as far as possible.

3.3.12 A holistic approach to harbour-front and transport planning should be taken for the enhancement of the shoreline of Wan Chai, Causeway Bay and adjoining areas by combining these harbour-front enhancement ideas with the functional needs of the Trunk Road to derive a consolidated Trunk Road and harbour-front enhancement scheme.

3.3.13 With reference to the harbour-front enhancement ideas that have been received from the public (paragraph 3.3.11 above), the Tunnel Option can incorporate the following harbour-front enhancement features:

- land formation along the Wan Chai shoreline, required for Trunk Road tunnel construction in this area, can be used for harbour-front enhancement, with a landscaped promenade for leisure purposes and incorporating harbour-front cafes and the like. The area of open space for waterfront will be around 3.5ha and the GFA provided for waterfront related commercial and leisure facilities will be 3,900m^2. New at-grade and elevated pedestrian connections will improve access to the waterfront. The promenade could be extended through Causeway Bay up to North Point;
- the ex-PCWA basin can be turned into a marine recreational facility, for public use, and with mooring facilities for visiting sailing ships providing sight-seeing opportunities for local residents and visitors alike. The area of public waterfront promenade and water recreation activities will be around 1ha, including a GFA of 1,650m^2 for water recreation related uses;
- construction of a landscaped deck over Victoria Park Road enables Victoria Park to be extended to the harbour-front from the existing raised “knoll” area at the north-western corner of the park;
- with no permanent reclamation in the typhoon shelter, or any new intruding structures, the existing CBTS and it’s cultural heritage can be retained essentially as it presently exists. As such, the harbour-front enhancement idea of preserving the existing CBTS as far as possible can be achieved.

3.3.14 Along the Wan Chai shoreline, with the Trunk Road being entirely underground for the Tunnel Option, there are no adverse land use impacts; rather, from a planning and land use point of view, there will be a beneficial effect through the harbour-front enhancement opportunities that arise from the Trunk Road Tunnel Option.

3.3.15 At Causeway Bay, the sub-seabed tunnel through the CBTS means that there will be no permanent loss of any of the existing mooring or anchorage areas in the CBTS. There is no impact on inland existing land uses except Victoria Park:

while the mainline Trunk Road alignment does not intrude into Victoria Park and therefore will not require any demolition of the park, Slip Road 8 of the Trunk Road Tunnel Option does run along the inside of the northern boundary of the park, taking up around 0.2ha of the existing park land and requiring the relocation of the lawn bowling green and the nursery compound.

3.3.16 At North Point, part of the land formed together with the existing waterfront area along the seaward side the IEC elevated structure (some of this being private land), which is currently mainly occupied by incompatible land uses such as open car park and sand depot, can be developed as a waterfront park and used for harbour-front enhancement and pedestrian access after the construction of the Trunk Road tunnel below this ground. The area of public open space will be over 3ha.

3.3.17 However, the Tunnel Option does affect the seaward portion (in front of the existing IEC) of some existing and planned private developments along the North Point shore. In all, 5 private lots will need to be partially resumed to facilitate the Trunk Road Tunnel construction. The areas to be resumed are confined to the areas on the seaward side of the existing IEC, although some of the area underneath the IEC may need to be occupied temporarily during construction (temporary occupation of some of the area underneath the IEC may also be needed for the Flyover Option construction). Out of these 5 lots, part of one lot is currently being developed as a hotel, with the hotel building being constructed on the area behind the IEC.

3.3.18 For the Flyover Option, the harbour-front enhancement and pedestrian access to the waterfront is somewhat more limited, and is essentially restricted to making use of the land formation along the Wan Chai shoreline. Even here, though, the new waterfront area is partly occupied by the tunnel portal which constrains the extent of leisure area and compromises the leisure uses that could be put to this area. The useable area of open space for waterfront in this case would be only around half of that of the Tunnel Option and no land would be provided for waterfront related commercial and leisure facilities.

3.3.19 The ex-PCWA basin cannot be used as a marine recreational facility due to the highway bridge piers occupying the water area and the low headroom clearance (less than 5m at the western part of the ex-PCWA basin) of the flyover.

3.3.20 In Causeway Bay, the new elevated road running along the northern side of Victoria Park makes implementation of a landscaped deck over Victoria Park Road, for an extension of Victoria Park to the waterfront, impractical. With part of the water area occupied by bridge piers, pile caps and protective dolphins, and the marine uses further restricted by the reduced headroom clearances of the new flyover structures (around 8m at the western part but as low as zero in the eastern part at, for example, the Victoria Park Road to IEC eastbound connection), the existing CBTS would not be preserved. There will be a permanent loss of around 1.7ha of mooring and anchorage area and restricted use of the southern part of the CBTS caused by the structures of the Flyover Option in the existing

water areas of the CBTS. Reference can be made to Appendix A, Reclamation for the Flyover Option, and in particular Figure 4.3 of that report, which illustrates the impacts of the Flyover Option on the typhoon shelter.

3.3.21 The flyover structures and the ground level roads would occupy a large portion of the existing promenade along the CBTS, disrupting the provision of a continuous waterfront promenade through Wan Chai and Causeway Bay (which the Tunnel Option can provide). On the other hand (unlike the Tunnel Option) Slip Road 8 of the Flyover Option would not directly impact Victoria Park.

3.3.22 At North Point, the existing land uses at the waterfront area underneath and along the seaward side the IEC elevated structure (with incompatible land uses such as open car park and sand depot) would be retained, as there is no change to the existing IEC. Existing and planned private developments along the North Point shore would therefore not be affected. However, no new land would be formed in this area which could be used for increasing the public open space provision, as under the Tunnel Option.

3.3.23 Whilst the Flyover Option would not involve any resumption of land along the North Point shore, it cannot meet public aspirations for harbour-front enhancement, particularly the preservation of the CBTS and the provision of more public open spaces in Wan Chai and North Point, water recreational uses at the ex-PCWA, and a continuous promenade in Wan Chai, Causeway Bay and North Point.

Public Views

3.3.24 A 3-stage public engagement exercise, the "Harbour-front Enhancement Review – Wan Chai, Causeway Bay and Adjoining Areas" ("HER"), under the steer of the then Harbour-front Enhancement Committee ("HEC") Sub-committee on WDII Review has been undertaken from May 2005 to June 2007 in parallel with the WDII Review. The 3 stages are:

(i)	"Envisioning Stage"	Public to provide their visions, wishes and concepts, as well as to compile Sustainability Principles and Indicators as a basis for the development of the Concept Plan
(ii)	"Realization Stage"	Public to evaluate the Concept Plan to arrive at consensus
(iii)	"Detailed Planning Stage"	Ensure draft OZPs and RODP reflect the consensus.

3.3.25 The outcome of this extensive public engagement has indicated that there is overwhelming support from the public for a tunnel option, especially where this can incorporate suggested harbour-front enhancement ideas while at the same time provide for the functional requirements of the Trunk Road.

3.3.26 At the Envisioning Stage of HER, the public has been engaged at the early stage to solicit their views on the need for and the form of the Trunk Road. This early envisioning stage public engagement included five public forums and two community design charrettes, as well as engagement with the TPB, the Legislative Council (LegCo), the four District Councils (DCs) of the Hong Kong Island and other relevant statutory and advisory bodies. Written submissions and several detailed proposals were received from the public. The outcome of this extensive public engagement has indicated a clear preference for having the Trunk Road in the form of a tunnel, with opposition to having an extension of the IEC (i.e. flyover) through Causeway Bay and Wan Chai. In particular, at the two community design charrettes (where the participants were asked to prepare broad concept plans to reflect their proposed design themes for the WDII project), a tunnel form of construction for the Trunk Road was preferred unanimously and, out of the 13 concept plans produced, there was NO suggestion of adopting a flyover option.

3.3.27 Following the then HEC Sub-committee's endorsement of the report of the Expert Panel on Sustainable Transport Planning and Central-Wan Chai Bypass (Expert Panel) and expressing support to the construction of a Central-Wan Chai Bypass in December 2005, the Report on Trunk Road Alignments and Harbour-front Enhancement was prepared to present the findings on preliminary assessment on possible trunk road alignments and its construction forms at the request of the then HEC Sub-committee. Views on the Report were solicited during April to June 2006 from, among others, the TPB, the then HEC Sub-committee, four DCs of the Hong Kong Island, LegCo and the Transport Advisory Committee, and the relevant professional bodies through two seminars organised respectively by the Hong Kong Institution of Engineers and jointly by the Hong Kong Institute of Architects, Hong Kong Institution of Engineers, Hong Kong Institute of Landscape Architects, Hong Kong Institute of Planners and Hong Kong Institute of Surveyors. There was strong public support for the Tunnel Option for the Trunk Road.

3.3.28 Having examined the merits and demerits of the various options for the development of the Trunk Road, and taking into account the views received from the public engagement exercise, the then HEC Sub-committee endorsed at the meeting held on 13 June 2006 the adoption of Tunnel Option Variation 1 as the basis for the preparation of the Concept Plan.

3.3.29 At the Realization Stage of HER, members of the public were engaged on the Concept Plan including the Trunk Road and the corresponding harbour-front enhancement proposals. They were encouraged to voice their views at the roving exhibitions, community workshops and harbour walks, consensus building town hall meeting as well as by written submissions and questionnaires. At the consensus building town hall meeting, almost all the participants agreed to support the Concept Plan prepared based on Trunk Road Tunnel Variation 1 (the Tunnel Option) in principle and to proceed to the Detailed Planning Stage of HER based on the Concept Plan.

3.3.30 Details of the views of the public received through the public engagement process can be found in the Envisioning Stage Public Consultation Report (March 2006) and the Realization Stage Public Engagement Report (April 2007). These reports can be referenced on the internet through the HEC website.

3.3.31 At the Detailed Planning Stage of HER, the Concept Plan, which was well supported by members of the public, was taken forward for preparing the RODP and the proposed amendments to the relevant OZPs including the North Point OZP. A public briefing was held on 23 June 2007, to which all collaborators, stakeholders and the general public were invited. The views of the participants were collated and reported to the Town Planning Board for consideration in the statutory process. There was a general consensus that the RODP and the draft OZPs had reflected most of the views and directions on the Concept Plan expressed at the Realization Stage.

3.3.32 As presented above, there has been overwhelming support for the Tunnel Option throughout the extensive public engagement process. On the other hand, there has been strong objection to a flyover which is seen as virtually an extension of the IEC through Causeway Bay and Wan Chai and which, no matter how designed, would be visually intrusive.

Impacts to Existing Traffic

3.3.33 Connection of the Trunk Road to the existing IEC will be a major cause for concern in respect of disruption to existing traffic during the construction period. Temporary traffic diversions have to be arranged during the construction work to maintain traffic flows. Should the temporary traffic arrangements of either Trunk Road option cause significant disruption and delays to the existing traffic, then the reasonableness of that option must be called into question.

3.3.34 For the Tunnel Option, the Trunk Road tunnel will rise up beyond the east of the CBTS for connection with the existing elevated IEC. Connection to the IEC is made to the northern side of the existing IEC elevated road structure, which is considered to be the least disruption form of connection. The existing IEC links back into Causeway Bay (to Victoria Park Road and Hing Fat Street) are retained.

3.3.35 The temporary traffic diversion scheme for the Tunnel Option is reasonably straightforward. The new Hing Fat Street Slip Road can be temporarily widened and extended during construction to accommodate diverted IEC eastbound traffic. When the existing eastbound traffic of IEC is diverted to the temporarily widened Hing Fat Street Slip Road, the IEC westbound traffic can be diverted to the existing IEC eastbound carriageway, allowing the re-construction of the IEC westbound structure. Once the works of the IEC westbound structure are completed, the westbound traffic can be diverted back to the westbound carriageway and the connection of the tunnel portal, approach ramps and the IEC eastbound structure will take place. When the tunnel and the connection to IEC are completed, and the mainline Trunk Road is opened (taking up the diverted

IEC eastbound traffic), the temporarily widened section of the Hing Fat Street Slip Road can be demolished. Hence, with this simple temporary traffic arrangement, disruption to the existing traffic at the new tie-in to IEC during construction will not cause significant disruption or delay.

3.3.36 For the Flyover Option, demolition of the existing IEC structure through the south-eastern corner of the CBTS to enable the construction of the new elevated structure of the Flyover Option, together with the slip road connections, will require complex temporary traffic arrangements for keeping the traffic flowing during construction. Several temporary roads would need to be constructed for traffic diversions. Amongst these will be a diversion of eastbound traffic from Victoria Park Road to IEC and diversion of traffic on the at-grade Victoria Park Road away from the works area for demolishing the existing IEC and for constructing the Trunk Road mainline flyover. Another temporary road would need to be constructed to divert traffic from Hing Fat Street to IEC to enable the reconstruction of that slip road. In addition, temporary traffic diversion for the section from FEHD Depot to City Garden would be required for the reconstruction of the existing IEC structure to accommodate noise mitigation measures for the Flyover Option.

3.3.37 The temporary traffic arrangement for the Flyover Option, which involves the demolition of the existing IEC starting from Victoria Park Road, through the CBTS to Hing Fat Street, is not as straightforward as the Tunnel Option, and far more extensive. Tie-ins to the existing Victoria Park Road and Hing Fat street would not be free-flow and would result in severe disruption to traffic flows and traffic 'black spots'. The public will need to endure this disruption and substantial delay to journey times for a period of around 4 years, before the new roads are sufficiently in place to alleviate the traffic congestion.

Time of Implementation

3.3.38 The urgent need for the Trunk Road to relieve the congested east-west Connaught Road – Harcourt Road – Gloucester Road corridor has been well established, and there is increasing impatience from the public, whose lives are increasingly adversely affected by this congestion, for the Trunk Road to be implemented as quickly as possible. It has already suffered significant delay over the last few years due to various reasons.

3.3.39 The Tunnel and Flyover Options will respectively require 7 years and 6 years for construction. Therefore, the Flyover Option performs better in respect of time of implementation. However, the shorter time of construction of the Flyover Option (about 1 year less than the Tunnel Option) is not particularly significant and it would not provide any substantive justifications to offset the other social factors as discussed in this sub-section, bearing in mind that the public is keen to have the opportunity of enhancing the harbour-front while satisfying infrastructural needs.

(ii) Environmental Implications

3.3.40 Environmental Impact Assessments (EIAs) for the WDII & Trunk Road projects have been carried out under the Environmental Impact Assessment Ordinance. During the preparation of the Report on Trunk Road Alignments and Harbour-front Enhancement and the CCM Report, preliminary environmental assessments were carried out and review of the previously approved EIA Reports for WDII under the WDII Comprehensive Feasibility Study (WDIICFS) and for the Trunk Road (CWB and IECL) under the Project Review Study of the CWB&IECL (Application No's EIA-058/2001 and EIA-057/2001) was undertaken to support the comparison between the Tunnel Option and Flyover Option in respect of environmental concerns.

3.3.41 The previously approved EIA Reports for WDIICFS and CWB&IECL were for a flyover scheme which differed from the current Flyover Option mainly in respect of reclamation in the ex-PCWA basin and in the CBTS, a proposed marina outside the ex-PCWA basin, an eastbound slip road from the Trunk Road to the eastbound Victoria Park Road, and a slight shift eastwards of the eastern tunnel portal to the ex-PCWA. However, in respect of the critical aspects of air, noise and visual impacts of the elevated road, there is no material difference between the road schemes, including the open road sections and alignments. The findings of the previously approved EIA Reports are considered to be applicable to the Flyover Option.

3.3.42 The environmental impacts of the Tunnel Option have been assessed in detail in the recently completed EIA Report for WDII and CWB (EIA Study Brief No. ESB-153/2006), that has been subjected to public inspection and endorsed by the Advisory Council on the Environment. Whilst approval by the Director of Environmental Protection is still pending, this EIA provides a sound basis for the determination of Tunnel Option impacts.

Environmental Nuisance and Impacts during Construction

3.3.43 The key environmental concerns during construction are air quality, noise, water quality and landscape and visual impacts.

Air Quality

3.3.44 The major issue related to air quality impacts during the construction phase is construction dust. The major sources of dust impact under the Tunnel Option and Flyover Option are similar, such as filling works, materials handling and wind erosion. However, with the implementation of appropriate mitigation measures (dust suppression measures), no air quality impact is anticipated during the construction phase for both the Tunnel Option and Flyover Option.

