For discussion **PWSC(2012-13)11**
on 7 May 2012

ITEM FOR PUBLIC WORKS SUBCOMMITTEE OF FINANCE COMMITTEE

HEAD 706 – HIGHWAYS
Transport – Roads
844TH – Hong Kong–Zhuhai–Macao Bridge Hong Kong Link Road

Members are invited to recommend to Finance Committee to increase the approved project estimate of **844TH** by $8,857.3 million from $16,189.9 million to $25,047.2 million in money-of-the-day prices.

PROBLEM

The approved project estimate (APE) of **844TH** is not sufficient to cover the cost of the works under the project.

PROPOSAL

2. The Director of Highways, with the support of the Secretary for Transport and Housing, proposes to increase the APE of **844TH** by $8,857.3 million from $16,189.9 million to $25,047.2 million in money-of-the-day (MOD) prices.

PROJECT SCOPE AND NATURE

3. On 18 November 2011, having considered FCR(2011-12)48, the Finance Committee (FC) approved the upgrading of **844TH** (the Project) to Category A at an estimated cost of $16,189.9 million in MOD prices for the detailed design and construction works of the Hong Kong Link Road (HKLR).

/ 4. …..

4. The Hong Kong-Zhuhai-Macao Bridge (HZMB) is a cross-boundary cross-sea road infrastructure project providing direct land transport connection between the two shores of the Pearl River Delta (PRD), linking Hong Kong in the east to Macao and Zhuhai in the west. A brief background of the project is set out in Enclosure 1. Structurally, the HZMB comprises two parts: (i) the HZMB Main Bridge; and (ii) the respective link roads and boundary crossing facilities of the three places.

5. The Project involves the construction of the HKLR, which is a dual three-lane road of about 12 kilometres (km) connecting the HZMB Main Bridge at the HKSAR boundary with the Hong Kong Boundary Crossing Facilities (HKBCF) at the north-east of the Airport Island, the scope of which comprises the following –

(a) construction of a dual three-lane viaduct of approximately 9.4 km long, connecting the HZMB Main Bridge from the HKSAR boundary to the Scenic Hill on the Airport Island;

(b) construction of a dual three-lane tunnel (with an additional climbing lane for the west bound traffic) of approximately 1 km long, passing through the Scenic Hill and underneath the existing Airport Road and Airport Express Line, and daylighting at a new reclamation (see item (d) below), as well as construction of associated tunnel operation and maintenance facilities for the tunnel;

(c) construction of a dual three-lane at-grade road of approximately 1.6 km long, along the east coast of the Airport Island between the tunnel exit and the HZMB HKBCF;

(d) construction of a seawall of approximately 2.3 km long and reclamation of approximately 17 hectares (ha) of land, along the east coast of the Airport Island for the construction of the proposed HZMB HKLR and the proposed associated tunnel operation and maintenance facilities;

(e) reprovision of an existing weather station located at east coast of the Airport Island, upgrading and modification of an existing wind profiler station at the northern shore of Lantau Island near Sha Lo Wan, and provision of anemometers on the HKLR viaduct and the Airport Island; and

/ (f) …..

(f) associated ancillary works, including civil, structural, building, electrical and mechanical (E&M), geotechnical, site investigation, marine, environmental protection, slope, landscaping and drainage works, fire services, environmental mitigation measures, and traffic control and surveillance systems (TCSS).

Site plans and artist's impression of the proposed works are at Enclosure 2.

6. Subject to the funding approval of FC, we will award two design–and-build (D&B) contracts under the Project as soon as possible, so as to complete the HKLR by end 2016 to dovetail with the commissioning of the HZMB.

JUSTIFICATIONS

Strategic Importance of HZMB

7. The HZMB is strategically important. It will facilitate the further economic development of Hong Kong, Macao and Western PRD. The construction of the HZMB will significantly reduce transportation costs and time for travellers and goods on roads[1], but the benefits go far beyond this. With the connection by the HZMB, the Western PRD will fall within a reachable three-hour commuting radius of Hong Kong. This would enhance the attractiveness of the Western PRD to external investment, which is conducive to the upgrading of its industry structure. Hong Kong will benefit from this new economic hinterland, the vast human and land resources in Western PRD will provide ample opportunities for Hong Kong businesses to expand their operation in the Mainland. The commissioning of the HZMB will also benefit various sectors in Hong Kong, such as tourism, finance and

/ commerce …..

[1] The HZMB will result in a significant reduction in relevant travelling time between Hong Kong and the Western PRD. For instance, as illustrated by the table below, the travelling time between Zhuhai on the one hand, and the Kwai Chung Container Port and the Hong Kong International Airport on the other, will be reduced by more than 60% and 80% respectively.

