Construction of Central-Wan Chai Bypass (CWB) Tunnel in Causeway Bay Typhoon Shelter (CBTS) and ex-Wan Chai Public Cargo Working Area (ex-PCWA)

Public Forum

19 July 2008

**Important Notes**
This forum is held solely for demonstration and discussion on the need of temporary reclamation works for the construction of the Trunk Road Tunnel Option. It is not intended to, and should not, be relied upon by any other party that either the Tunnel Option or any other option is the preferred option for the construction of Central-Wan Chai Bypass.

**Purpose**

This forum aims at briefing and inviting the public to express views on the Consultants’ findings that the Overriding Public Need Test in compliance with the Protection of the Harbour Ordinance (“PHO”) for the temporary reclamation to provide working platform for constructing the tunnel of the Central-Wan Chai Bypass and Island Eastern Corridor Link (the “Trunk Road”) in CBTS and ex-PCWA has been demonstrated.

**Background**

2. There was broad support from the public on the proposed Trunk Road Tunnel as revealed from the extensive public engagement exercise entitled “Harbour-front Enhancement Review - Wan Chai, Causeway Bay and Adjoining Areas” (“HER”) carried out from May 2005 to June 2007 under the steer of the then Harbour-front Enhancement Committee (“HEC”) Sub-committee on Wan Chai Development Phase II (“WDII”) Review (“HEC Sub-committee”). The details of the consultations are shown in Annex 1.

3. The need for temporary reclamation during construction was raised in the report entitled “Trunk Road Alignments & Harbour-front Enhancement” (April
2006) \(^1\) and “Report on Cogent and Convincing Materials to Demonstrate Compliance with the Overriding Public Need Test” (February 2007) (the “CCM Report”) \(^2\). These reports have been uploaded onto the website of the Government and a link has also been provided in the HEC website for public reference. The temporary reclamation were described in the project profile for WDII and CWB that was exhibited in August 2006 under the Environmental Impact Assessment Ordinance for public comments. The issue of temporary reclamation was also covered when the then Legislative Council Panel on Planning, Lands and Works, Town Planning Board and the four District Councils of Hong Kong Island were consulted on the WDII and Trunk Road projects and the relevant Outline Zoning Plans in May to June 2007.

4. In the light of the Court of First Instance’s judgment for a judicial review\(^3\) on 20 March 2008 that the PHO applies to the proposed temporary reclamations referred to in the road scheme of the Trunk Road gazetted under the Roads (Works, Use and Compensation) Ordinance on 27 July 2007, we engaged the consultants to examine the overriding public need for the temporary reclamation that is required for constructing the Trunk Road Tunnel\(^4\) as well as its compliance with the PHO and to consult the public about the findings.

Methods of Construction

5. According to the CCM Report, the Trunk Road Tunnel Option serves best to protect and preserve the Harbour amongst all feasible options. By having the Trunk Road Tunnel running beneath the seabed in the CBTS and immediately to the west as well as within the ex-PCWA, permanent reclamation in these areas could be avoided. However, temporary reclamation at these locations would be required to facilitate tunnel construction.

6. Moreover, to maintain the existing traffic during construction of the Trunk Road connection to the existing Island Eastern Corridor, a temporary bridge for temporary traffic diversion would also be required.

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\(^1\) The “Report on Trunk Road Alignments and Harbour-front Enhancement” (April 2006) describes the step-by-step derivation of the Trunk Road Tunnel as the option that serves best to protect and preserve the Harbour.

\(^2\) The CCM Report describes the comprehensive package of materials which explain how the presumption against reclamation is rebutted by an overriding public need for reclamation, in compliance with the PHO and Court of Final Appeal Judgment on 9 January 2004.

\(^3\) The judicial review applied by the Society for Protection of the Harbour on 3 October 2007.