Noise

3.3.45 The major construction noise will be from the construction of the tie-in of the Trunk Road to the existing elevated IEC structure and the construction of noise barriers along the IEC, mainly due to the extensive demolition of the existing highway structures that is required. For the Tunnel Option, around 730m length of existing highway structures will need to be demolished, while for the Flyover Option, including provision for noise barriers of similar extent as that provided by the Tunnel Option, around 1,420m length of highway structures will need to be demolished. Due to the close proximity of adjacent residential noise sensitive receivers (NSRs), the demolition noise will cause significant nuisance even if mitigated to within the statutory limits. The EIA for WDII and CWB indicates that even with extensive noise mitigation, noise levels will be very high (approaching the limits of the acceptance criteria) and there may still be some isolated instances of noise criteria exceedances at particular NSRs. Given that the Flyover Option will involve nearly twice the length of demolition as the Tunnel Option, construction noise, even though mitigated to comply with the statutory noise criteria, will cause much greater nuisance for the nearby residential NSRs than for the Tunnel Option.

Water Quality

3.3.46 Water quality impacts are expected to be similar for the two options in the construction phase. The EIAs for both schemes have found that, provided recommended mitigation measures are implemented, no residual water quality impact due to the reclamation works would be anticipated during construction.

Landscape and Visual Impacts

3.3.47 During construction, both the Tunnel and Flyover Options would have substantial negative impacts especially on the CBTS landscape character, and there would be moderate impact on Victoria Harbour. The Tunnel Option would have moderate impact on Victoria Park due to the Slip Road 8 construction. There would be moderate negative visual impacts from both the Tunnel and Flyover Options on visually sensitive receivers in the front row of high rise buildings along the waterfront from Central to North Point.

Summary of Construction Impacts

3.3.48 Environmental nuisance and impacts during construction will be quite similar in magnitude in most key areas of concern for both the Tunnel and Flyover Options, except noise nuisance arising from the demolition of the existing highway structures at the connection with the IEC which would be worse for the Flyover Option due to the greater length of demolition required.

Operational Environmental Impacts

3.3.49 Again, the key environmental concerns during operation of the Trunk Road scheme are air quality, noise, water quality and landscape and visual impacts.

Air Quality

3.3.50 The major concern with regard to air quality impacts during the operation phase is traffic emissions. Sources of traffic emissions include vehicle emissions from open roads and portal and ventilation building emissions at the tunnel portals. The major differences between the Tunnel Option and Flyover Option arise from the extent of open road section through Wan Chai and Causeway Bay for the Flyover Option and the portal and ventilation building emissions at North Point for the Tunnel Option.

3.3.51 From the Wan Chai shoreline through the CBTS to around Oil Street in North Point, the Trunk Road stays in tunnel form under the Tunnel Option while it will be an open road throughout this section under the Flyover Option. The tunnel portal for the Tunnel Option is located at around Oil Street in North Point with the East Ventilation Building next to the FEHD Depot. For the Flyover Option, the tunnel portal and the East Ventilation Building are located in Wan Chai North, opposite the Wan Chai Sports Ground.

3.3.52 With reference to the findings from the WDIICFS and CWB&IECL EIA Reports, pollutant levels due to open roads close to the air sensitive receivers (ASRs) along Gloucester Road in the Causeway Bay area would approach the limit of acceptable air quality objectives (AQOs), in particular for NO_2 concentrations. The contribution to air quality impacts is significant for the Flyover Option, where the flyover section in the CBTS is at a distance of only around 150m from the nearest ASRs. Nevertheless, whilst pollutants are at undesirable levels, the AQOs can be met by the Flyover Option.

3.3.53 Obviously, with around half of the east-west traffic being moved underground in the Tunnel Option, air quality impacts due to open road emissions, in particular at Causeway Bay, will be much less and air quality impact from vehicle emissions from open roads for the Tunnel Option will not be a major issue.

3.3.54 For the Tunnel Option, an air quality concern was identified at the eastern tunnel portal at North Point, in view of the close proximity of ASRs. This concern has been addressed with the adoption of a “zero portal emission” ventilation system design and the use of electrostatic precipitator at the East Ventilation Building. With this design, the detailed EIA assessments have demonstrated that there will be no adverse air quality impacts at the portal area for the Tunnel Option.

3.3.55 For the Flyover Option, portal emissions at the East Ventilation Building at Wan Chai North would not cause adverse impact due to adequate separation from ASRs in this area.

3.3.56 Overall, though, air quality conditions at ASRs will be better for the Tunnel Option than the Flyover Option, mainly due to the reduction of open road traffic emissions.

3.3.57 In addition, the existing odour nuisance associated with the CBTS will be mitigated in large part by the dredging of the odourous sediments in the typhoon shelter for the temporary works of the Tunnel Option. This relief will not occur for the Flyover Option, which does not require such dredging in the CBTS.

Noise

3.3.58 The major concern for noise impacts during the operation phase of both the Tunnel and Flyover Options is road traffic noise.

3.3.59 For the Tunnel Option, traffic stays underground from Wan Chai all the way through to the eastern portal at around Oil Street in North Point, therefore there will be no unacceptable adverse road traffic noise impact at NSRs at the Causeway Bay area. Exceedance of the traffic noise criterion (70 dB(A)) would occur where the Trunk Road connects with the open road IEC flyover, and noise mitigation measures, including noise barriers and semi-enclosures, are recommended at the tunnel portal area and along the IEC at North Point. With the implementation of these noise mitigation measures, no unacceptable adverse noise impact is predicted.

3.3.60 For the Flyover Option, the Trunk Road tunnel section through Wan Chai emerges from below ground to the tunnel portal near the ex-PCWA and rises onto elevated structure across Kellett Island, staying as open road across the CBTS to the connection with the IEC. The slip road carrying traffic from Causeway Bay to the Trunk Road and connections with the IEC are also elevated open roads. Adverse road traffic noise impact on the NSRs at Causeway Bay, Tin Hau and North Point areas is predicted from these open road sections.

3.3.61 At Causeway Bay, with reference to the previously approved CWB&IECL EIA Report, the noise contribution from the elevated Trunk Road to NSRs at Riviera Mansion and Marco Polo Mansion would be up to around 73.6 dB(A). At Tin Hau and North Point, the contribution of the elevated Trunk Road to the NSRs at Belle House and Victoria Centre would be up to around 75.2 dB(A). Noise mitigation for the Flyover Option, in the form of noise barriers and semi-enclosures, will be required to mitigate these noise impacts.

3.3.62 Based on the above findings, the Flyover Option will cause significant traffic noise impacts along the flyover section through Causeway Bay and at the connection with the IEC at North Point. Extensive noise mitigation in the form of noise barriers will be required along this entire length of flyover. The Tunnel Option, on the other hand, will only require noise mitigation at the open road connection with the IEC at North Point, and noise impacts here can be fully mitigated.

Water Quality

3.3.63 In comparing the Tunnel Option and the Flyover Option, the extent of reclamation is similar at HKCEC and Wan Chai and there is no permanent reclamation at CBTS. For the Tunnel Option, there will be reclamation at North Point but the effects on the hydrodynamics and water quality is considered minor. Overall, there would not be any significant changes to the hydrodynamic regime and there would be no unacceptable adverse water quality impacts associated with the operation phase for both the Tunnel and Flyover Options.

Landscape and Visual Impacts

3.3.64 For the Tunnel Option, during the operation stage, the urban landscape character will be strengthened and enhanced by the project, although there will be slight residual negative landscape impacts on Victoria Park due to the slight reduction in park area by Slip Road 8. Overall, the Tunnel Option will not create adverse impact to the open space framework and it will have positive impact to the waterfront from Central to North Point. The Tunnel Option would enhance the urban landscape character of the waterfront district, whereas the Flyover Option would result in adverse impacts to the landscape character of the waterfront.

3.3.65 For the Tunnel Option, the Trunk Road will be in tunnel from the ex-PCWA through the CBTS and will rise to above ground level at North Point for connection with the existing IEC elevated structure. There will therefore be no visual impact caused by the underground tunnel structure along the Wan Chai and Causeway Bay waterfront. At North Point, where the new Tunnel Option structures tie into existing elevated road structures, it is anticipated that there will be slight residual visual impact due to the provision of noise barriers/semi-enclosures. However, there will be a significant area of new waterfront open space created by the Tunnel Option scheme from CBTS to Oil Street, with extensive landscape treatment, integrated with a landscaped deck that is proposed over the tunnel portal. Therefore, overall, the residual impact for the Tunnel Option is found to be acceptable with mitigation measures in the short term and beneficial with mitigation in the long run, with no significant residual visual impact.

3.3.66 For the Flyover Option, during the operation phase, there would be significant adverse visual impacts on visual sensitive receivers (VSR's) in the Tin Hau, Tai Hang, Causeway Bay and Wan Chai districts where numerous residential and hotel buildings would have clear views of the elevated road structure at the ex-PCWA, across Kellett Island, through the CBTS and at the connection back to the existing IEC at North Point. With reference to the CWB&IECL EIA Report, residential VSRs at Riviera Mansion, Prospect Mansion, Miami Mansion, Highland Mansion, Marco Polo Mansion, Victoria Park Mansion, Chesterfield Mansion, with significant adverse visual impacts, are in locations where the total height of the proposed elevated flyover structure and the associated noise barriers will become an imposing feature to the residential flats facing the Harbour. The Flyover Option will pose a key concern on the issue of visual

impact to this local area in Causeway Bay. Other VSR's categorised with significant adverse impacts are Gloucester Road 160-233, Elizabeth House, Top Glory Tower/Hoi Kung Court/Hoi To Court/Hoi Deen Court, Belle House, Gordon House, Mayson Garden Building, Victoria Court, Viking Court, Triumph Court, Park Towers, King's Road 2-14 and Victoria Heights.

3.3.67 The flyover structures will also create an imposing visual intrusion on views from the waterfront and on views from Tsim Sha Tsui and from passing tourist cruise ships. In effect, the existing visual barrier of the IEC, which is the subject of much adverse comment, would be extended from North Point all the way through the CBTS to the Wan Chai shoreline.

3.3.68 The mitigation measures proposed in the CWB&IECL EIA at these areas within the project have limited potential to reduce the scale of the impact. In the earlier Trunk Road proposals that incorporated the IECL as flyover, further developments and landscape proposals at the new waterfront could alleviate some adverse impacts by offering a high quality alternative view. These measures for mitigation of views across the flyover structures were made possible by the reclamation that was proposed under the earlier Trunk Road scheme at Wan Chai and in the CBTS, which enabled extensive hard and soft landscaping as well as architecturally attractive waterfront developments that would draw attention away from and visually screen the flyover structures. However, with minimum reclamation now at Wan Chai and without any permanent reclamation in the CBTS under the current Flyover Option, there is limited opportunity for visual mitigation at Wan Chai, especially with the tunnel portal occupying most of the waterfront open space, and no opportunity along the Causeway Bay or North Point shorelines to create a new waterfront to alleviate the visual impacts. The dominating visual presence of the flyover structures will prevail.

Summary of Operational Impacts

3.3.69 Operational environmental impacts in respect of air quality relate mainly to open road vehicular emissions, where the Flyover Option will have significant contribution to air pollution levels (although the AQOs can be met), whereas with traffic being diverted underground for the Tunnel Option, air quality impacts due to open road emissions will be much less.

3.3.70 Similarly, the open road sections of the Flyover Option will cause significant traffic noise impacts through Causeway Bay and at the connection with the IEC at North Point, requiring extensive noise mitigation in the form of noise barriers along this entire length of flyover. Again, with traffic being diverted underground for the Tunnel Option, noise mitigation will only be required at the open road connection with the IEC at North Point, and noise impacts here can be fully mitigated.

3.3.71 There would be no unacceptable adverse water quality impacts associated with the operation phase for both the Tunnel and Flyover Options.

3.3.72 In respect of landscape and visual impacts, the Flyover Option would result in some residual adverse landscape impacts and would cause significant adverse visual impacts for VSRs in Wan Chai and Causeway Bay, and for users at the waterfront, as well as VSRs in the Harbour and from Tsim Sha Tsui. The flyover structures will create an imposing visual intrusion to the waterfront and to the Harbour. The Tunnel Option would have an overall positive landscape impact to the waterfront from Central to North Point, and visual impacts of the Tunnel Option are found to be acceptable with mitigation measures in the short term and beneficial with mitigation in the long run.

(iii) Economic Implications

Implementation Costs

3.3.73 A comparison in broad terms of the construction and annual maintenance costs for the Tunnel and Flyover Options is summarised below.

		Tunnel Option	**Flyover Option**
Costs (including WDII works & CWB in WDII)	Total Construction	HK$20B	HK$11B
	Total Annual Recurrent	HK$110M	HK$75M

3.3.74 The comparison of the construction costs indicate that the Tunnel Option would cost about 80% more than the Flyover Option to construct. This is mainly due to the higher costs of tunnel construction at Causeway Bay and North Point. Annual recurrent costs for the Tunnel Option would be around 47% higher than that of the Flyover Option; this is due to the longer length of tunnel which incurs a higher maintenance cost than above-ground roads.

3.3.75 In considering these costs, it is important to appreciate that cost, by itself, should not be taken as overriding the need to protect and preserve the Harbour. Constructing a Trunk Road scheme that will not only fulfil its functional requirements but also minimise the extent of reclamation and maximise the enhancement of the harbour-front would be the primary objective. From the PHO point of view and taking into account the added social and environmental value of harbour-front enhancement, the higher costs associated with a scheme that could fulfil all the above requirements would be considered money well justified.

3.3.76 The higher costs associated with the Tunnel Option were highlighted when the public was consulted in 2006 on the Report on Trunk Road Alignments and

Harbour-front Enhancement, but there was no particular comment, adverse or otherwise, in this regard; instead, the Tunnel Option was well supported, and there was no support for the Flyover Option on the grounds of its lower costs. What was considered more important by the public was the derivation of an acceptable scheme from the point of view of the PHO.

3.3.77 Of course, the costs of any option under consideration should not be so high as to be unreasonable. In this case, the cost of the Tunnel Option relative to the Flyover Option, while higher, is not unreasonably high. Nor is the cost of the Tunnel Option relative to other major road tunnel projects unreasonably high. As example, the construction cost of the Tunnel Option tunnel equates to around HK$4.4B per kilometre, compared to the construction cost of the Western Harbour Crossing tunnel which, at equivalent pricing level, was around HK$4.0B per kilometre. Recurrent costs for the Tunnel Option, per equivalent length, are consistent with recurrent costs of other existing road tunnels in Hong Kong.

3.3.78 Therefore, while the Flyover Option does perform better than the Tunnel Option in respect of cost, the higher costs of the Tunnel Option are clearly offset by the benefits to the Harbour and these higher costs are not a factor that would notably negate the social and environmental benefits of the Tunnel Option as described in the sub-sections on social and environmental implications above.

3.4 Conclusion of the Comparison on Performance of Tunnel and Flyover Options

3.4.1 The assessment of social, environmental and economic implications of the Flyover Option, in respect of the comparison on the performance of the Tunnel and Flyover Options, is summarised in Table 3.1 overleaf.

Table 3.1 Comparison on Performance of Tunnel and Flyover Options

		Tunnel Option	Flyover Option
Social Implications			
Protection of the Harbour Affected area of the Harbour[(1)]: (i) Flyover structures over water (ii) Affected water area [(1)] this is not "reclamation" within the meaning of the PHO		0.3 ha	2.6 ha 4.0 ha
Planning and land use considerations	Along Wan Chai shoreline	Land formed can be used for harbour-front enhancement and pedestrian access to the waterfront.	Land formed is partly occupied by the tunnel portal which limits the area for harbour-front enhancement and constrains pedestrian access to the waterfront.
	ex-PCWA	ex-PCWA basin can be developed into a vibrant marine recreational facility.	Bridge piers and the low headroom clearance of the flyover restrict the development of the ex-PCWA basin as a marine recreational facility.
	Northern side of Victoria Park	Victoria Park can be extended to the harbour-front via a landscaped deck over the roads. Part of the northern edge of the park will be affected by Slip Road 8.	With the flyover running along the northern side of Victoria Park, a landscaped deck for extension of Victoria Park is impractical.
	CBTS	The existing CBTS is preserved.	Part of the water area and the existing promenade will be occupied by bridge piers and marine uses will be restricted.