Origin – Destination	Current Distance and Travelling Time	Distance and Travelling time with HZMB	Reduction in Distance and Travelling Time
Zhuhai – Kwai Chung Container Port	about 200 kilometres about 3.5 hours	about 65 kilometres about 75 minutes	more than 60%
Zhuhai – Hong Kong International Airport	over 200 kilometres about 4 hours	about 40 kilometres about 45 minutes	more than 80%

commerce. In particular, it will enhance Hong Kong's position as a trade and logistics hub as goods from the Western PRD and Western Guangdong, Guangxi, etc. can better make use of the airport and container ports in Hong Kong. Overall speaking, the HZMB will accelerate the economic integration of the PRD and its neighbouring provinces and enhance its competitiveness vis-á-vis countries of the Association of Southeast Asian Nations and other economic zones such as the Yangtze Delta region. Hong Kong will stand to gain in this process. The construction of the Main Bridge of the HZMB commenced in 2009 and the Bridge is scheduled for opening in 2016.

8. The HZMB connects Hong Kong, Zhuhai and Macao. The HZMB Hong Kong local projects would connect the HZMB Main Bridge located in Mainland waters at the Hong Kong Special Administrative Region (HKSAR) boundary. The road leading to the eastern artificial island in the Mainland waters has to connect the HKLR in Hong Kong waters in order to complete the entire traffic network. Therefore, apart from the HZMB Main Bridge, the associated Hong Kong projects need to be completed in tandem for connection to enable the commissioning of the HZMB. Similarly, Zhuhai and Macao have similar boundary crossing facilities or link roads, which need to be completed in tandem for connection to enable the commissioning of the HZMB. As the HZMB is an infrastructure to be constructed by Zhuhai, Macao SAR and HKSAR in collaboration, the three governments, through an agreement signed in 2010, agreed that each government would be obliged to complete and commence local works within its jurisdiction at the same time. If HKSAR could not complete the local projects on time making it not possible for the HZMB to be commissioned in 2016, there would be no toll fee income for the HZMB and at the same time three places have to bear other costs. This would cause direct financial loss. Without the connection for transport, tourists and economic activities amongst the three places by the HZMB, the three places would also have to bear direct and indirect economic loss.

Changes in Tendering and Construction Programme of HKLR

9. There are two D&B contracts under the Project: the first one mainly covers the 1 km long tunnel and 1.6 km long at-grade road section from the Scenic Hill to HKBCF ("Tunnel Contract"); and the second one mainly covers the 9.4 km viaduct section from the HKSAR Boundary to Scenic Hill ("Viaduct Contract"). According to our original plan, we were to invite tender in an orderly manner for the two contracts in early and mid 2011 respectively, with works commencing in mid and end 2011. Similar to the arrangements for other large scale civil engineering projects, sufficient time has been allowed for in the original works programme for the construction of the HKLR so that the contractors could deploy labour and plant

/ flexibly …..

flexibly to deal with the problems arising from possible unforeseen circumstances in mega-scale and complex projects. Subsequently, the local works of the HZMB were affected by a case of judicial review (JR)[2], and the original programme for tendering and construction could no longer be implemented. As a result, we could only invite tender for the two HKLR contracts in September and October 2011 respectively, with works commencement scheduled for the first half of 2012. This resulted in a delay of tendering and works commencement by about nine months compared to the original schedule. Although works could still be completed by 2016 if the same could commence in the first half of 2012, the works programme for the HKLR project which was originally very adequate is now very tight.

Results of Tendering of HKLR Contracts

10. As mentioned in paragraph 9 above, we invited tenders for the Tunnel Contract and Viaduct Contract in September and October 2011 respectively.

11. The tender prices of both contracts have exceeded the original estimates. Indeed, during the tendering process, we have adopted corresponding measures such that the tenderers may lower their tender prices as far as possible. Please see the analysis in paragraphs 13 to 26 below for the main reasons for higher-than-expected tender prices in the first tender exercise for the Tunnel Contract. To protect public funds and ensure fairness of the tendering process, we retendered the Tunnel Contract. Through the exercise, we adopted targeted measures to alleviate the risks of the project as much as possible. In view of the higher-than-expected tender prices in the first tender exercise for the Tunnel Contract, we have made similar modifications to the Viaduct Contract before the close of tender with a view to alleviating tenders' risk. Despite the retendering exercise and modifications, the prices of the final returned tenders of the two contracts are still higher than our original estimates.

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[2] On 22 January 2010, a Tung Chung resident filed an application for leave for JR against the decisions of the Director of Environmental Protection (DEP) as regards the approval of the Environmental Impact Assessment (EIA) Reports and the granting of Environmental Permits (EPs) relating to the HKBCF and HKLR projects. The High Court handed down its judgement on 18 April 2011. The court judgement quashed the EPs of the HZMB local projects and therefore the associated works could not commence. The DEP appealed against the court's judgment. The Court of Appeal handed down its judgment on 27 September 2011, allowing DEP's appeal and therefore the EIA reports and EPs of HKBCF and HKLR projects are maintained valid.