\(^4\) The need for temporary reclamation for reprovisioning of part of the typhoon shelter is being reviewed separately.
7. The Trunk Road Tunnel layout in CBTS and ex-PCWA is shown in Annex 2. The constraints for construction works in the vicinity include-

(i) varying ground and seabed conditions;
(ii) existing and planned infrastructure, such as Cross Harbour Tunnel ("CHT"), the proposed Shatin to Central Link ("SCL"), utilities and the existing seawalls at the CBTS, etc;
(iii) continual operation of the CBTS; and
(iv) connection of slip road from Hing Fat Street/Tsing Fung Street to the Trunk Road Tunnel at the CBTS ("Slip Road 8").

Considerations on choice of construction methods include-

(i) minimisation of concerned reclamation;
(ii) construction safety and environmental impacts;
(iii) a reliable, safe and low risk construction method based on the available engineering techniques; and
(iv) to ensure fairness and competitiveness during open tendering (construction method must be common and widely adopted by contractors).

8. The consultants have examined various construction methods for constructing the Trunk Road Tunnel beneath the seabed of the CBTS and ex-PCWA, which include “Immersed Tube Construction”, “Bored Tunnel Construction” and “Cut-and-cover Tunnel Construction”. The discussion referring to CBTS below is deemed to be applicable to the ex-PCWA as well.

Immersed Tube Construction

9. Immersed tube tunnel ("IMT") involves floating and sinking precast units into place just below the seabed level like Cross Harbour Tunnel, Eastern Harbour Crossing and Western Harbour Crossing. Before sinking the precast units, excavation of a trench and removal of soft materials from the seabed are required to provide a firm foundation.

10. However, construction of the Trunk Road tunnel section running through the CBTS at a deep level would require an extremely deep open cut trench (up to around 30m deep, with side slopes). A typical section is shown in Annex 3. Due to the close proximity, excavation of this deep trench would affect roads and
services behind the southern seawalls (e.g., Victoria Park Road and intakes of the cooling systems), disturb typhoon shelter breakwater and affect the operation of the CBTS. During excavation of the deep trench, the CHT structure may be damaged, thus paralysing one of the most vital road links in Hong Kong. Moreover, reinforcing the existing CBTS seawall or installation of a retaining structure in front of the existing CBTS seawall has found to be technically not feasible due to the great depth. Floating of precast units into the CBTS would also require dredging of the seabed of the CBTS which would seriously affect the continual operation of the typhoon shelter.

11. IMT construction is therefore considered not feasible in this instance.

Bored Tunnel Construction

12. The consultants have also examined bored tunnel construction using a tunnel boring machine (“TBM”). This method involves boring of circular tunnel section through the soil and rock under the existing seabed. The bored tunnel surface will then be protected with tunnel concrete lining. For the dual 3-lane Trunk Road configuration in eastbound and westbound carriageways, two separate circular tunnel bores of at least 15.5m in diameter would be required.

13. For tunnelling beneath the soft seabed sediments in the CBTS, the TBM construction would require a minimum soil cover of at least 1.5 times the diameter of the bored tunnel above the tunnel to ensure ground stability in the vicinity. At the eastern part of the CBTS where the Trunk Road Tunnel rises up to the portal above the seabed, the soil cover would not be sufficient for safe construction by TBM. A typical section is shown in Annex 4.

14. Moreover, Slip Road 8 is a shallow tunnel connecting the mainline tunnel at an oblique angle in the CBTS. Its connection to the mainline tunnel would end up with a very long merging section. If TBM were to be adopted for constructing the mainline tunnel, cutting into such a long length of the constructed bored tunnel tube to create the required connection opening would seriously affect the structural integrity of the bored tunnel. If the Slip Road 8 connection could not be constructed as a result, and this would undermine the function of the Trunk Road in relieving traffic congestion.

15. Other considerations include the technical feasibility of using TBM with diameter greater than 15m in mixed ground (i.e. rock, alluvium and marine
sediments) condition and through hard rock condition (TBM with diameter greater than 15m through hard rock has not been used anywhere else). The extent of permanent reclamation along the Wan Chai and North Point shorelines would also be increased due to greater separation required between eastbound and westbound bored tunnels to ensure ground stability. In view of the above, construction of the Trunk Road Tunnel through the CBTS by TBM is considered not feasible.