		Tunnel Option	Flyover Option
	North Point	The seaward portion of some existing and planned developments along the North Point shore will be affected and will require resumption. Part of land formed can be used for harbour-front enhancement and pedestrian access.	No major impact on the existing and planned developments at North Point. Significant new public open space not provided and harbour-front enhancement cannot be achieved.
	Continuous waterfront promenade	A continuous waterfront promenade in Wan Chai, Causeway Bay and North Point can be provided.	Flyover structures at CBTS disrupt the provision of a continuous waterfront promenade.
Public views		Overwhelming support throughout the public engagement process.	No support during public engagement at the time when feasible Trunk Road options were being examined.
Impact to existing traffic		Traffic diversions at new tie-in to IEC, but no major traffic disruption.	Complex temporary traffic arrangements at CBTS and at connection with IEC at North Point. Major traffic disruption and delays at tie-in to IEC and due to reconstruction of Victoria Park Road connections.
Time of implementation (time of construction)		7 years	6 years

		Tunnel Option	Flyover Option
Environmental Implications			
Environmental nuisance and impacts during construction	Air quality	No construction air quality impacts.	No construction air quality impacts.
	Noise	Main concern is noise from demolition at IEC connection, which can be mitigated.	Main concern is noise from demolition at IEC connection, which can be mitigated, but twice the length of road structure to be demolished, therefore much more noise nuisance.
	Water quality	No major construction phase impacts.	No major construction phase impacts.
	Landscape and visual impacts	Substantial to moderate landscape impacts and moderate visual impacts during construction.	Substantial to moderate landscape impacts and moderate visual impacts during construction.
Operational environmental impacts	Air quality	No operational air quality impacts. Air quality at eastern portal mitigated through design.	Significant contribution to air pollution levels from open road emissions in Causeway Bay.
	Noise	With mitigation measures (noise barriers) at tie-in to IEC, no noise impacts.	Extensive mitigation (noise barriers all the way through Causeway Bay and North Point).
	Water quality	No major operational impacts.	No major operational impacts.
	Landscape and visual impacts	Overall urban landscape character would be enhanced, visual impacts are acceptable with mitigation in the short term and beneficial with mitigation in the long term.	Adverse impact to landscape character, significant adverse visual impacts in Wan Chai and Causeway Bay caused by flyover. Dominating visual presence of elevated road structure is against public desire.

		Tunnel Option	Flyover Option
Economic Implications			
Costs *(including WDII works & CWB in WDII)*	Total construction	HK$20B	HK$11B
	Total annual recurrent	HK$110M	HK$75M

3.4.2 After consideration of all the social, environmental and economic implications, the Flyover Option, even though it requires a lesser extent of permanent and temporary reclamation, should not be regarded as a reasonable alternative to the Tunnel Option for the following reasons:

- In respect of protection of the Harbour, the Flyover Option will affect a substantially greater area of the Harbour than the Tunnel Option (some 6.3ha more), and as such the Flyover Option has a major drawback in terms of protection and preservation of the Harbour as intended by the PHO.

- Unlike the Tunnel Option, the Flyover Option cannot meet public aspirations for harbour-front enhancement or accommodate reasonably expected harbour-front planning improvements, and land use opportunities for providing similar extent and quality of harbour-front are comparatively limited.

- The Flyover Option goes against the public views and the strong desire by the public for the Trunk Road to be underground rather than, in effect, an extension of the elevated IEC along the shoreline.

- In terms of traffic disruption, construction of the Flyover Option will result in severe disruption to traffic flows and cause substantial delay to journey times, compared to the Tunnel Option which can be constructed with minimal traffic disruption or delay.

- In respect of the environment, the Flyover Option will, comparatively, cause greater air and noise impacts than the Tunnel Option. But it is the visual impact of the Flyover Option that is of greatest concern. Quite clearly, the dominating visual presence along the harbour-front of the Flyover Option goes against the public desire NOT to have an extension of the existing elevated IEC all the way along the Causeway Bay and Wan Chai shoreline. The underground tunnel of the Tunnel Option, on the other hand, will have no adverse visual impacts, and indeed the Tunnel Option will bring visual benefits in the end.

- Although the Flyover Option does perform better than the Tunnel Option in respect of time for construction and costs, these are clearly outweighed by the above factors.

3.4.3 Overall, the Flyover Option is not considered a reasonable alternative to the Tunnel Option particularly in respect of key aspects of: protection of the Harbour, harbour-front enhancement, environmental impacts and, not least, public acceptance.

3.4.4 In comparing the two options, it has been demonstrated that, in most respects, the Tunnel Option performs better than the Flyover Option. The Tunnel Option:

- will result in a lesser affected area of the Harbour;
- will have more opportunities for harbour-front enhancement and providing access to the waterfront;
- has received public support through extensive public engagement activities;
- will cause less traffic disruption during construction;
- will cause less extensive air and noise impacts;
- will have no adverse visual impact.

Only in respect of time for construction and costs can the Flyover Option be seen as performing better than the Tunnel Option.

3.4.5 Taking into account all of the above, it is considered that the Flyover Option is NOT a reasonable alternative to the Tunnel Option that requires an additional permanent reclamation of 2.6ha and an additional temporary reclamation of 1.5ha, in particular in respect of social and environmental implications.

4 CONCLUSIONS

4.1 Conclusions of the Review of Feasible Options

4.1.1 Tunnel and Flyover Options along the foreshore of Wan Chai and Causeway Bay have been found to be feasible options that can meet the overriding need for the Trunk Road.

4.1.2 In comparing the extent of reclamation, the Flyover Option will result in a lesser extent of permanent reclamation than the Tunnel Option by around 2.6ha. The Flyover Option will also result in a lesser extent of temporary reclamation than the Tunnel Option by around 1.5ha during construction. However, the temporary reclamation of the Tunnel Option will be short term and will have no permanent effect on the Harbour. Moreover, such temporary reclamation is necessary with a view to avoiding more extensive permanent reclamation.

4.1.3 The Flyover Option is not considered a reasonable alternative to the Tunnel Option in that the Flyover Option, though involving a lesser degree of "reclamation" within the meaning of the PHO, will in fact affect a greater extent of the Harbour when other areas of the Harbour impinged upon by the infrastructure of the Flyover Option are taken into account, as well as in terms of limited harbour-front enhancement, severe traffic disruption during construction and, importantly, the environmental and visual impacts – taking also into account the overwhelming public support for the Tunnel Option. The higher costs of the Tunnel Option in economic terms are not considered to be excessive bearing in mind that they are offset and, indeed, outweighed by the much more significant social and environmental benefits of the Tunnel Option in comparison with the Flyover Option. In all circumstances, including social, environmental and economic implications, it is therefore concluded that the Flyover Option is NOT a reasonable alternative to the Tunnel Option.

4.2 Satisfying the Overriding Public Need Test

4.2.1 The Tunnel Option has been developed that satisfies the traffic and functional requirements for the Trunk Road in meeting the overriding public need, and that affects the least area of the Harbour in overall terms, even though it involves a greater extent of reclamation in comparison with the Flyover Option. The Tunnel Option also accommodates harbour-front enhancement ideas that have been proposed by the public, and the scheme has the broad support of the public.

4.2.2 Construction under both the Tunnel and Flyover Options will require reclamation in the areas to the west of the HKCEC, through the HKCEC water channel and along the Wan Chai shoreline. Under the Tunnel Option, reclamation is also required along the North Point shoreline, however, permanent reclamation is not required in the ex-PCWA basin or in the CBTS. In total, an area of 12.7 ha of reclamation (land formation), and in addition around

0.1ha of pile caps and dolphins, is needed to meet essential engineering requirements for construction of the Trunk Road under the Tunnel Option.

4.2.3 The Flyover Option would require a lesser extent of permanent reclamation (2.6ha less) and temporary reclamation (1.5ha less). However, such Option has been demonstrated, in respect of social and environmental implications, to be not a reasonable alternative to the Tunnel Option. While, in economic terms, the Tunnel Option is more expensive, such detriment is offset and outweighed by the benefits in social and environmental terms.

4.2.4 Overall, it is considered that the Trunk Road Tunnel, as described in Section 2.4, serves best to protect and preserve the Harbour, among all the options that have been assessed, and is consistent with the PHO as clarified by the CFA judgment. This option has predominant public support as the preferred Trunk Road scheme, following extensive consultations with various public, advisory and relevant statutory bodies.

LEGEND

- CUT & COVER TUNNEL
- ELEVATED STRUCTURE
- AT-GRADE ROAD
- EXTENT OF PERMANENT RECLAMATION (LAND FORMATION)

N

817 000 N

VICTORIA HARBOUR

EXISTING IEC

EXISTING CROSS HARBOUR TUNNEL

PROPOSED SCL RAILWAY ALIGNMENTS

SLIP ROAD 8

EXISTING MTR TSUEN WAN LINE

SLIP ROAD 1

SLIP ROAD 2

SLIP ROAD 3

TRUNK ROAD TUNNEL UNDER CRIII

EXPO DRIVE EAST PIER

CRIII LIMIT

WDII REVIEW STUDY AREA

HKCEC EXTENSION

HKCEC

816 000 N

836 000 E

837 000 E

838 000 E

CAUSEWAY BAY TYPHOON SHELTER

RHKYC

EX-PCWA BASIN

CROSS HARBOUR TUNNEL PORTAL

POC

VICTORIA PARK

EXISTING WAN CHAI FERRY PIER

WAN CHAI EAST SEWAGE SCREENING PLANT

PROPOSED NIL RAILWAY ALIGNMENT

DATE 2008-10-15 15 20 03

MAUNSELL | AECOM

Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - DESIGN AND CONSTRUCTION FOR TRUNK ROAD TUNNEL OPTION

TRUNK ROAD SCHEME - TUNNEL OPTION

FIGURE 2.1

p:\projects\60041297\DRAWING\REPORT\FLYOVER\CCM\ENGLISH\FL3\FIGURE 2.1.dgn

SCALE A3 1 : 8000

LEGEND

- CUT & COVER TUNNEL
- ELEVATED STRUCTURE
- AT-GRADE ROAD
- EXTENT OF PERMANENT RECLAMATION (LAND FORMATION)

N

817 000 N

816 000 N

VICTORIA HARBOUR

EXISTING IEC

EXISTING CROSS HARBOUR TUNNEL

PROPOSED SCL RAILWAY ALIGNMENTS

SLIP ROAD 8

EXISTING MTR TSUEN WAN LINE

SLIP ROAD 2

SLIP ROAD 1

SLIP ROAD 3

TRUNK ROAD TUNNEL UNDER CRIII

EXPO DRIVE EAST PIER

CRIII LIMIT

WDII REVIEW STUDY AREA

HKCEC EXTENSION

HKCEC

CAUSEWAY BAY TYPHOON SHELTER

RHKYC

EX-PCWA BASIN

CROSS HARBOUR TUNNEL PORTAL

POC

VICTORIA PARK

PROPOSED NIL RAILWAY ALIGNMENT

EXISTING WAN CHAI FERRY PIER

2700 3100 3300 3500 3700 3900 4100 4300 4500 4700 4900 5100 5300

836 000 E 837 000 E 838 000 E

DATE 2008-10-15 11 22 41

MAUNSELL AECOM

Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - DESIGN AND CONSTRUCTION FOR TRUNK ROAD TUNNEL OPTION

TRUNK ROAD SCHEME - FLYOVER OPTION

FIGURE 2.2

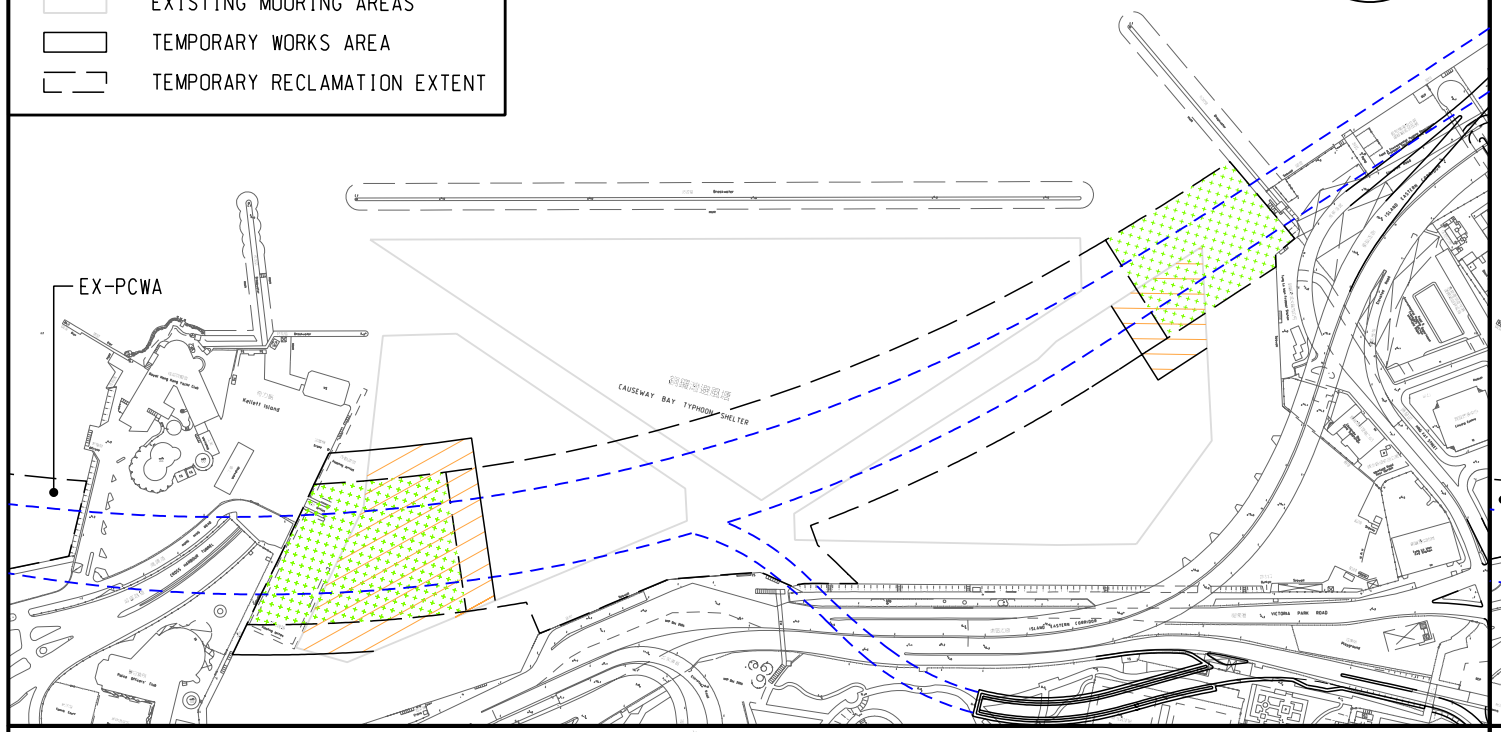
p:\projects\60041297\DRAWING\REPORT\FLYOVER\CCM\ENGLISH\FL3\FIGURE 2.2.dgn