12. After reviewing the financial position of **844TH** and the tendering results of the two contracts, we consider it necessary to increase the APE of the project by $8,857.3 million from $16,189.9 million to $25,047.2 million in MOD prices to cover the additional costs arising from the higher-than-expected prices of the recommended tenders and the associated increase in provision for price adjustment. The details of the additional costs are enclosed in Enclosure 3.

Reasons for Higher-than-expected Tender Prices

13. We already explained when we applied for funding for the HZMB related local projects from the Legislative Council (LegCo) in November last year that because of the delay in commencement of the various HZMB local projects, the works programme and financial arrangements would be affected to a certain extent. As a result, the commencement of works for the HKBCF and advance works for the Tuen Mun-Chek Lap Kok Link have been delayed for nearly one year. The original works arrangement could no longer enable the works to be completed on time. The construction timetable has to be compressed through increased labour resources, arrangement of overtime work and increased plant resources in order to complete the works on time by 2016. The above-mentioned measures, together with the increase in construction prices, have led to an increase in the expenditures of approximately $6.5 billion (in MOD prices) for the two local projects. We stressed that the estimated additional expenditures were very conservative when we applied for funding from LegCo, and pointed out that such estimates did not include the HKLR project. This was because, though the works programme of the HKLR had become very tight, it was still possible to complete the works by 2016.

14. The now higher-than-expected tender prices of the HKLR are a further revelation of the impact of the delay in commencement of works on the construction programme and cost, and the impact is more serious than expected. According to our analysis, the higher-than-expected construction cost for the works of the HKLR is a result of two main factors caused by the delay in commencement of works: the surge in construction prices in the past six months after the delay; and the fact that tenderers are more conservative in assessing risks of works than we expected. Apart from the corresponding technical adjustments to price adjustment and contingencies, the two aforesaid factors each contributes approximately half of the total increase.

/ Surge …..

Surge in Construction Prices in Past Six Months after Delay

15. After the delay of the tendering process, the HKLR project encountered a surge in construction prices in the second half of 2011. The prices of a number of works items have become higher than our original estimates made in mid 2011. It is estimated that this factor has led to an increase in construction cost by $3,270 million (excluding the corresponding technical adjustments, accounting for about half of the total increase of $8,860 million).

16. The invitation of tenders for the two contracts of the HKLR were eventually delayed from early 2011 and mid 2011 to September and October 2011 respectively, with tender closing dates changed to end 2011 and early 2012. When we applied for funding from LegCo last year, our forecast and cost estimate were based on the market situation and data in mid-2011. Nevertheless, the tenderers made their estimates and determined the final tender prices taking into account the latest market situation and data in late 2011 and early 2012. Since the second half of 2011, the increase in the prices of certain labour, plant and materials required by the project is higher than that originally estimated by the Administration. The tenderers have correspondingly reflected such increase in their tender prices. According to market information, the increase in prices and the tight supply of certain construction resources, especially plant and raw materials, is a regional phenomenon. Mainland China and Macao, where construction works are in full swing, also face the same situation.

Local Labour Wages

17. Regarding local labour wages, according to statistics released by the Census and Statistics Department, daily wages of concretors and construction plant mechanics (a large number of which the HKLR will require) have increased by 6% and 4.5% respectively in the forth quarter of 2011 alone. In fact, the wages of the types of workers most involved in the HKLR project increased by only about 4.5% per annum according to data in June 2011. The increase in wages was nearly doubled to about 8.5% per annum in December 2011. According to data from some roadworks contracts in early 2012, the wage increase for workers required in the HKLR project has risen to about 16% per annum, which was higher than the annual increase for the index of composite labour wages for civil engineering contracts of 6.5% over 2011. The tender prices reveal that tenderers were concerned that labour costs for the types of workers most involved in the HKLR might surge continuously. In addition, apart from the rapid increase in wages for types of labour required in the HKLR project, contractors have also indicated that in the recruitment of design personnel in the market, the competition has become more intense than expected. During the last quarter of 2011 alone, the salary of such design staff became 2% to 4% higher than our estimates made in mid-2011. The tenderers have reflected this in their returned tender prices.

/ *Supply*…..