**Cut-and-Cover Construction**

16. For cut-and-cover construction using diaphragm walls, the diaphragm walls would be constructed first to form an enclosure. The soil inside the diaphragm walls would then be excavated to the bottom level for construction of tunnel. Upon completion, the space above the tunnel would then be backfilled to the original seabed level. Diaphragm wall construction is a reliable method used as retaining wall systems and foundations. The advantage is that they can be installed in close proximity to existing structures and provide effective retaining functions for soil and underground water behind the diaphragm walls. This method is well-suited to the construction of the deep Trunk Road Tunnel with varying depths and complex tunnel and connection layout at the CBTS. The associated section is shown in Annex 5.

17. This form of construction will not cause any disturbance to existing adjacent infrastructure, does not have any minimum ground cover or clearance restrictions, will readily enable the Slip Road 8 connection and facilitates the minimum extent of permanent reclamation at the adjoining areas.

18. In view of the above, it can be concluded that the only practically feasible form of construction for the Trunk Road tunnel sections at the CBTS and ex-PCWA is by cut-and-cover method.

**The Need for Temporary Reclamations**

19. Construction of diaphragm walls by cut-and-cover method requires a dry working platform with safe working environment on which the contractor's construction plant could stand. It is not feasible to construct diaphragm walls through water. Therefore, when constructing the Trunk Road Tunnel through the CBTS, a working platform would need to be formed first by temporary reclamation. This construction method would also enable staged construction works in the CBTS and ex-PCWA to minimize the mooring area to be affected at any one time;
to maintain acceptable water quality standards; and to ensure uninterrupted seawater supply from the CBTS to the existing cooling systems for the adjacent buildings.

20. To facilitate cut-and-cover tunnel construction, the possible alternative to temporary reclamation is the use of cofferdam. The cofferdam would need to be installed around the works area and dewatered for the construction works to be carried out. For deep excavation within the cofferdam (up to 35 metres below sea level), there is a risk that the very high water and soil pressures would lead to movement and subsequent ground settlement and thus damage to adjacent structures as well as underground facilities such as the CBTS seawall and the CHT. The ingress of water would also cause safety concerns. (Past experience suggests that cofferdam with depth of around 20m below sea level would already be considered a ‘deep’ cofferdam, so working at nearly twice this depth would certainly cause both technical difficulties and safety issues.) Moreover, the cofferdam would also be susceptible to damage from accidental ship impact, as the typhoon shelter would still be in operation. The cofferdam approach is shown in Annex 6.

21. Due to the above reasons, it is concluded that temporary reclamation is the only practically feasible and safe approach for constructing the Trunk Road Tunnel through the CBTS and the ex-PCWA by cut-and-cover method. Temporary reclamation will be removed and the seabed reinstated after construction of the Trunk Road Tunnel.

**Minimum Extent of Temporary Reclamation**

22. The minimum overall extents of temporary reclamation required to facilitate the construction of the Trunk Road Tunnel beneath the seabed of the CBTS and the ex-PCWA are 6.4ha and 1.9ha respectively. The extent of the proposed temporary reclamation is shown in Annex 7. Through a staged construction approach, it is estimated that the affected area of the Harbour in respect of temporary reclamation at any one time in the CBTS will range from 1.8ha to 3.7ha, whilst at the ex-PCWA the area of temporary reclamation will range from 0.7ha to 1.2ha. The durations of the individual temporary reclamation stages will vary from around 1 year to just over 3 years. An illustrative construction staging plan for the works through the CBTS is shown in Annex 8. These areas are the minimum extents of temporary reclamation required to meet the overriding public need for the construction of the Trunk Road Tunnel.
Conclusion

23. Cut-and-cover method is the only practically safe and feasible method of construction for the Trunk Road Tunnel at the CBTS and ex-PCWA, although it will require temporary reclamation. Temporary reclamation will be removed and the seabed reinstated after construction of the Trunk Road Tunnel.