SCALE A3 1 : 8000

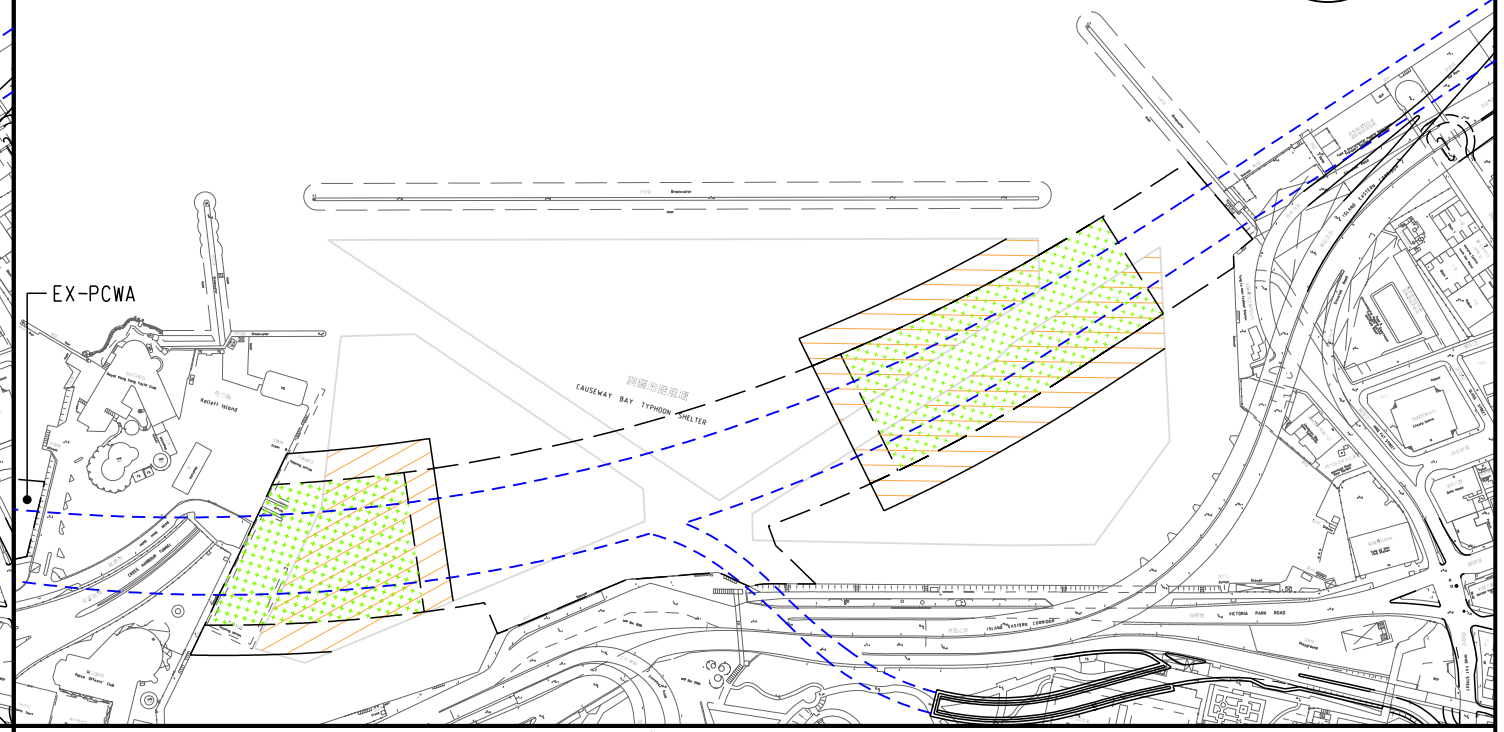
LEGEND:

- CWB TUNNEL
- ACTIVE TEMPORARY RECLAMATION AREAS
- AFFECTED MOORING AREAS
- EXISTING MOORING AREAS
- TEMPORARY WORKS AREA
- TEMPORARY RECLAMATION EXTENT

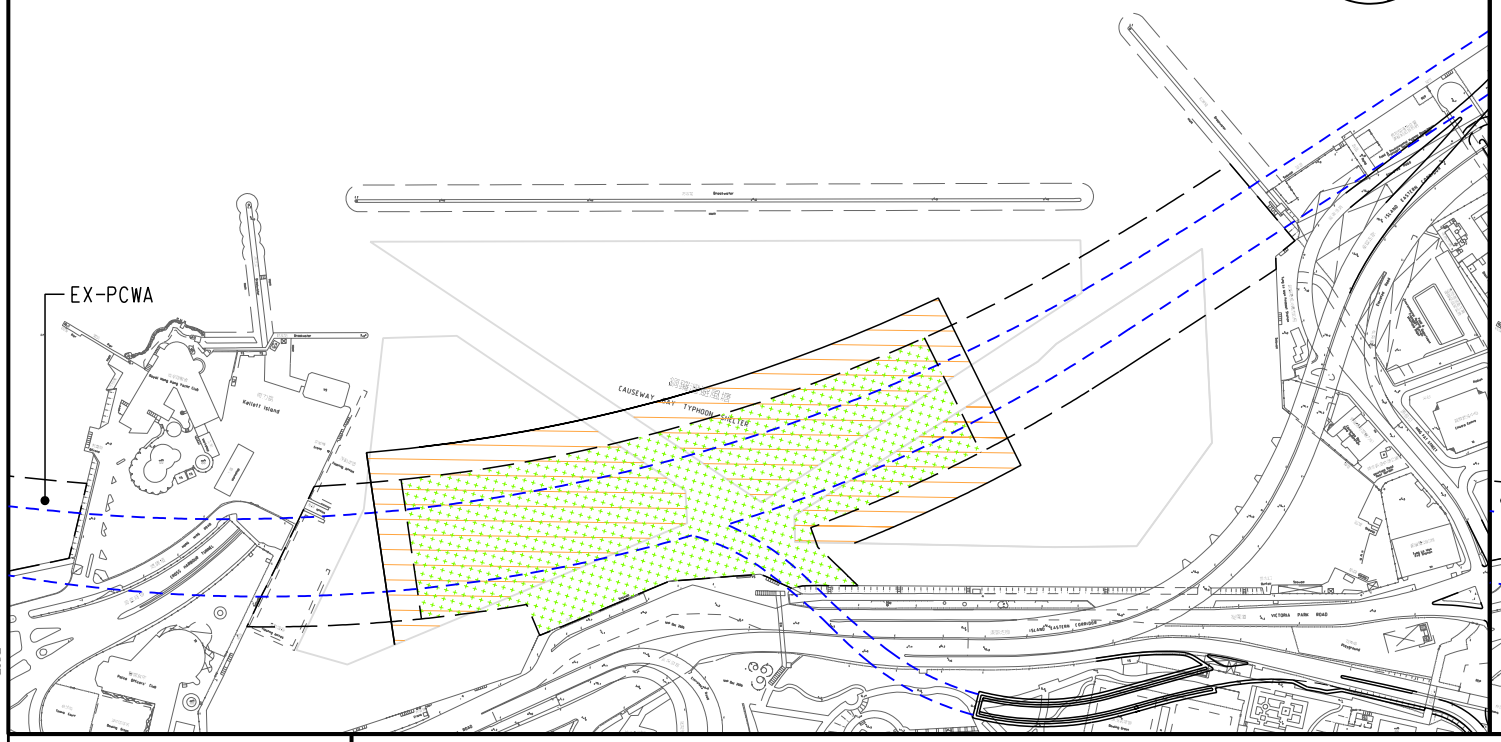
STAGE 1



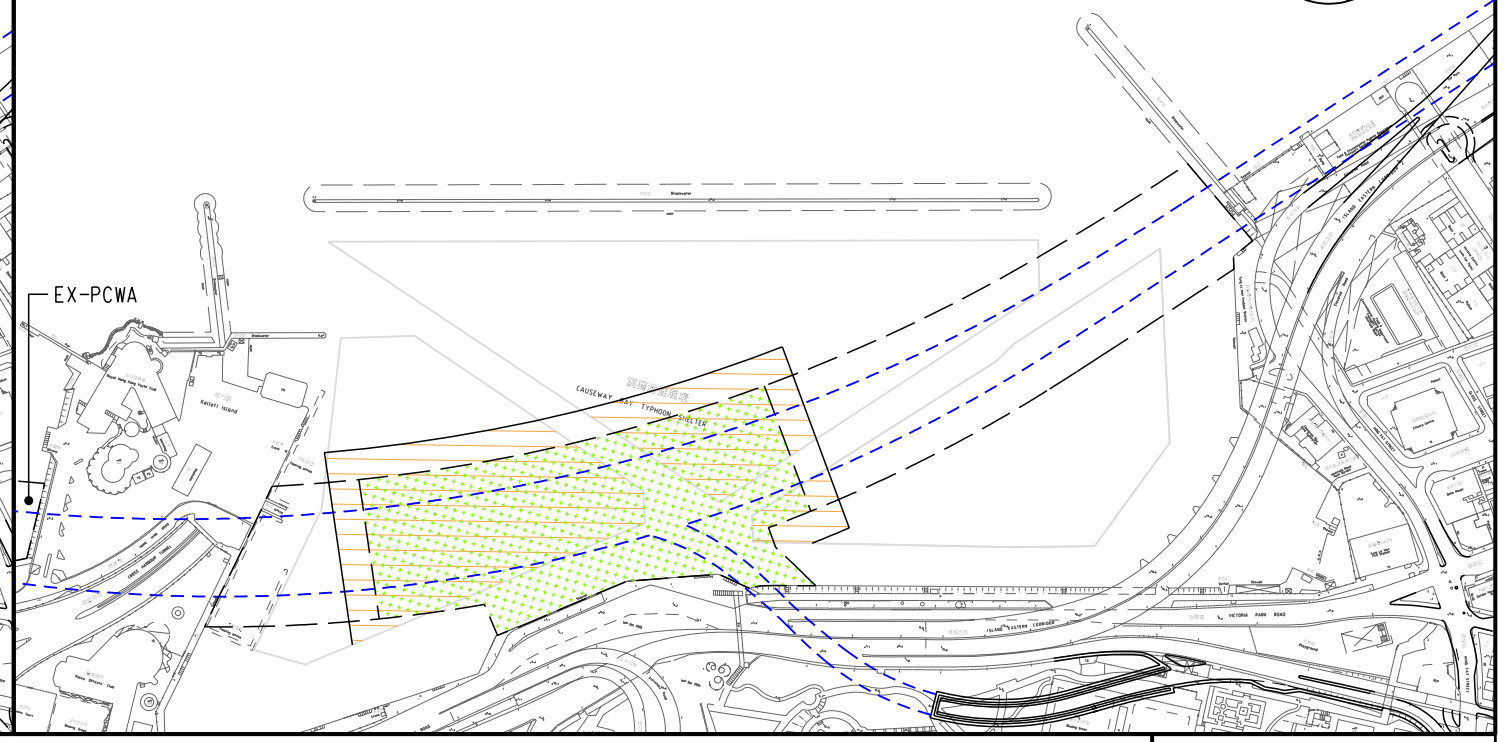
STAGE 2



STAGE 3



STAGE 4



WAN CHAI DEVELOPMENT PHASE II - DESIGN AND CONSTRUCTION FOR TRUNK ROAD TUNNEL OPTION

CONSTRUCTION STAGING AT CBTS

FIGURE 3.1

MAUNSELL | AECOM

Maunsell Consultants Asia Ltd

Plot File by : 2008-09-16

p:\projects\60041297\DRAWING\REPORT\FLYOVER\CCM\FIGURE 3.1.dgn

LEGEND:

- TRUNK ROAD FLYOVER OPTION
- TEMPORARY RECLAMATION FOR TRAFFIC DIVERSION
- TEMPORARY RAMP STRUCTURE
- TEMPORARY TRAFFIC DIVERSIONS
- TRAFFIC FLOW
- PILE CAP FOR TEMPORARY BRIDGE

816 000 N

TRUNK ROAD

TEMPORARY ROAD B

TEMPORARY ROAD A

CAUSEWAY BAY TYPHOON SHELTER

TEMPORARY RAMP STRUCTURE Z

TEMPORARY BRIDGE STRUCTURE W

IEC(E/B)
IEC(W/B)

PROPOSED LOCATIONS OF PILE CAPS FOR TEMPORARY BRIDGE

EXISTING IEC

VICTORIA PARK ROAD (E/B)

VICTORIA PARK ROAD (W/B)

HING FAT STREET

TEMPORARY RAMP STRUCTURE X

TEMPORARY RAMP STRUCTURE Y

815 500 N

837 800 E

838 300 E

WAN CHAI DEVELOPMENT PHASE II - DESIGN AND CONSTRUCTION FOR TRUNK ROAD TUNNEL OPTION

TEMPORARY TRAFFIC DIVERSIONS FOR CONSTRUCTION OF IEC LINK AND RECONSTRUCTION OF EXISTING IEC WITH NOISE BARRIER IN FLYOVER OPTION

FIGURE 3.2

MAUNSELL | AECOM

Maunsell Consultants Asia Ltd

Plot File by : 2008-10-13 shizh

p:\projects\60041297\DRAWING\REPORT\FLYOVER\CBTS\FIGURE 3.2_R2.dgn

A3 1 : 5000

LEGEND :

NEW LAND FORMED (PERMANENT RECLAMATION)

FLYOVER STRUCTURES OVER WATER

EXTENT OF PERMANENT RECLAMATION (LAND FORMATION)

N

817 000 N

816 000 N

VICTORIA HARBOUR

ISLAND EASTERN CORRIDOR

PROPOSED TUNNEL PORTAL

EXISTING CROSS HARBOUR TUNNEL

CAUSEWAY BAY TYPHOON SHELTER

RHKYC

EX-PCWA BASIN

HKCEC EXTENSION

HKCEC

POC

VICTORIA PARK

5700

5500

5300

5100

4900

4700

4500

4300

4100

3900

3700

3500

3300

3100

2900

2700

836 000 E

837 000 E

838 000 E

DATE 2008-9-30 16 44 40

MAUNSELL | AECOM

Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - DESIGN AND CONSTRUCTION OF TRUNK ROAD TUNNEL OPTION

AFFECTED AREAS OF THE HARBOUR - TUNNEL OPTION

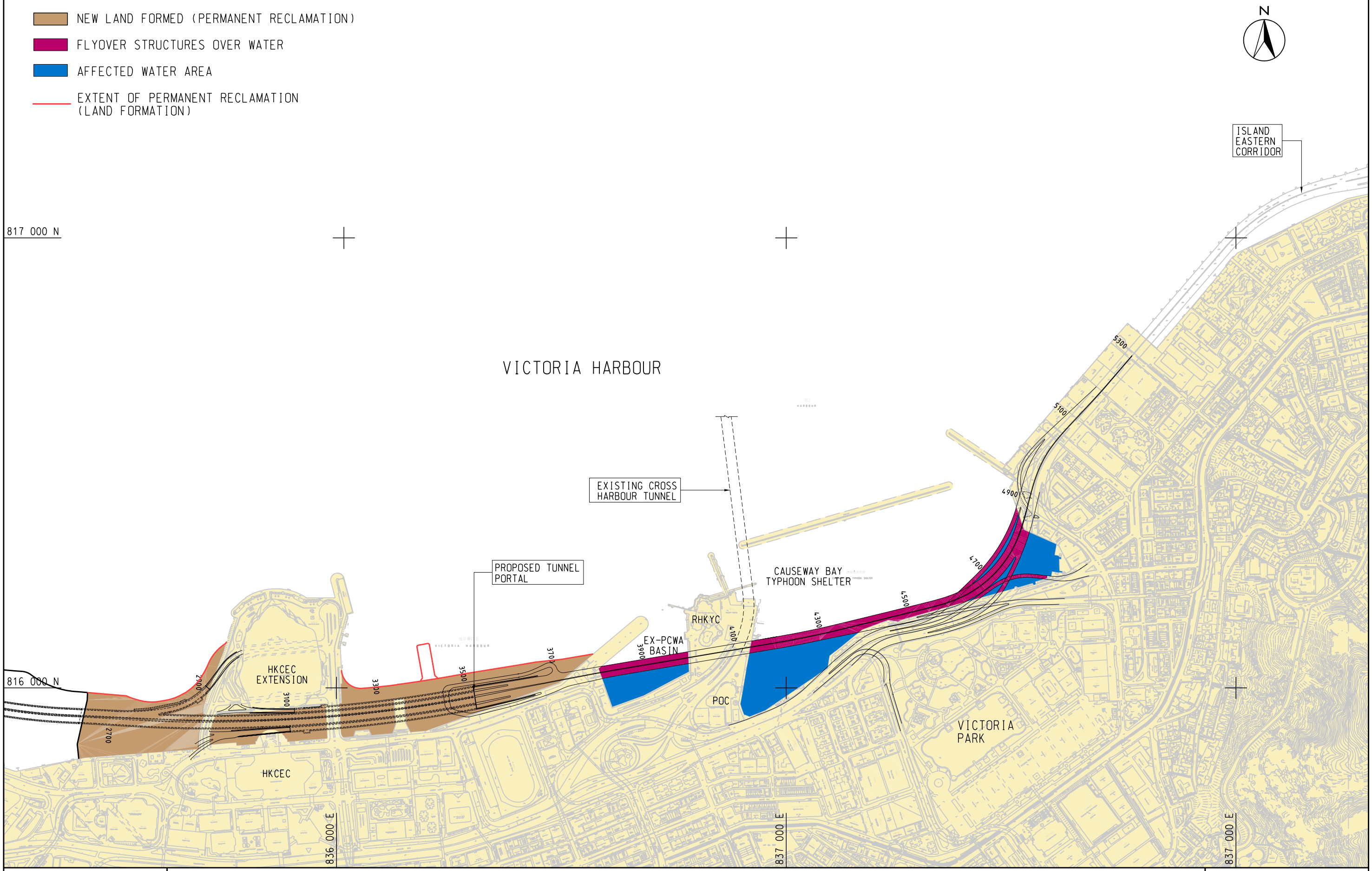
FIGURE 3.3

p:\projects\60041297\DRAWING\REPORT\FLYOVER\CCM\FL3\FIGURE 3 3.dgn

SCALE A3 1 : 8000

LEGEND :