Supply of Machinery

18. The market prices of machinery have also become volatile. There has been quite a marked surge in the cost of some machinery needed in the HKLR project starting from mid-2011. Take derrick barges that are most needed for marine viaduct works in the HKLR project as an example, cost of the barges increased by over 30% between the second quarter of 2011 and early 2012. The cost of large marine-based and land-based machinery has also increased by about 25% from mid-2011 to early 2012. The tenderers have taken into account the latest market prices as the basis in preparing the tenders. In addition, a large number of major civil works projects have been commencing successively in the Mainland and Macao recently. As a result, there is a strong demand for similar machinery, such as derrick barges, needed in the HKLR project. Tenderers envisage that the supply of construction machinery in the region might become even tighter and therefore have included additional costs in their tender prices in order to secure sufficient machinery and equipment.

19. The Building Services Tender Price Index for the third quarter of 2011 released in end 2011 has risen by more than 15% compared with the second quarter of 2011. The tenderers have also taken into account such increase in determining the tender prices for the E&M works.

Construction Materials and Other Factors

20. Regarding construction materials, there was also a higher-than-expected increase in the prices of some materials in the second half of 2011. For instance, the price of aggregates that are widely used in the HKLR works increased by 4% in the forth quarter of 2011 alone. The price of sand needed in the works increased by 15% in the same period. In view of the recent volatility of the market, tenderers made upward adjustments to their tender prices when making the bids in end 2011 and early 2012.

<u>Higher-than-Expected Risk Assessment by Tenderers</u>

21. Apart from the above-mentioned increase in construction prices in the past six months after the delay, tenderers have made a higher-than-expected assessment of the risks of the works of the HKLR, leading to higher-than-expected risk costs. It is estimated that this factor has led to an increase in construction cost by $3,440 million (excluding other corresponding technical adjustments, accounting for about half of the total increase of $8,860 million, similar to the increase due to the surge in construction prices after the delay).

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22. For the tendering work of the HKLR, in accordance with established procedures, the Highways Department has appointed a professional consultant to estimate the cost of the HKLR. The consultant has assessed the final costs according to the profile of the HKLR, difficulty and complexity of works, as well as the envisaged construction methods and procedures adopted by the contractors, and by making reference to the then market situation and construction prices. However, as revealed from the returned tenders, under a tight construction programme caused by the delay in commencement of works, and in response to the latest market situation as well as the uniqueness and requirements of the works of HKLR, the tenderers have made a higher-than-expected assessment of risks in preparing their tenders. The tenderers have also adopted designs and construction methods which they have the most experience and confidence in. This has led to a higher construction cost.

Tight Works Programme

23. The delay in commencement time of works of the HKLR has rendered the works programme, which was originally very adequate, very tight. According to the latest construction programme of the HKLR, works could still be completed as scheduled if the same could commence in the first half of 2012. However, the tenderers understand that they do not have flexibility to deploy plant and labour or to schedule their works similar to other infrastructure projects of such scale in implementing the works. Tenderers anticipate that some unforeseeable circumstances will cause delay to the works programme during construction. As such, when calculating their costs, they have taken into account the increase in labour resources and plant as well as the arrangement of overtime work for shortening some parts of the construction period to further assure the timely completion of the works. While assessing the above risks, coupled with issues such as the recent surge in labour and plant costs in the market and the premium required as a result of the difficulty to recruit workers to work in remote sites (see paragraph 25 below), the tenderers have reflected these risk costs in the tender prices. For the design of the works, in view of the tight works programme, tenderers have also budgeted for more-than-expected design manpower for shortening the time for design works.

/ *Stringent…..*

Stringent Technical Requirements

24. Works of the HKLR have stringent technical requirements. Tenderers are concerned that they may face more difficult or complex work environment or situation than expected that would lead to delay of works. In fact, the HKLR is the first major project to be carried out in the vicinity of North Lantau and the Airport Island after the major facilities in the area have been completed. For example, part of the HKLR works involves tunnelling works through the rock layer in the vicinity of sensitive facilities such as fuel storage and the Ngong Ping 360 cable car; and also tunnelling works underneath the Airport Express line and the Airport Road on the Airport Island. Such works have to be carried out with extreme care in order not to affect the operation of the aforementioned facilities. Apart from the requirement to complete works on time under an extremely tight schedule, tenderers have to take into account the serious technical difficulties as well as the site constraints. Tenderers, on the one hand, have included provisions for sporadic corresponding design changes that are needed to match with the actual site conditions in the tender prices, which has resulted in higher-than-expected design cost. On the other hand, tenderers have adopted designs and construction methods that they feel most experienced, confident and conversant with in accordance with their own experience and assessment of the difficulty of the works. The costs of these design and construction methods are higher than those envisaged by the reference design. Such costs have been reflected in the tender.