24. The Overriding Public Need for construction of the Trunk Road Tunnel has been demonstrated in the CCM Report. The purpose of the temporary reclamation is for the construction of the Trunk Road Tunnel with minimum permanent reclamation, and therefore, ultimately, to serve best to protect and preserve the Harbour. Without the temporary reclamation, the Trunk Road Tunnel cannot practically be constructed. There is consequently an overriding public need for the temporary reclamation in the CBTS and the ex-PCWA for the Tunnel Option. The above findings will form the basis of the cogent and convincing materials for the temporary reclamation for constructing the Trunk Road Tunnel at the CBTS and the ex-PCWA.

Your Views are Invited

25. Your views on the Consultants’ findings are invited.

Attachments
Annex 1 – Public Engagement undertaken under HER
Annex 2 – Trunk Road Tunnel Layout, Trunk Road Tunnel Plan & Profile through ex-PCWA and CBTS
Annex 3 – Typical Sections through Immersed Tube Tunnel
Annex 4 – Typical Section through Bored Tunnel
Annex 5 – Typical Section through Temporary Reclamation
Annex 6 – Illustrative Cofferdam Approach
Annex 7 - Temporary Reclamation Layout Plan
Annex 8 – Construction Staging at CBTS

Highways Department
July 2008
Annex 1

Central-Wan Chai Bypass and Island Eastern Corridor Link
(Trunk Road)

Public Engagement undertaken under Harbour-front Enhancement Review – Wan Chai, Causeway Bay and Adjoining Areas (HER)

The HER project comprised of three stages: the “Envisioning”, “Realization” and “Detailed Planning” Stages.

1. **Envisioning Stage**
   
   Public engagement on the need for constructing a Central-Wan Chai Bypass
   
   May 2005 – Nov 2005

2. **Public Engagement on alignment options for the Trunk Road**
   
   HEC Sub-committee
   
   Town Planning Board
   
   HEC Sub-committee
   
   Works and Development Committee of Eastern District Council
   
   Traffic and Transport Committee of Southern District Council
   
   Wan Chai District Council
   
   Transport Advisory Committee
   
   Joint Forum of 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
   
   Legislative Council Panel on Planning, Lands and Works (LegCo PLW Panel)
   
   20 April 2006
   
   21 April 2006
   
   8 May 2006
   
   11 May 2006
   
   15 May 2006
   
   16 May 2006
   
   17 May 2006
   
   20 May 2006
   
   23 May 2006
3. **Realization Stage**

Public engagement on the Concept Plan of Wan Chai Development Phase II based on Trunk Road Tunnel alignment through roving exhibition, telephone survey, road-side survey, community workshops and consensus building town hall meeting.

- **HEC Sub-committee** 13 Jun 2006
- **LegCo PLW Panel** 26 Jun 2006
- **Town Planning Board** 25 Aug 2006
- **HEC Sub-committee** 31 Aug 2006
- **Task Force of HEC Sub-committee** 6 Sept 2006
- **Wan Chai District Council** 26 Sept 2006
- **Collaborator’s Working Session** 14 Oct 2006
- **Central and Western District Council** 19 Oct 2006
- **Eastern District Council** 19 Oct 2006
- **Southern District Council** 23 Oct 2006
- **LegCo PLW Panel** 28 Oct 2006
- **Consensus Building Town Hall Meeting** 16 Dec 2006

4. **Detailed Planning Stage**

Public Engagement on Recommended Outline Development Plan and draft Outline Zoning Plans based on Trunk Road Tunnel alignment
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The document contains diagrams illustrating typical sections at the centre and eastern end of a typhoon shelter, along with labels and specifications in Chinese. The descriptions include details about water levels, existing infrastructure, and tunnel sections through an immersed tube tunnel.
Bored Tunnel at Eastern End of Typhoon Shelter
雙向三線行車主幹道的典型切面圖

TYPICAL SECTION FOR DUAL 3-LANE MAINLINE

TYPICAL SECTION THROUGH TEMPORARY RECLAMATION