- NEW LAND FORMED (PERMANENT RECLAMATION)
- FLYOVER STRUCTURES OVER WATER
- AFFECTED WATER AREA
- EXTENT OF PERMANENT RECLAMATION (LAND FORMATION)



WAN CHAI DEVELOPMENT PHASE II - DESIGN AND CONSTRUCTION OF TRUNK ROAD TUNNEL OPTION

AFFECTED AREAS OF THE HARBOUR - FLYOVER OPTION

FIGURE 3.4

MAUNSELL | AECOM

Maunsell Consultants Asia Ltd

DATE 2008-9-30 16 46 59

p \projects\60041297\DRAWING\REPORT\FLYOVER\CCM\FL3\FIGURE 3 4 dgn

SCALE A3 1 : 8000

Appendix A

Reclamation for the Flyover Option

土木工程拓展署
Civil Engineering and Development Department

SA2 to Agreement No. CE 54/2001 (CE)

Wan Chai Development Phase II Design and Construction for Trunk Road Tunnel Option

RECLAMATION FOR THE FLYOVER OPTION

October 2008

Document Ref. CCM_FL1 (081015)

MAUNSELL CONSULTANTS ASIA LTD

SA2 to Agreement No. CE 54/2001(CE)
WAN CHAI DEVELOPMENT PHASE II
DESIGN & CONSTRUCTION FOR TRUNK ROAD TUNNEL OPTION

RECLAMATION FOR THE FLYOVER OPTION

LIST OF CONTENTS

1 INTRODUCTION

1.1 The Trunk Road Scheme

1.1.1 A comprehensive planning and engineering review of development and reclamation proposals for the Wan Chai Development Phase II project ("the WDII Review") has been conducted to assess individually the purpose and extent of each proposed reclamation by reference to the Overriding Public Need Test in accordance with the Court of Final Appeal ("CFA") judgment handed down on 9 January 2004 in respect of the judicial review on the Draft Wan Chai North Outline Zoning Plan No. S/H25/1 ("the draft OZP"). The WDII Review also makes recommendations on the revised alignment for the Trunk Road (comprising the Central-Wan Chai Bypass ("CWB") and Island Eastern Corridor Link ("IECL")) and at-grade roads, the extent of reclamation and the land uses for the review area covered by the assignment.

1.1.2 Under the WDII Review and through an extensive public engagement process, a Trunk Road scheme (known as the Trunk Road Tunnel Variation 1, or "Trunk Road Tunnel") has been developed that satisfies the traffic and functional requirements for the Trunk Road. The Trunk Road scheme also accommodates harbour-front enhancement ideas that have been proposed by the public, and the scheme with the Trunk Road in tunnel is supported by the public.

1.2 Cogent and Convincing Materials for the Trunk Road Scheme

1.2.1 The CFA ruled that the presumption against reclamation in the Protection of the Harbour Ordinance ("PHO") can only be rebutted by establishing an overriding public need for reclamation ("the Overriding Public Need Test"), and that there must be cogent and convincing materials available to enable the decision-maker to be satisfied that the test is fulfilled for rebutting the presumption against reclamation.

1.2.2 A report that was prepared in February 2007 sets out the process by which the Trunk Road scheme and its associated reclamation were derived and presents the "cogent and convincing materials" in support of the proposed reclamation required for such scheme under the PHO. That report, namely, the Cogent and Convincing Materials Report ("CCM Report") provided a full package of materials which explained how the presumption against reclamation was intended to be rebutted by an overriding public need for reclamation for the purposes of the PHO as clarified in the CFA judgment. The CCM Report sought to explain how the Overriding Public Need Test was intended to be complied with, why the extent of reclamation was justified, and provided an account of the process of identifying the alignment that would best serve to protect and preserve the Harbour.

1.2.3 The CCM Report has been widely distributed to relevant public bodies and key stakeholders as part of the consultation leading to the gazettal of the Trunk Road scheme, reclamation scheme for WDII and the amendments to the relevant draft OZPs. The CCM Report has also been uploaded onto the website of the Government [1] where it can be viewed by the public or downloaded.

1.3 Temporary Works for the Construction of the Trunk Road

1.3.1 Temporary works will be required for the implementation of the Trunk Road scheme. Of particular relevance in respect of the CFA ruling on the presumption against reclamation in the PHO are the temporary works that impinge upon the water areas of the Harbour. These include temporary reclamation for the Trunk Road construction through the ex-Public Cargo Working Area ("ex-PCWA") and Causeway Bay Typhoon Shelter ("CBTS"), temporary bridge construction for temporary traffic arrangements at the connection with the existing Island Eastern Corridor ("IEC") and temporary reprovisioning of mooring area for boats displaced by the construction works in the CBTS to facilitate the construction of the sub-seabed tunnel.

1.3.2 In October 2007, Society for Protection of the Harbour sought, through a judicial review, a declaration that the PHO and the presumption against reclamation contained therein apply to the proposed temporary reclamation works referred to in the road scheme for the Trunk Road gazetted under the Roads (Works, Use and Compensation) Ordinance on 27 July 2007. The ruling of the Court of First Instance ("CFI"), delivered on 20 March 2008, is that the PHO and the presumption against reclamation contained therein do apply to the proposed temporary reclamation works referred to in the road scheme for the Trunk Road gazetted under the Roads (Works, Use and Compensation) Ordinance on 27 July 2007.

1.3.3 In the light of the CFI judgment on temporary reclamation, the need and extent of temporary reclamation for both the Tunnel Option, on the basis of Tunnel Variation 1 as described in the CCM Report, and the Flyover Option has to be taken into account for reconfirming, if appropriate, the conclusion of the CCM Report.

1.3.4 Highways Department ("HyD") has, separately, reviewed the cogent and convincing materials that demonstrate the temporary reclamation for the construction of the Trunk Road Tunnel in the CBTS and ex-PCWA will meet the Overriding Public Need Test. Reference could be made to the report titled "Construction of the Trunk Road Tunnel in Causeway Bay Typhoon Shelter and ex-Wan Chai Public Cargo Working Area", prepared by HyD.

[1] http://www.devb-plb.gov.hk/reclamation/eng/ccm/cogent.htm

1.4 Purpose of this Report

1.4.1 Whilst the area of permanent reclamation for the Trunk Road Tunnel has been clearly defined in the CCM Report, and the need for and area of temporary reclamation within the CBTS and ex-PCWA for the Tunnel Option are being reviewed by HyD, the area of permanent and temporary reclamation for the Flyover Option needs to be reviewed to ensure consistency.

1.4.2 In this Report, the extent of permanent reclamation for the Flyover Option is reviewed, as well as the extent of temporary reclamation required to facilitate the construction of the Flyover Option. The mooring area affected by the construction of the Flyover Option is also assessed to determine the impacts on the existing CBTS moorings and any consequential temporary reclamation that may be required for reprovisioning of these affected moorings.

2 THE FLYOVER OPTION

2.1 Derivation of the Trunk Road Alignment and Form of Construction

2.1.1 A detailed examination of Trunk Road's needs and constraints, including an exhaustive investigation into the need for reclamation for the Trunk Road construction and of alternative schemes that might do away with reclamation or, at least, minimise reclamation, has been carried out. A Report on Trunk Road Alignments and Harbour-front Enhancement, April 2006, outlines the appraisal of these issues and the conclusions in respect of the feasibility or acceptability of Trunk Road alignments and forms of construction.

2.1.2 The feasible Trunk Road routeing is along the foreshore of Wan Chai and Causeway Bay. After crossing over the MTR Tsuen Wan line, the Trunk Road will run in shallow tunnel through the HKCEC water channel and along the Wan Chai shoreline. Thereafter, the Trunk Road can pass either below the CHT portal in tunnel (i.e. Tunnel Option) or over the top of the CHT portal as flyover (i.e. Flyover Option), continuing as either tunnel or flyover through the CBTS to a connection with the existing elevated IEC to the east of the typhoon shelter.

2.2 The Trunk Road Flyover Layout

2.2.1 Details of the Trunk Road Flyover Option can be found in the Report on Trunk Road Alignments and Harbour-front Enhancement, as well as in the CCM Report. The following paragraphs provide a summary of the main engineering features of the Trunk Road Flyover Option layout.

2.2.2 The Trunk Road starts off at the connection with Central Reclamation Phase III ("CRIII") in cut-and-cover tunnel, crosses over the MTR Tsuen Wan Line tunnel and continues through the Hong Kong Convention and Exhibition Centre ("HKCEC") water channel and along the Wan Chai shoreline, in cut-and-cover tunnel. The Trunk Road needs to stay in tunnel through the HKCEC water channel to avoid conflict with the existing HKCEC atrium link bridge and to allow for ground level road access. The Trunk Road can only rise up to ground level along the Wan Chai shoreline.

2.2.3 Towards the eastern end of the Wan Chai waterfront, the Trunk Road tunnel rises up to a tunnel portal and then onto elevated road structure to cross over the ex-PCWA basin, then over Kellett Island and the Cross Harbour Tunnel ("CHT") portal, and stays on elevated structure over the full length of the CBTS and connects to the existing elevated IEC at the eastern side of the CBTS at a level of around +14mPD.

2.2.4 The flyover alignment is kept to the southern part of the typhoon shelter to minimise physical intrusion into the mooring areas and disruption to the

marine users. For this alignment, the new elevated road must tie directly into the IEC at the location of the Hing Fat Street slip roads, with new connections to Victoria Park Road replacing the existing elevated road through the south-eastern corner of the CBTS.

2.2.5 The same slip road connections to the local road network in Wan Chai North and in Causeway Bay are provided as for the Tunnel Option, and the Trunk Road maintains the same overall dual 3-lane configuration.

2.2.6 The layout of the Flyover Option is shown in **Figure 2.1**.

2.3 Permanent Reclamation for the Flyover Option

2.3.1 An indicative area of around 11.5ha of permanent reclamation was found in preliminary studies to be required for the Trunk Road Flyover Option construction, as reported in the Report on Trunk Road Alignments and Harbour-front Enhancement. This earlier indicative estimate of reclamation also made allowance for reprovisioning of affected facilities and allowed for some flexibility in defining the reclamation edge in order to cater for uncertainties of the seawall design at that time. Similar to the case of the Trunk Road Tunnel Option, as reported in the Minimum Reclamation Report which forms Annex O of the CCM Report, the extent of reclamation for the Flyover Option can be refined to ensure that it is the minimum necessary for the implementation of the Trunk Road scheme, including seawall construction details determined from more detailed engineering design and detailed reprovisioning requirements that do not require reclamation.

2.3.2 A detailed examination of reclamation requirements indicates that reclamation in the area to the west of the HKCEC Extension, through the HKCEC water channel and along the Wan Chai shoreline, for the Trunk Road Flyover Option, will be similar to that for the Tunnel Option, with the same cut-and-cover tunnel construction. Although the Trunk Road rises up to elevated road along the Wan Chai shoreline, reclamation is still required for the cut-and-cover tunnel as it rises to ground level, and for the ground level tunnel portal. The tunnel structural width and the extent of seawall protection in front of the tunnel will be the same for both tunnel and flyover options. There is a small difference in extent of permanent reclamation between the Tunnel and Flyover Options at the eastern end of the Wan Chai shoreline: where the Tunnel Option dips below the seabed just before reaching the existing seawall of the ex-PCWA, the new permanent seawall and reclamation can be cut back to leave a small basin and, in so doing, minimise the extent of reclamation. This is not possible for the Flyover Option where the tunnel structure will rise to the ground level portal at this area, and the new seawall copeline will continue eastwards to the ex-PCWA breakwater.

2.3.3 The area of land formed for the Flyover Option at the HKCEC and along the Wan Chai shoreline, based on the detailed assessment of land formed for the Tunnel Option (as presented in the Minimum Reclamation Report at Annex O of the CCM Report) is thus about 9.8ha. This area of land formation (permanent reclamation) is shown in **Figure 2.1**.

2.3.4 The reduction from the earlier indicative estimate of 11.5ha arises mainly from a smaller reclamation area at HKCEC West due to the modification of the interface with CRIII and as additional reclamation is not required for reprovisioning of facilities such as cooling water pumping chambers, salt water pumping station, etc.

2.3.5 The flyover across the ex-PCWA basin and through the CBTS does not require any land formation in these areas, and the elevated connection to the IEC at the eastern side of the CBTS means that no new land needs to be formed along the North Point shoreline.

2.3.6 However, foundations are required to support the bridge columns which, in turn, support the elevated deck structure. Over water, the foundations would be constructed by steel tubular piles in the seabed, with concrete pile caps on top of the steel piles that will support the bridge piers; these pile caps would be constructed at around water surface level (partly above and partly below water level). Bridge protection would be by dolphins that are also constructed with steel piles in the seabed and a concrete capping at water surface level. These substructures of the elevated Trunk Road inside the ex-PCWA basin and CBTS, including pile caps and protective dolphins, will physically occupy the water area of the ex-PCWA basin and CBTS.

2.3.7 Whilst the pile caps and protective dolphin structures are not land formed with soil, they are solid structures fixed rigidly and permanently to the seabed (or, they can be viewed as solid structures rising up from the seabed to above water level), and these will permanently occupy the water area of the Harbour. The pile caps form a solid platform in the water on which the road structure rests. To all intents and purposes they can be considered as ‘forming land’ (this view is reinforced if one were to look at this area of the Harbour before and after construction of the Trunk Road, to see first open water and then solid mass replacing what was water), and they are therefore considered as reclamation in respect of the PHO.

2.3.8 In view of the similarity of road form and the geometrical and locational context of the flyover, and visual aspects, the form of elevated road structure and construction method for the Trunk Road through the CBTS are reasonably assumed, for the purpose of this review, to be similar to the existing elevated IEC structure that runs along the North Point shoreline and across the south-eastern corner of the CBTS, with the road deck supported on bridge piers which in turn are founded on foundation pile caps. However, whereas the existing IEC bridge deck is constructed using

pre-stressed u-beams with spans of around 30m, in order to minimise the number of pile caps in the water (bearing in mind now the PHO implications), pre-stressed segmental box girder construction is now assumed for the new flyover section across the ex-PCWA basin and through the CBTS, with a longer span of around 60m, where this span is considered to approach the limit of cost effective and efficient bridge design. Of course, while there would be a lesser number of pile caps for this longer bridge span, the size of the pile caps will be larger than those of the existing IEC bridge structure.

2.3.9 The pile caps and dolphins of the Flyover Option through the ex-PCWA basin and CBTS are shown in **Figure 2.2**. The total area of the pile caps and dolphins of the elevated Trunk Road at the water surface in the ex-PCWA basin and in the CBTS is about 0.4ha.

2.3.10 Other forms of elevated road structure, especially long span bridge, have also been considered. The form of the elevated road structure is a function of, amongst other factors, the functional requirements and purposes of the highway structure, the physical and visual connection to the existing IEC bridge structure, and aesthetic scale and proportion of the bridge structure. (Scale is the perceived size of individual members relative to their context. If a structure or some of its elements is too large or too small, the structure or the element will appear out of scale.) Longer spans would result in greater superstructure depth, which, in terms of scale of the structure, would be disproportionately large in this site context. The more substantial and bulky superstructure would also be visually more intrusive. In addition, foundations (pile caps) would be larger due to the larger loads, so while longer spans may result in fewer pile caps, they will individually occupy more water area.

2.3.11 The feasibility of a long span cable-stayed bridge was reviewed during the course of the WDII Review and during the public engagement on the Trunk Road options, but was not considered appropriate in this site context due to, amongst other reasons, the technical impracticality of this form of structure for the curved Flyover Option alignment through the eastern part of the CBTS, the technical feasibility of the connection of Slip Road 8 with the cable-stayed structure and the massive support pylons and foundations that would be required. After all, the functional requirements and purpose of the highway structure should not be compromised by an out of context application of structural form or design.