Preference of Workers over Job Opportunities in Urban Areas

25. In light of the recent abundance of job opportunities, construction workers have become more sensitive than expected in their preference over work locations. The work sites of the HKLR are located in remote areas on northwest Lantau. The recent recruitment fair organised by the HKBCF contractor in Tung Chung has revealed that the labour force supply in Tung Chung cannot meet the requirements of the works. Therefore, contractors of HKLR will need to arrange workers from other areas in Hong Kong to commute to work in Tung Chung every day. Although the current overall labour force in the market is considered adequate, with the recent successive commencement of large scale projects in urban areas, tenderers anticipate that most workers will choose to work in urban areas. Unless extra subsidies are provided, most workers are unwilling to travel to remote sites such as Lantau, or even take further boat trips from Lantau to work at sea. As such, tenderers anticipate that in the engagement of workers, they have to provide the necessary subsidies in order to attract workers to work at the HKLR sites.

/ Increase …..

Increase in Provision of Price Adjustment and Contingencies

26. The increase in the provision of price adjustment and contingencies is a technical adjustment required following the increase in tender prices due to the two aforementioned factors (i.e., surge in construction prices in the past six months after the delay; and tenderers' risk assessment being higher-than-expected). These adjustments are made based on established procedures of the Government in handling public works. The price adjustment is assessed according to the latest cashflow of the Project. This technical adjustment is based on the increase in project estimates mentioned in paragraph 12 above and the Government's latest set of assumptions on the trend rate of change in the prices of public sector building and construction output for the period from 2012 to 2019. Relevant details are set out in Enclosure 4. Regarding contingencies, they represent the 10% of project expenditure reserved for unforeseen situations, similar to other public works projects.

27. A summary of the increases due to the above factors is as follows –

	$million
Surge in Construction Prices in Past Six Months after Delay	3,270
Higher-than-Expected Risk Assessment by Tenderers	3,440
Increase in Contingencies	670
Increase in Provision for Price Adjustment	1,480
Total	**8,860**

28. A comparison of the cost breakdown of the APE and the revised project estimate in MOD prices is at Enclosure 3.

FINANCIAL IMPLICATIONS

29. Subject to approval, we will phase the expenditure as follows –

Year	**$ million (Sep 2011 prices)**	**Price adjustment factor**	**$ million (MOD)**
2011 – 2012	1.3	1.00000	1.3
2012 – 2013	2,432.7	1.05325	2,562.2
2013 – 2014	5,126.6	1.11118	5,696.6
2014 – 2015	4,282.1	1.17229	5,019.9

/ **Year**…...

Year	$ million (Sep 2011 prices)	Price adjustment factor	$ million (MOD)
2015 – 2016	3,908.3	1.23677	4,833.7
2016 – 2017	3,732.9	1.30479	4,870.7
2017 – 2018	884.3	1.37656	1,217.3
2018 – 2019	582.2	1.45227	845.5
	20,950.4		25,047.2

30. We estimate the annual recurrent expenditure arising from the Project to be $151.4 million.

PUBLIC CONSULTATION

31. We consulted the LegCo Panel on Transport on the proposed increase in APE for **844TH** on 25 April 2012. The Panel supported the Administration's submission of funding application to Public Works Subcommittee. Supplementary information requested by members will be provided separately.

ENVIRONMENTAL IMPLICATIONS

32. The proposed increase in the APE will not have any environmental implications.

HERITAGE IMPLICATIONS

33. The proposed increase in the APE will not have any heritage implications.

LAND ACQUISITION

34. The proposed increase in the APE will not require any land acquisition.

/ **BACKGROUND**…..

BACKGROUND INFORMATION

35. FC approved the upgrading of **844TH** to Category A in November 2011 at an estimated cost of $16,189.9 million in MOD prices for the detailed design and construction of the HZMB HKLR.

36. The proposed increase in the APE will not involve any additional tree removal or planting proposal.

37. The proposed increase in the APE will not involve the creation of any additional professional/technical posts or job opportunities.

Transport and Housing Bureau
April 2012

844TH – Hong Kong–Zhuhai–Macao Bridge Hong Kong Link Road

Background of Hong Kong-Zhuhai-Macao Bridge Project

Compared to the linkage with other parts of the Pearl River Delta (PRD), transport link between the Hong Kong Special Administrative Region (HKSAR) and the Western PRD has been weak, relying primarily on waterborne traffic. A study on "Transport Linkage between Hong Kong and Pearl River West", jointly commissioned by the National Development and Reform Commission (NDRC) and the HKSAR Government in 2003, confirmed the urgent need for the construction of a land transport link connecting Hong Kong and Western PRD.