2.3.12 For completeness, the idea of purposely designing the bridge foundations to lie entirely below seabed, in which case reclamation associated with the pile caps and dolphins may be reduced or avoided completely, has also been considered. The conclusion is that it is not a practical or cost-effective approach. Substantial cofferdams would be required to enable the submarine concrete construction of the pile caps and the bridge piers, resulting in construction work being carried out in an undesirable situation

especially when compared with conventional pile cap construction at about sea level. With pile caps below seabed, the bridge piers have to be much longer and would result in a more massive and bulky structure in order to maintain the stability of the whole structure. The bridge piers extending through water to the seabed would be more susceptible to structural deterioration in the marine environment and they will still be susceptible to damage from ship impact (or, for that matter, from impact by any object in the water). The protective dolphins would still be required.

2.3.13 In summary, the end product for this Flyover Option is permanent reclamation (comprising land formation and substructures that physically occupy the water area of the Harbour) at the HKCEC, along the Wan Chai shoreline, in the ex-PCWA basin and in the CBTS, of about 10.2ha.

3 TEMPORARY WORKS REQUIRED FOR CONSTRUCTION OF THE FLYOVER OPTION

3.1 Temporary Works in the CBTS and ex-PCWA for Flyover Option

3.1.1 Construction of the Trunk Road Flyover requires first the construction of the foundations, namely the piles and pile caps, to support the bridge columns which, in turn, support the elevated deck structure. Temporary works are required for the concrete pile cap and dolphin construction, under a conventional approach. These are the surrounding formwork and, in this case because the concrete construction would be at the water surface or partially under water, containment of the pile cap and formwork within what could best be described as a 'cofferdam' structure to keep the water out of the concreting area. These temporary structures would lie partially submerged at the water surface, and they would provide temporary working platform or 'land' access for construction workers and equipment, displacing the water in the area; they would therefore constitute temporary reclamation in the context of the PHO.

3.1.2 An alternative method of construction for the pile caps and dolphins would be to use prefabricated concrete formwork, which would be lifted into place on the foundation piles and within which the concrete pile cap is constructed; the prefabricated concrete formwork would become part of the permanent pile cap structure. With this system, temporary works that may be considered as temporary reclamation under the PHO, as described in the paragraph above, would not be required. In view of the requirements of the PHO to seek reasonable alternatives to reclamation, it is assumed that, providing the necessary construction access is available, a prefabricated formwork system would be used (this would need to be specified in the construction contract) and therefore no temporary reclamation for the construction of the pile caps and dolphins is assigned to the Flyover Option.

3.2 Temporary Works in the CBTS for Temporary Traffic Arrangements

3.2.1 As mentioned in Section 2.2 above, for the Flyover Option, the new elevated Trunk Road has to connect to the IEC at the location of the Hing Fat Street slip roads. The section of the existing IEC structure joining Victoria Park Road and the slip road from Hing Fat Street to the IEC have to be demolished and rebuilt for such connection. Temporary traffic diversions have to be arranged during the construction works to maintain the traffic flow. Due to space limitation and the constraints of existing development in the vicinity of the tie-in to the IEC that make inland traffic diversions not feasible, most of the road diversions would have to be provided at the south-eastern corner of the CBTS. Alternative traffic diversions, in particular for the more efficient diversion of Hing Fat Street traffic, have been considered but would result in greater intrusion into the

CBTS. Temporary works, including temporary reclamation in the south-eastern corner of the typhoon shelter, will be required to facilitate these road diversions during the construction period.

3.2.2 Complex temporary traffic arrangements would be required for keeping the traffic flowing during construction of the Flyover Option. **Figure 3.1** indicates the temporary road diversions that would need to be put in place. Amongst these, Temporary Road A would be constructed to divert eastbound traffic from Victoria Park Road to IEC and to divert traffic on the at-grade Victoria Park Road away from the works area for demolishing the existing IEC and for constructing the Trunk Road mainline flyover. Also, Temporary Road B would be constructed to divert traffic from Hing Fat Street to IEC to enable the reconstruction of that slip road. Temporary Road A lies mainly within the CBTS area and Temporary Road B also protrudes into the CBTS area. Both of these are ground level roads, requiring temporary reclamation to cross the existing water body.

3.2.3 The new eastbound carriageway of the IEC, joining temporarily to Temporary Road A, has to be built before the existing IEC can be demolished in stages for constructing the Flyover Option mainline structures. However, Temporary Road A together with the new eastbound carriageway of the IEC will run across the front of the new Flyover Option mainline structures as well as the existing IEC structures to be demolished. Temporary reclamation would also be required to provide access from Victoria Park Road for the construction and demolition works that need to be undertaken in the south-eastern corner of the CBTS. These works cannot be carried out using marine access, as marine access would be cut off by the ground level Temporary Road A and the new eastbound IEC structure.

3.2.4 A small area in front of the A King Shipyard site is not directly required for traffic diversions or construction works, but if this is not filled in, it would become an isolated pond into which existing drainage culverts R and S would continue to discharge. To avoid the resultant pollutant build-up and associated health and odour problems, this pond would need to be filled in and the discharges from culverts R and S temporarily diverted to the outside of the temporary reclamation.

3.2.5 The resultant temporary reclamation would fill in the south-eastern corner of the typhoon shelter, with an area of about 3.3ha, as shown in **Figure 3.1**.

3.2.6 These temporary road diversions and the temporary reclamation (together with the temporary drainage extensions) would be removed by the contractor on completion of Trunk Road construction and the existing seabed reinstated.

Overriding Public Need for the Temporary Traffic Arrangements

3.2.7 There is no alternative to the temporary traffic arrangements. There is an overriding public need to maintain the traffic flows through this area, as the consequence of not doing so would be major disruption of traffic along the north shore of Hong Kong Island and indeed this part of the road network would become inoperable. There is thus an overriding public need for the temporary traffic arrangements.

Alternative to Temporary Reclamation for Temporary Traffic Arrangements

3.2.8 Alternatives to the temporary reclamation have been examined. A possible alternative would be to construct all the temporary roads on piled structures and use piled deck as an alternative to the temporary reclamation. In effect, replacing the 3.3ha of temporary land formation by soil filling with a steel deck structure covering the water and supported on a closed spaced grid of piled foundations into the seabed. The idea being that the sea is not "filled in". This is not a reasonable alternative and is not a practical engineering solution. The deck would need to be opened up to construct the foundations of the new bridge structures and access for construction of pile caps at the water level, with the pile cap works being carried out below the deck, would be restricted through the deck openings. There would be higher construction costs and programme delays compared with the approach using temporary reclamation. Qualitative appraisal indicates that water quality would be a major concern, as the mass of close spaced piles supporting the deck would have the effect of inhibiting flows under the deck, while outfalls from culverts R and S could not be diverted outside the covered corner of the typhoon shelter and their discharges would be largely trapped below the deck. For these reasons, a piled deck scheme for the temporary works and traffic diversions in the south-eastern corner of the CBTS would not be practically feasible and is not regarded as a reasonable alternative to the more conventional approach of filling in the south-eastern corner of the CBTS.

3.2.9 Moreover, construction of the deck would completely cover this water area of the harbour "for the purpose of forming land" on which men would be walking and construction plant standing. The deck would be contiguous with and physically connected alongside the existing shoreline, and would therefore effectively be a seaward extension of the existing land (indeed, a person walking from the existing land onto the platform would not realise that he was crossing the shoreline). The deck, lying just above the water surface, would cut off visual and physical contact with the existing water area; the sea underneath the deck would, for all practical purposes, be inaccessible to marine traffic. In view of the above, the piled deck structure is considered to fall within the definition of "reclamation" in the PHO. As such, it would not be an alternative to the temporary reclamation.

3.2.10 The only reasonable and practically feasible manner in which the temporary traffic arrangement could be implemented in order to maintain traffic flows through this area of construction, and to facilitate the construction and demolition works of the Flyover Option, would be by temporary filling in of the south-eastern corner of the CBTS, as shown in Figure 3.1.

Minimum Extent of Temporary Reclamation

3.2.11 The temporary traffic arrangement scheme that is presented is the one that requires the minimum extent of reclamation. This is achieved by confining the traffic diversions to the inshore area as much as possible, even though this would give rise to some traffic congestion black spots. Alternative routing of some of the traffic diversions to provide smoother traffic flows would require the extension of the temporary roads further out into the CBTS, with associated increase in the extent of temporary reclamation, and has therefore not been pursued.

3.2.12 Vertical temporary seawall, by blockwork construction, is assumed in order to minimise the intrusion of the temporary reclamation into the CBTS. A minimum separation between the temporary roads and the copeline of the temporary seawall of 6m has been determined. This is the minimum separation required to allow for pedestrian passageway alongside the temporary roads and for access for the contractor's construction and maintenance vehicles without impeding the diverted traffic flows.

3.3 Temporary Works at North Point for Temporary Traffic Arrangements

3.3.1 The Tunnel Option requires the installation of noise barriers along the new roads at the tie-in to the IEC to around City Garden, as a noise mitigation measure identified generally in accordance with the requirements of the Environmental Impact Assessment Ordinance. For the purpose of comparative appraisal of temporary reclamation areas for the Tunnel and Flyover Options, installation of noise barriers is also assumed for the Flyover Option along the existing IEC to a similar extent as would be provided for the Tunnel Option, so that both Trunk Road options would provide a similar level of benefit to North Point residents. However, it should be borne in mind that the actual extent of noise barriers required along the North Point shoreline beyond the physical tie-in of the Flyover Option to the existing IEC, in the event that the Flyover option were to be implemented, would be subject to further detailed assessment including noise assessment under the Environmental Impact Assessment Ordinance. Along the North Point shoreline, reconstruction of the existing flyover structure would be for strengthening of the structure to accommodate the noise barriers, but the existing form and layout of the IEC would not change, and therefore there would be no additional permanent reclamation

associated with this reconstruction. However, a temporary diversion of the elevated IEC will be required to enable the reconstruction of the existing flyover structure with noise barriers, as shown in **Figure 3.1**.

3.3.2 Similar to the explanation given in paragraph 2.3.7, concrete pile caps would need to be constructed in the Harbour for the temporary diversion of the IEC and, in this case, these would be regarded as temporary reclamation. Assuming prefabricated formwork is used for the pile cap construction, this area of temporary reclamation would be about 0.1ha.

3.3.3 These temporary works would be demolished and removed by the contractor on completion of the reconstruction of the IEC, along with the demolition of the temporary traffic diversion.

3.4 Minimum Extent of Temporary Reclamation for Flyover Option

3.4.1 In the preceding paragraphs, temporary reclamation has been shown to be required for the Flyover Option construction through the CBTS and along the North Point shoreline. This temporary reclamation is for the purpose of enabling the construction of the foundations for the flyover bridge and for temporary traffic diversions.

3.4.2 The estimation of temporary reclamation area is based on the actual physical area of works at the water surface and a minimum separation from the temporary road diversions to the temporary seawall copeline of the temporary reclamation through the south-eastern corner of the CBTS.

3.4.3 The overall minimum temporary reclamation requirements for the Trunk Road Flyover Option in the ex-PCWA basin, in the CBTS and along the North Point shoreline, in terms of total working areas to be formed during the course of construction, are:

(i) CBTS
(reclamation for temporary traffic arrangements
and to facilitate flyover construction) : 3.3ha

(ii) North Point
(temporary bridge foundations) : 0.1 ha

3.4.4 The total temporary reclamation area required for the construction of the Flyover Option is thus 3.4ha.

3.4.5 Staging of the temporary works has been considered. However, as the whole of the temporary traffic arrangements scheme would be required at any one time, so too would the associated temporary reclamation (i.e. the temporary reclamation could not, practically speaking, be implemented in stages). Moreover, the temporary traffic arrangements at the south-eastern corner of the CBTS would be concurrent with those at North Point, so the

temporary reclamation associated with the temporary bridge foundations would need to be in place at the same time as the temporary reclamation for traffic diversions in the CBTS. These temporary works would be in place for the overall period of construction of the works through the CBTS and the connection with the IEC, around 4 years.

3.4.6 Therefore, the temporary reclamation area required for the construction of the Flyover Option that will be in place at any one time would be approximately 3.4ha. This is considered to be the minimum overall extent of temporary reclamation required to facilitate the construction of the Trunk Road Flyover Option across the seabed of the ex-PCWA basin, the CBTS and along the North Point shoreline.

4 AFFECTED MOORING AREA

4.1 Existing Moorings in CBTS

4.1.1 The CBTS provides shelter for pleasure and operational vessels together with some dwelling vessels and miscellaneous local craft. As at April 2008, around 570 vessels of various types, at private licensed moorings and at anchorage areas, use the CBTS as a base. Details of the CBTS private mooring allocations, as at 19 March 2008, have been provided by Marine Department, while visual surveys were conducted during March/April 2008 to establish the type and numbers of vessels which occupy the anchorage areas.

4.1.2 The layout of the existing typhoon shelter is shown in **Figure 4.1**. As shown in Figure 4.1, the layout of the typhoon shelter comprises three distinct mooring/anchorage areas:

- The south-western triangle ("RHKYC Mooring Area") contains moorings licensed to the Royal Hong Kong Yacht Club ("RHKYC") for pleasure vessels. There are currently 152 private moorings in this mooring area, which occupy a water area of around 3ha.
- The northern triangle ("Private Mooring Area") contains moorings licensed by Marine Department for private vessels. There are currently 152 private moorings in this mooring area, which occupy a water area of around 4.4ha.
- The south-eastern triangle ("Anchorage Area"), occupying a water area of approximately 2.6ha, is mainly used as an anchorage by work boats, floating workshops and various local/miscellaneous craft, including motor launches and ferry vessels, small passenger sampans, fishing craft, rowing boats, and some pleasure vessels of various types (including junks, speed boats, etc). The floating Tin Hau Temple is currently moored within this anchorage area. The surveys have indicated that around 200 vessels are located in this anchorage area.

4.1.3 Outside of these designated mooring areas, a further 12 private licensed moorings are found elsewhere in the typhoon shelter; around 4 to 6 pilot craft occupy a small area in the south-eastern corner of the typhoon shelter, under the IEC road structure; around 25 small boats are moored up alongside the seawall of the Causeway Bay Promenade (to the south of the Anchorage Area); and around 30 miscellaneous small craft including dwelling vessels occupy the south-western corner of the typhoon shelter to the south of the RHKYC Mooring Area (outside the Police Officers' Club).

4.2 Construction Stage Impacts on CBTS Moorings

4.2.1 The construction of the Flyover Option in the CBTS will occupy part of the water area and hence affect the existing mooring and anchorage areas in the typhoon shelter. **Figure 4.2** illustrates the water areas that will be occupied by the Flyover Option construction in the CBTS. The temporary reclamation in the south-eastern corner of the typhoon shelter will be in place for the whole of the construction period of the works in the CBTS. However, construction of the flyover foundation piles, piles caps and bridge piers can be carried out sequentially and in stages. By so doing, occupation of the water area will be reduced and the impacts on the moorings in these water areas lessened.

4.2.2 The water areas occupied by the Flyover Option construction works are defined by the physical intrusion of the works (temporary reclamation and flyover bridge foundation and pile cap construction) and an allowance for a 20m contractor's works area, this being the minimum area that the contractor would need to physically occupy to carry out his works.

4.2.3 As shown in Figure 4.2, around 1.5ha of the Anchorage Area will be occupied by the temporary reclamation for Flyover Option construction. This will affect around 150 local vessels that currently occupy that part of the anchorage area. In addition, the pilot boats under the IEC will need to be relocated, as will the 25 or so small boats that are moored up alongside the seawall to the south of the Anchorage Area.

4.2.4 In the RHKYC Mooring Area, a maximum of around 0.6ha of the mooring area will be occupied at any one time, affecting about 30 boats at that time. The part of the RHKYC Mooring Area to the south of the flyover structure will not be physically occupied by the contractor, but boat moorings in this area will be restricted due to access constraints during the flyover construction.

4.2.5 Thus, a total of around 2.1ha of the designated mooring and anchorage areas of the CBTS, plus the boats anchored in the southern part of the typhoon shelter outside the designated Anchorage Area (local craft and pilot boats), would be affected and would need to be temporarily reprovisioned. In addition, there would be restricted access to the southern part of the RHKYC Mooring Area at the south-western corner of the typhoon shelter. Altogether, over 200 boats would be directly affected by the Flyover Option construction works and would need to be relocated.

4.3 Temporary Reprovisioning of Affected Moorings

4.3.1 The affected mooring and anchorage areas will need to be temporarily reprovisioned during the construction of the Flyover Option. The number of boats that would need to be relocated outside the CBTS could be reduced by first filling up the existing vacant mooring spaces in the Private

Mooring Area. The 30 boats on private moorings in the RHKYC Mooring Area that would be affected by the flyover construction works could be accommodated in this manner. (Filling up the vacant mooring spaces with the boats from the Anchorage Area would result in a mix of vessel types on fixed and anchored moorings which is considered not appropriate – the anchorage and mooring vessels should be separated.) That would leave the local craft in the 1.5ha affected area of the Anchorage Area, as well as those anchored outside the designated Anchorage Area, to be relocated outside the CBTS. Full on-site reprovisioning within the CBTS is not possible, as there is not sufficient space in the CBTS to accommodate all the affected Anchorage Area boats, unless unaffected private moorings in the RHKYC and Private Mooring Areas were relocated outside the CBTS in their stead.

4.3.2 HyD are, separately, reviewing the effects of the Trunk Road Tunnel construction through the CBTS on the existing private moorings and anchorage area and reviewing practically feasible alternatives for the temporary reprovisioning of these affected moorings and anchorages. These include off-site reprovisioning options involving temporary relocation of the pleasure boats in the Private Mooring Area or in the RHKYC Mooring Area to other typhoon shelters or sheltered anchorages outside the Harbour (for example to Aberdeen Typhoon Shelter (South)), or relocation of the local craft in the Anchorage Area to other typhoon shelters (most likely to Aberdeen Typhoon Shelter (West)). On-site reprovisioning options under review by HyD include reprovisioning of affected vessels in a temporary typhoon shelter to be constructed outside the existing CBTS or temporary use of the ex-PCWA basin, but both of these options would involve temporary reclamation for breakwater protection and therefore would have PHO implications (i.e. they should not be pursued if there is a feasible “no reclamation” option).

4.3.3 For the Flyover Option case, the option of using the ex-PCWA basin as temporary anchorage area would not be feasible as, apart from the PHO implications of the temporary breakwater, flyover construction works would be taking place in the ex-PCWA basin at the same time as the temporary reclamation in the CBTS, that requires relocation of the Anchorage Area boats, would be in place. Otherwise, any of the other temporary reprovisioning options being reviewed by HyD could also be adopted for the reprovisioning of CBTS users affected by the Flyover Option construction, particularly in view that the overall extent of affected moorings and anchorages to be reprovisioned under the Flyover Option is smaller than that under the Tunnel Option.

4.3.4 Therefore, for the temporary reprovisioning of the boats in the total affected 2.1ha of the designated mooring and anchorage areas of the CBTS, and particularly the boats in the 1.5ha affected Anchorage Area (as well as those outside the designated Anchorage Area), which may need to be relocated outside the CBTS, the findings of HyD’s review in respect of the

approach for temporary reprovisioning of the affected moorings and anchorages could be taken on board in determining suitable temporary reprovisioning schemes for the mooring and anchorage areas affected by the Flyover Option.

4.4 Operational Stage Impacts on CBTS Moorings

4.4.1 Unlike the Trunk Road Tunnel Option where, upon completion of construction, the CBTS will be reinstated to its existing condition with no loss of mooring or anchorage area, the Flyover Option will have a permanent impact on the existing use of the CBTS.

4.4.2 **Figure 4.3** illustrates impact of the Flyover Option on the existing mooring and anchorage areas after completion of construction. There will be a permanent loss of around 1.1ha of the Anchorage Area due to the occupation of this area by numerous pile caps of the Flyover Option mainline and slip roads and the low level connection from Victoria Park Road to IEC Eastbound, and the passageway that must be maintained to the south of the Anchorage Area for fire safety reasons. There will also be limited access for the boats that currently moor along the seawall to the south of the designated Anchorage Area.

4.4.3 There will be a permanent loss of around 0.6ha of the RHKYC Mooring Area due to the occupation of this area by the pile caps of the Flyover Option mainline. In addition, some 0.6ha of the southern part of the RHKYC Mooring Area will be limited for use by small vessels due to restricted access by headroom clearance limitations of the flyover structure and blocked access in the fairway to this area by the pile caps of the Flyover Option. This blocked fairway access will also partially restrict access to the existing landing steps at the south-western corner of the CBTS.

4.4.4 This overall loss of around 1.7ha of designated anchorage and mooring areas and restricted use of the southern part of the CBTS will be caused by the structures of the Flyover Option in the existing water area of the CBTS, and it will be a permanent loss. Consequently, some of the boats at the affected anchorages and moorings, once relocated outside CBTS, may not be able to return even after the Trunk Road is built. Permanent reprovisioning arrangements for these affected boats would be subject to further study and consultation with stakeholders, should the Flyover Option be pursued.

5 CONCLUSIONS

5.1 The Flyover Option and its Permanent Reclamation

5.1.1 A Flyover Option has been identified as an alternative to the Trunk Road Tunnel, that runs from the connection with CRIII and through the HKCEC water channel in the form of tunnel, but rises up to a ground level portal along the Wan Chai shoreline and then rises up onto elevated flyover structure over Kellett Island and the CHT portal and through the CBTS, connecting with the existing elevated IEC at the eastern side of the CBTS.

5.1.2 Permanent reclamation would be required for the Flyover Option, comprising land formation at the HKCEC and along the Wan Chai shoreline, and the flyover substructures that physically occupy the water area of the Harbour in the ex-PCWA basin and CBTS.

5.1.3 A total of about 10.2ha of permanent reclamation is associated with the Flyover Option.

5.2 Temporary Reclamation Required for the Flyover Option

5.2.1 Temporary reclamation would be required at the south-eastern corner of the CBTS for temporary traffic diversions and to facilitate the Flyover Option construction and demolition works. Along the North Point shoreline, temporary diversion of the existing IEC would require temporary flyover foundations in the Harbour.

5.2.2 The total temporary reclamation area required for the construction of the Flyover Option arising from the above would be about 3.4ha. This is considered to be the minimum overall extent of temporary reclamation required to facilitate the construction of the Trunk Road Flyover Option in the ex-PCWA basin, in the CBTS and along the North Point shoreline. This temporary reclamation would be in place for a duration of around 4 years.

5.3 Affected Mooring Area

5.3.1 A total of around 2.1ha of the existing designated mooring and anchorage areas of the CBTS, plus the boats anchored in the southern part of the typhoon shelter outside the designated Anchorage Area (local craft and pilot boats), would be affected by the Flyover Option construction works and would need to be temporarily reprovisioned. Altogether, over 200 boats would be directly affected by the Flyover Option construction works and would need to be relocated.

5.3.2 There would be a permanent loss of around 1.7ha of the designated mooring and anchorage areas and permanently restricted use of the southern part of the CBTS, caused by the structures of the Flyover Option, after construction. Some of the boats that would be relocated off-site during construction would likely not be able to return to the CBTS after the Trunk Road is built.

LEGEND :

- CUT & COVER TUNNEL
- ELEVATED STRUCTURE
- AT-GRADE ROAD
- EXTENT OF PERMANENT RECLAMATION (LAND FORMATION)

N

817 000 N

816 000 N

VICTORIA HARBOUR

EXISTING IEC

EXISTING CROSS HARBOUR TUNNEL

PROPOSED SCL RAILWAY ALIGNMENTS

SLIP ROAD 8

EXISTING MTR TSUEN WAN LINE

SLIP ROAD 1

TRUNK ROAD TUNNEL UNDER CRIII

SLIP ROAD 2

SLIP ROAD 3

EXPD DRIVE EAST PIER

CRIII WDII REVIEW LIMIT STUDY AREA

HKCEC EXTENSION

HKCEC

CAUSEWAY BAY TYPHOON SHELTER

RHKYC

EX-PCWA BASIN

CROSS HARBOUR TUNNEL PORTAL

POC

VICTORIA PARK

PROPOSED NIL RAILWAY ALIGNMENT

EXISTING WAN CHAI FERRY PIER

836 000 E

837 000 E

838 000 E

WAN CHAI DEVELOPMENT PHASE II - DESIGN AND CONSTRUCTION FOR TRUNK ROAD TUNNEL OPTION

TRUNK ROAD SCHEME - FLYOVER OPTION

FIGURE 2.1

MAUNSELL AECOM

Maunsell Consultants Asia Ltd

SCALE 1 : 8000

p:\project\M6041297 DRAWING\REPORT\FLYOVER\CBTS\FIGURE 2.1.dgn

LEGEND:

TRUNK ROAD FLYOVER OPTION

PERMANENT RECLAMATION
(PILE CAPS & DOLPHINS)

N

816 500 N

CAUSEWAY BAY
TYPHOON SHELTER

EXISTING TEC

VICTORIA PARK ROAD (E/B)

VICTORIA PARK ROAD (W/B)

TRUNK ROAD
FLYOVER OPTION

DOLPHINS

PILE CAPS

816 000 N

836 800 E

837 300 E

shizh

Plot File by : 2008-10-13

MAUNSELL | AECOM

Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - DESIGN AND CONSTRUCTION FOR TRUNK ROAD TUNNEL OPTION

FLYOVER OPTION - PERMANENT RECLAMATION (PILE CAPS & DOLPHINS)

FIGURE 2.2

P:\projects\60041297\DRAWING\REPORT\FLYOVER\CBTS\FIGURE 2.2_R2.dgn

SCALE 1 : 3000

LEGEND:

- TRUNK ROAD FLYOVER OPTION
- TEMPORARY RECLAMATION FOR TRAFFIC DIVERSION
- TEMPORARY RAMP STRUCTURE
- TEMPORARY TRAFFIC DIVERSIONS
- TRAFFIC FLOW
- PILE CAP FOR TEMPORARY BRIDGE

816 000 N

TRUNK ROAD

TEMPORARY ROAD B

TEMPORARY ROAD A

CAUSEWAY BAY TYPHOON SHELTER

TEMPORARY RAMP STRUCTURE Z

TEMPORARY BRIDGE STRUCTURE W

IEC(E/B)
IEC(W/B)

PROPOSED LOCATIONS OF PILE CAPS FOR TEMPORARY BRIDGE

EXISTING IEC

VICTORIA PARK ROAD (E/B)

VICTORIA PARK ROAD (W/B)

HING FAT STREET

TEMPORARY RAMP STRUCTURE X

TEMPORARY RAMP STRUCTURE Y

815 500 N

837 800 E

838 300 E

WAN CHAI DEVELOPMENT PHASE II - DESIGN AND CONSTRUCTION FOR TRUNK ROAD TUNNEL OPTION

TEMPORARY TRAFFIC DIVERSIONS FOR CONSTRUCTION OF IEC LINK AND RECONSTRUCTION OF EXISTING IEC WITH NOISE BARRIER IN FLYOVER OPTION

FIGURE 3.1

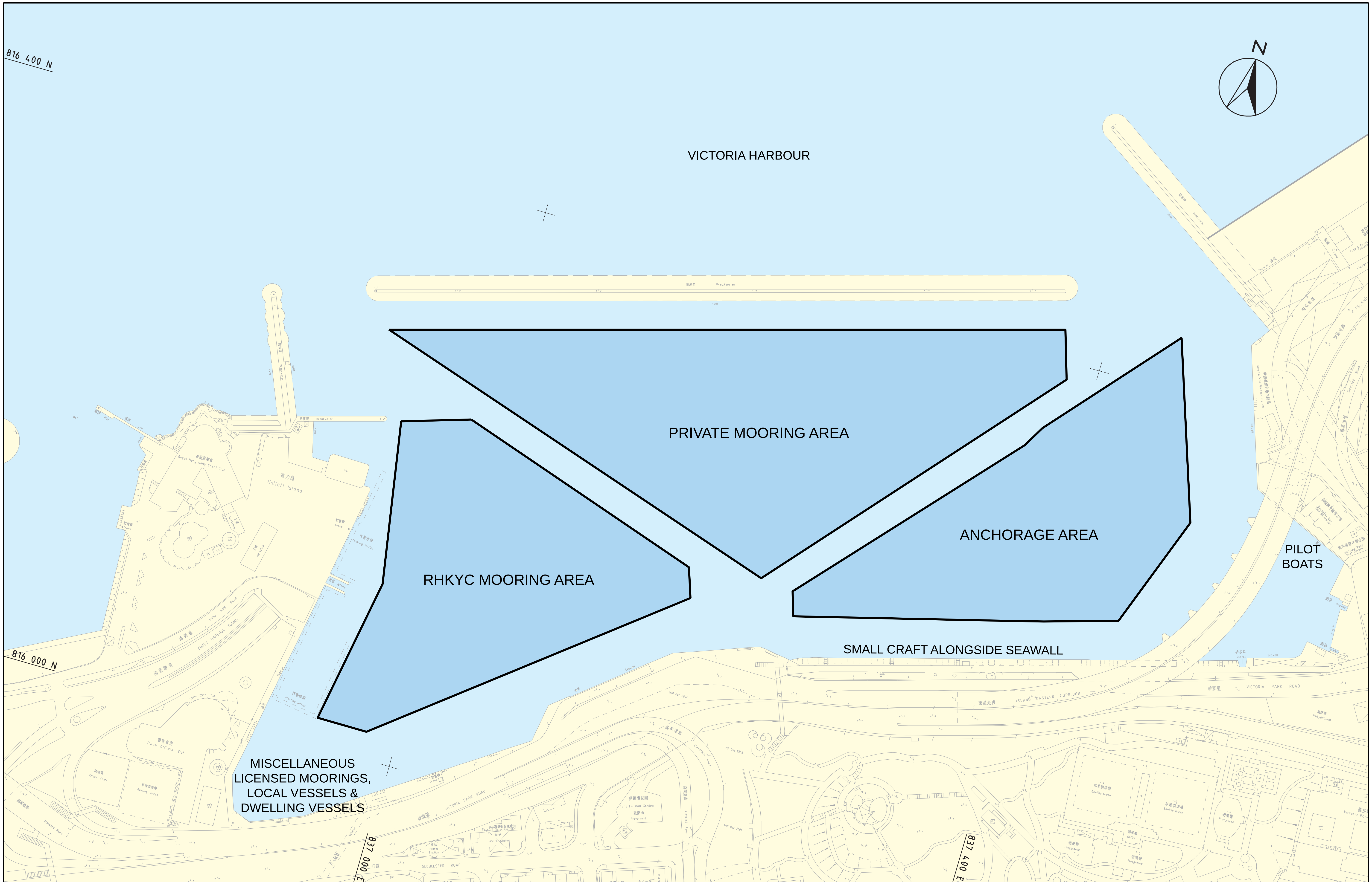
MAUNSELL | AECOM

Maunsell Consultants Asia Ltd

Plot File by : 2008-10-13 shizh

p:\projects\60041297\DRAWING\REPORT\FLYOVER\CBTS\FIGURE 3.1_R2.dgn

A3 1 : 5000



MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - DESIGN AND CONSTRUCTION FOR TRUNK ROAD TUNNEL OPTION

CAUSEWAY BAY TYPHOON SHELTER

FIGURE 4.1

Plot File by : 2008-8-25 GUOSR

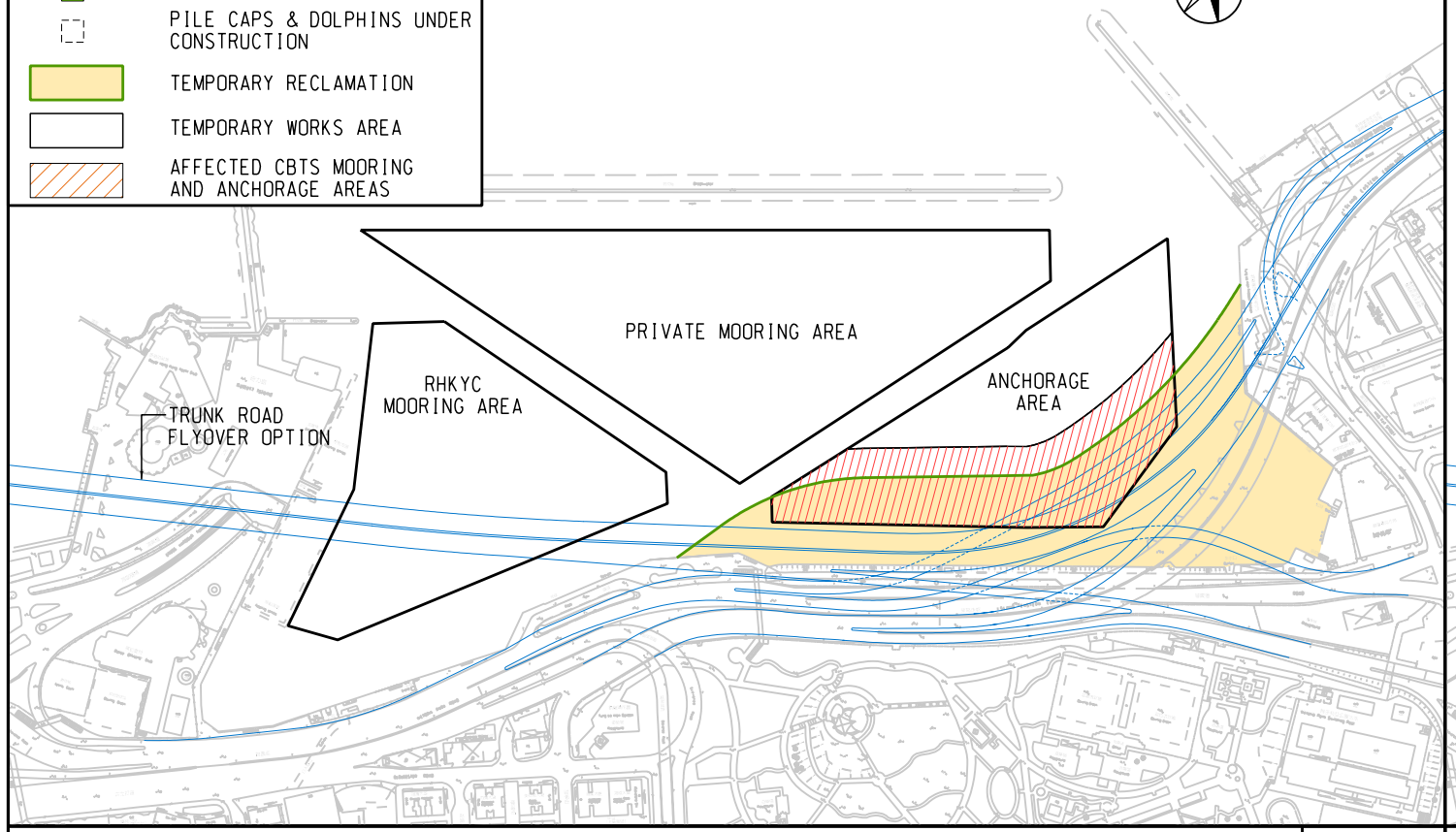
p:\projects\60041297\DRAWING\REPORT\FLYOVER\CBTS\FIGURE 4.1.dgn