2. With the approval of the State Council to proceed with the preparatory work for the Hong Kong-Zhuhai-Macao Bridge (HZMB), the governments of Guangdong Province, the HKSAR and the Macao Special Administrative Region (the three governments) in 2003 established an HZMB Advance Work Coordination Group (AWCG) to commence the preparatory work for the HZMB. In 2004, the AWCG commissioned the China Highway Planning and Design Institute (HPDI) to conduct a feasibility study of the HZMB. The NDRC also formed an HZMB Task Force in 2007 to push forward the project. The Task Force was led by the NDRC, with representatives from the Ministry of Transport, the Hong Kong and Macao Affairs Office, and the three governments as members. At its meeting on 7 January 2007, the Task Force recommended that the three governments should set up boundary crossing facilities (BCF) within their respective territories.

3. The Central People's Government approved the Feasibility Study Report of the project in October 2009. In respect of the works programme of the Bridge itself, works of the Main Bridge within Mainland waters and the Zhuhai Macao Boundary Crossing Facilities, commenced in end 2009 as scheduled and are expected to be completed by 2016 as planned.

4. To facilitate the works of the HZMB Main Bridge, the three governments jointly signed an Inter-governmental Agreement in late February 2010, which specifies the partnership arrangements between the three governments as well as their rights and responsibilities in respect of the construction, operation, maintenance and management of the HZMB Main Bridge. The three governments also established the Joint Works Committee of the Three Governments (the Committee) on 24 May 2010, comprised

representatives of the three governments. The Committee plays a supervisory role over the implementation of the HZMB project, and is responsible for decision-making on major issues concerning the project. On the basis of the Articles of Association signed by the three governments, they also established the managing body of the HZMB Main Bridge (the HZMB Authority) [1]. The HZMB Authority is responsible for co-ordinating the construction, operation, maintenance and management of the HZMB Main Bridge, and implementing various policies of the Committee.

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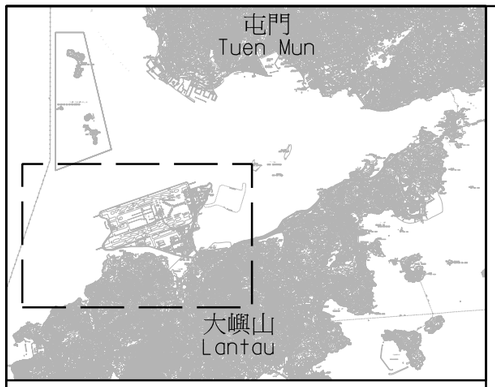
[1] The HZMB Authority is the project's legal person, which operates as a non-profit-making public institution legal person.



位置圖
Location Plan
比例 Scale : 1:300000

圖例
Legend

- 施工區界限 Limit of works area
- 擬建高架結構 Proposed elevated structure
- 擬建地面道路 Proposed at-grade road
- 擬建隧道 Proposed Tunnel
- 香港接線的擬建填海範圍 Proposed extent of reclamation for HKLR
- 在工務計劃項目第845TH號下的擬建填海範圍及道路（連接香港口岸及香港國際機場） Proposed extent of reclamation and roads (Connecting HKBCF and Hong Kong International Airport) under PWP Item No. 845TH

擬建港珠澳大橋香港口岸工程項目（只供指示用途）
Proposed Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities (HKBCF) Project (For indicative purpose only)

擬建屯門至赤鱲角連接路工程項目（只供指示用途）
Proposed Tuen Mun-Chek Lap Kok Link (TM-CLKL) Project (For indicative purpose only)

香港國際機場
Hong Kong International Airport

擬建港珠澳大橋香港接線
Proposed Hong Kong-Zhuhai-Macao Bridge Hong Kong Link Road (HKLR)

擬建掉頭設施
Proposed turnaround facilities

粵港分界線
HKSAR Boundary

通航孔
Navigation spans

通航孔
Navigation span

往珠海/澳門方向
To Zhuhai/ Macao

往香港口岸方向
To HKBCF

HZM6844TH-SK0033

視圖 View 1

視圖 View 2

沙螺灣
Sha Lo Wan

磡石灣
San Shek Wan

東涌灣
Tung Chung Wan

東涌
Tung Chung

大嶼山
Lantau

北大嶼郊野公園
North Lantau Country Park

附件 2/2
Enclosure 2/2

0 750 1500 m 米
比例尺
SCALE BAR

工務計劃項目第844TH號 - 港珠澳大橋香港接線
PWP Item No. 844TH - Hong Kong-Zhuhai-Macao Bridge Hong Kong Link Road

HZM6844TH-SK0024	1:30000

HONG KONG - ZHUHAI - MACAO BRIDGE
HONG KONG PROJECT MANAGEMENT OFFICE

HIGHWAYS DEPARTMENT HONG KONG 香港 路政署

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A3 420 x 297

圖例
Legend

施工區界限
Limit of works area

擬建高架結構
Proposed elevated structure

擬建地面道路
Proposed at-grade road

擬建隧道
Proposed tunnel

擬建隧道營運和維修後勤用地的輔助道路
Proposed service road for tunnel operation and maintenance back-up area

擬建隧道營運和維修後勤用地
Proposed tunnel operation and maintenance back-up area

擬建維修通道及環境美化地帶
Proposed maintenance access and landscape area

行車方向
Traffic direction

擬建氣象站（重置項目）
Proposed weather station (Reprovisioning item)

香港接線的擬建填海範圍
Proposed extent of reclamation for HKLR

在工務計劃項目第845TH號下的擬建填海範圍及道路（連接香港口岸及香港國際機場）
Proposed extent of reclamation and roads (Connecting HKBCF and Hong Kong International Airport) under PWP Item No. 845TH

香港國際機場
Hong Kong International Airport

往珠海/澳門方向
To Zhuhai/ Macao

往香港口岸方向
To HKBCF

擬建氣象站（重置項目）
Proposed weather station (Reprovisioning item)

擬建港珠澳大橋香港口岸工程項目（只供指示用途）
Proposed Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities (HKBCF) project (For indicative purpose only)

擬建海堤
Proposed seawall

擬建港珠澳大橋香港接線
Proposed Hong Kong-Zhuhai-Macao Bridge Hong Kong Link Road (HKLR)

隧道東面出口
Tunnel east portal

隧道西面出口
Tunnel west portal

HZM6844TH-SK0036

東涌
Tung Chung

0 100 200 300 400 500 m 米
比例尺
SCALE BAR

工務計劃項目第844TH號 - 港珠澳大橋香港接線
PWP Item No. 844TH - Hong Kong-Zhuhai-Macao Bridge Hong Kong Link Road

HZM6844TH-SK0025 | 1:10000

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HIGHWAYS DEPARTMENT HONG KONG 路政署 香港

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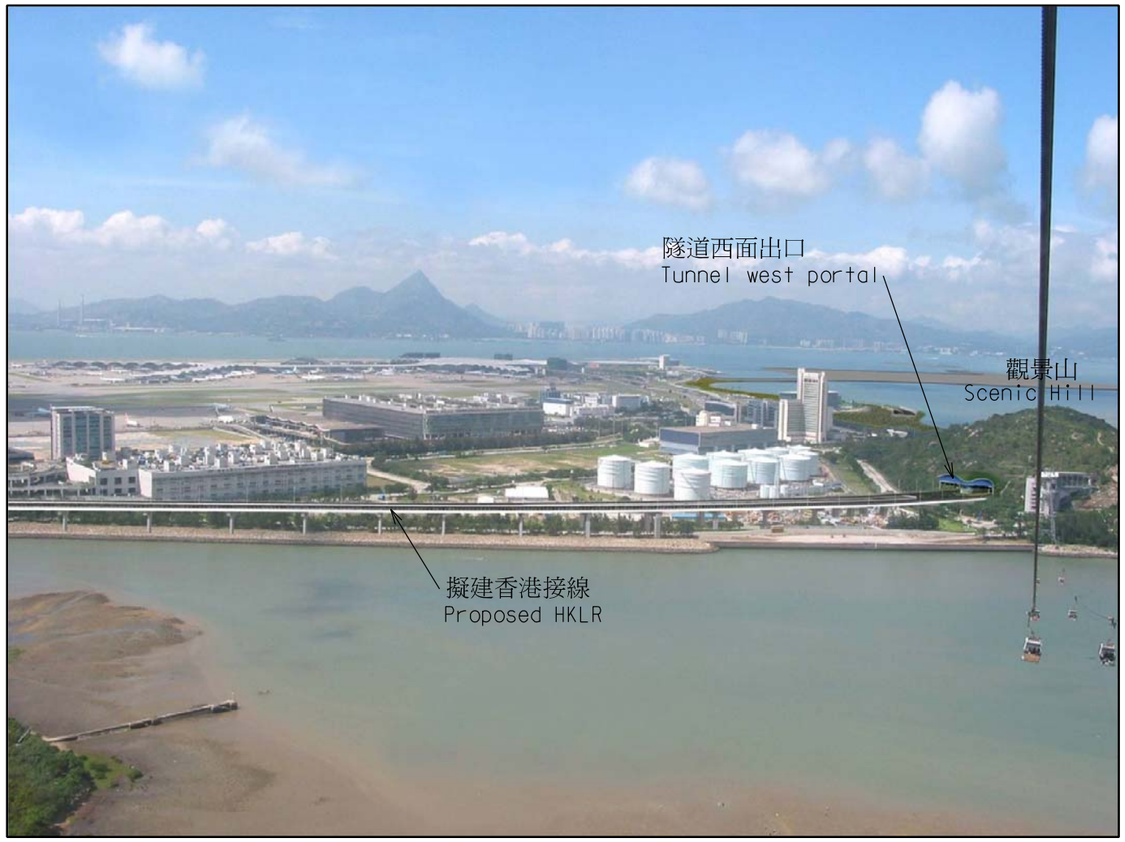
A3 420 x 297