LEGEND:

- TRUNK ROAD FLYOVER OPTION
- PILE CAPS & DOLPHINS
- PILE CAPS & DOLPHINS UNDER CONSTRUCTION
- TEMPORARY RECLAMATION
- TEMPORARY WORKS AREA
- AFFECTED CBTS MOORING AND ANCHORAGE AREAS

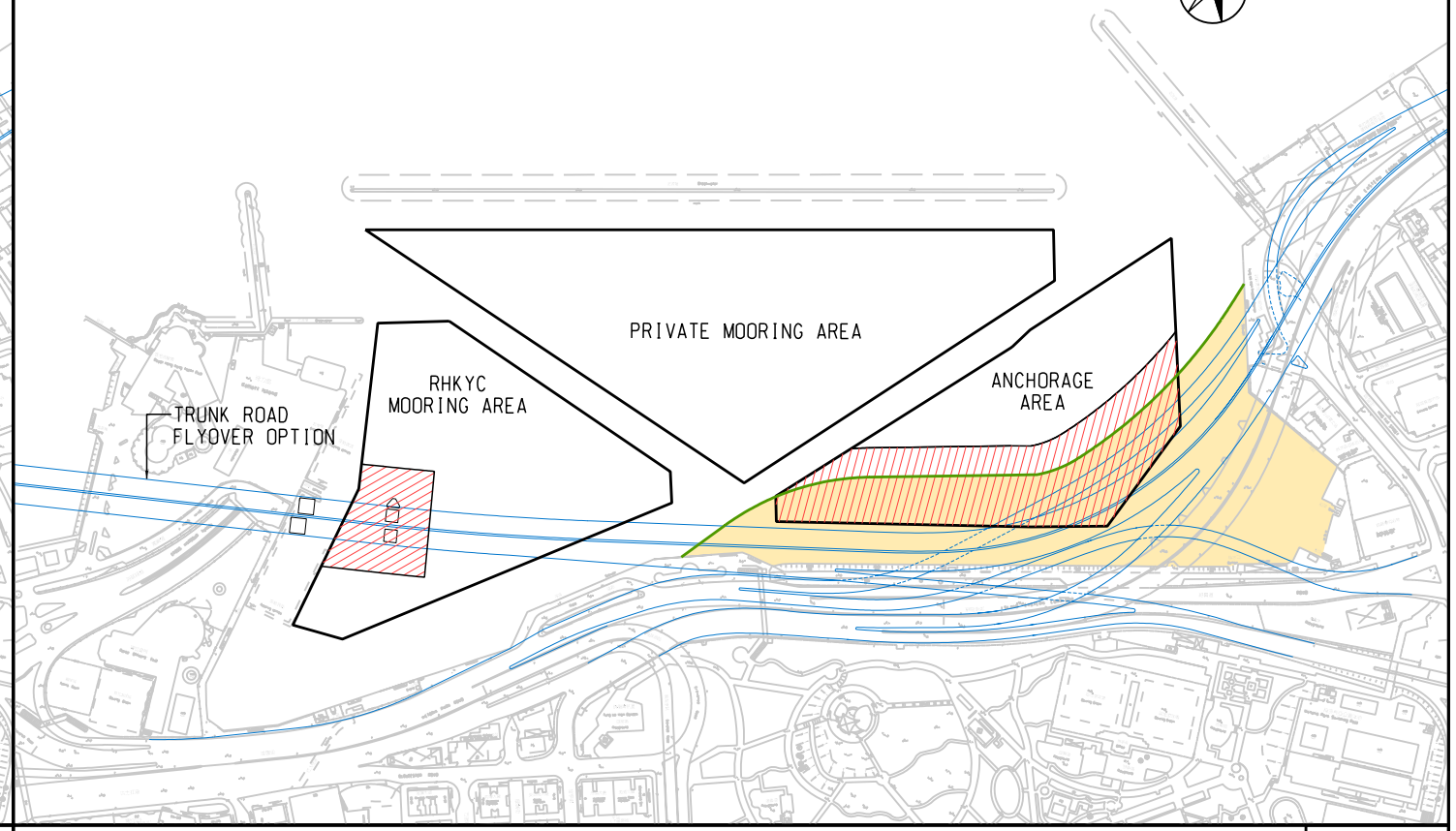
STAGE 1

LICENSED MOORING AREAS AFFECTED = 0 ha
ANCHORAGE AREAS AFFECTED = 1.5 ha



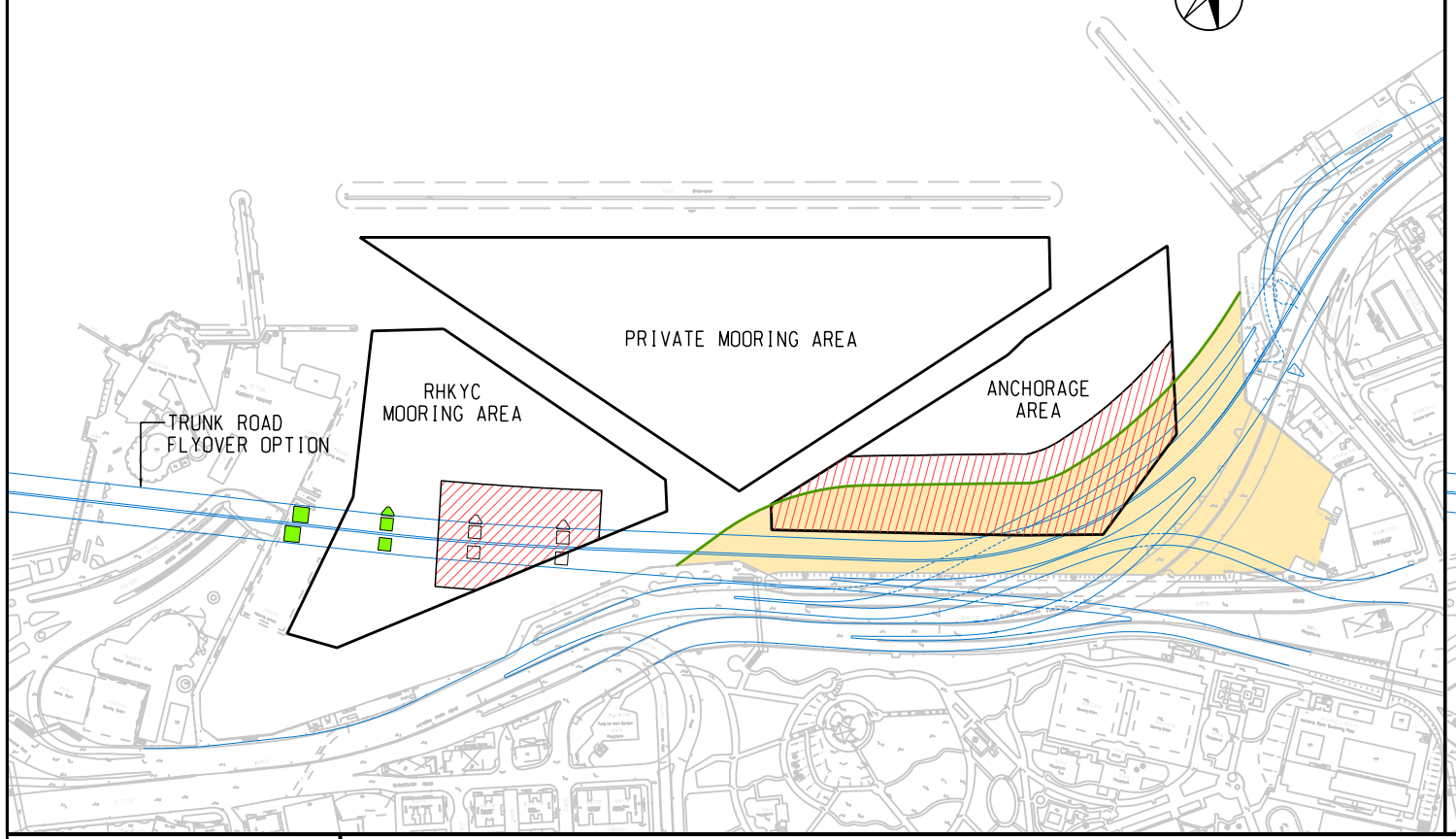
STAGE 2

LICENSED MOORING AREAS AFFECTED = 0.4 ha
ANCHORAGE AREAS AFFECTED = 1.5 ha



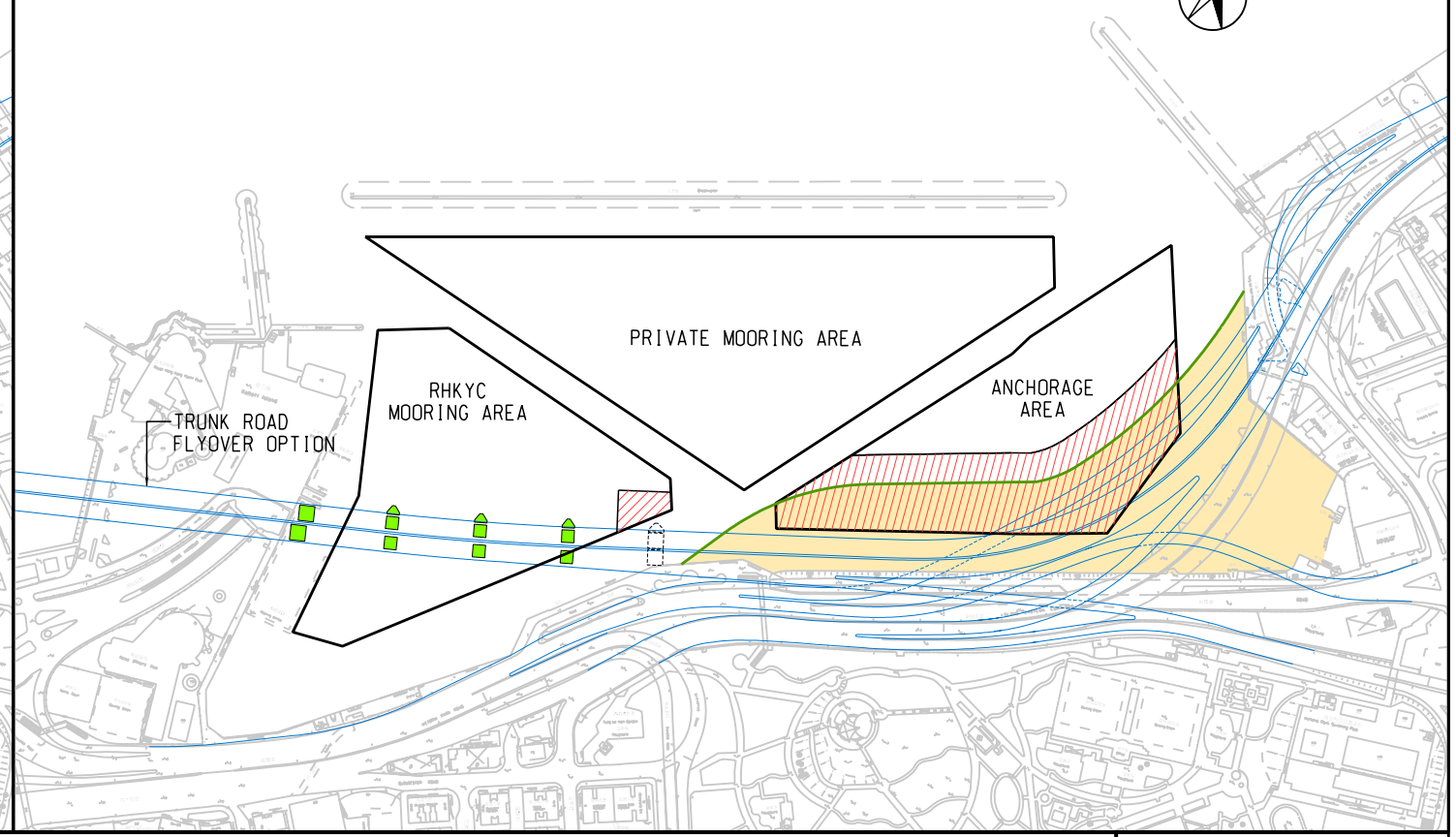
STAGE 3

LICENSED MOORING AREAS AFFECTED = 0.6 ha
ANCHORAGE AREAS AFFECTED = 1.5 ha



STAGE 4

LICENSED MOORING AREAS AFFECTED = 0.1 ha
ANCHORAGE AREAS AFFECTED = 1.5 ha



shizh

Plot File by : 2008-10-15

MAUNSELL | AECOM
Maunsell Consultants Asia Ltd

WAN CHAI DEVELOPMENT PHASE II - DESIGN AND CONSTRUCTION FOR TRUNK ROAD TUNNEL OPTION

AFFECTED MOORINGS IN CBTS DURING CONSTRUCTION OF FLYOVER OPTION

FIGURE 4.2

p:\projects\60041297\DRAWING\REPORT\FLYOVER\CCM\ENGLISH\FL1\FIGURE 4.2_R1.dgn

SCALE 1 : 5000 A3

LEGEND:

- TRUNK ROAD FLYOVER OPTION
- PERMANENT RECLAMATION (PILE CAPS & DOLPHINS)
- PERMANENTLY RESTRICTED MOORING AREA
- PERMANENTLY AFFECTED MOORING AREA

N

816 300 N

816 000 N

PRIVATE MOORING AREA

CAUSEWAY BAY TYPHOON SHELTER

TRUNK ROAD FLYOVER OPTION

RHKYC MOORING AREA

ANCHORAGE AREA

EXISTING IEC

VICTORIA PARK ROAD (E/B)

VICTORIA PARK ROAD (W/B)

837 000 E

837 300 E

837 600 E

WAN CHAI DEVELOPMENT PHASE II - DESIGN AND CONSTRUCTION FOR TRUNK ROAD TUNNEL OPTION

FLYOVER OPTION - PERMANENT LOSS OF MOORING AREA

FIGURE 4.3

MAUNSELL | AECOM

Maunsell Consultants Asia Ltd

Plot File by : 2008-10-14 shizh

p:\projects\60041297\DRAWING\REPORT\FLYOVER\CBTS\FIGURE 4.3_R2.dgn

SCALE 1 : 2500