視圖1 - 香港接線自西面水域至機場島
View 1 - HKLR from Western Waters to Airport Island



視圖2 - 香港接線沿機場島海堤至位於觀景山之隧道西面出口
View 2 - HKLR along seawall of Airport Island to tunnel west portal at Scenic Hill

工務計劃項目第844TH號 - 港珠澳大橋香港接線
PWP Item No. 844TH - Hong Kong-Zhuhai-Macao Bridge Hong Kong Link Road

HZM6844TH-SK0026 | N.T.S.

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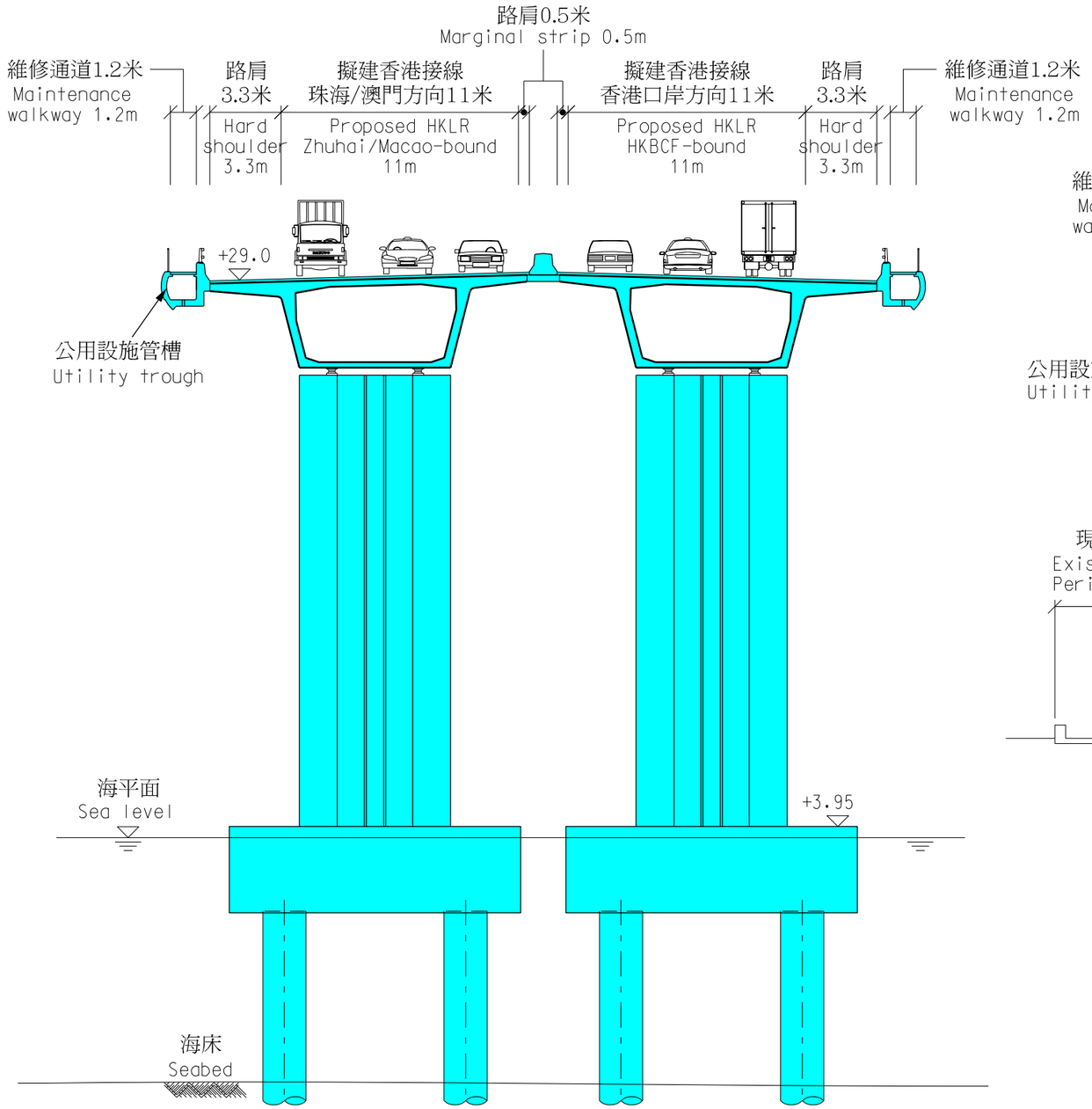
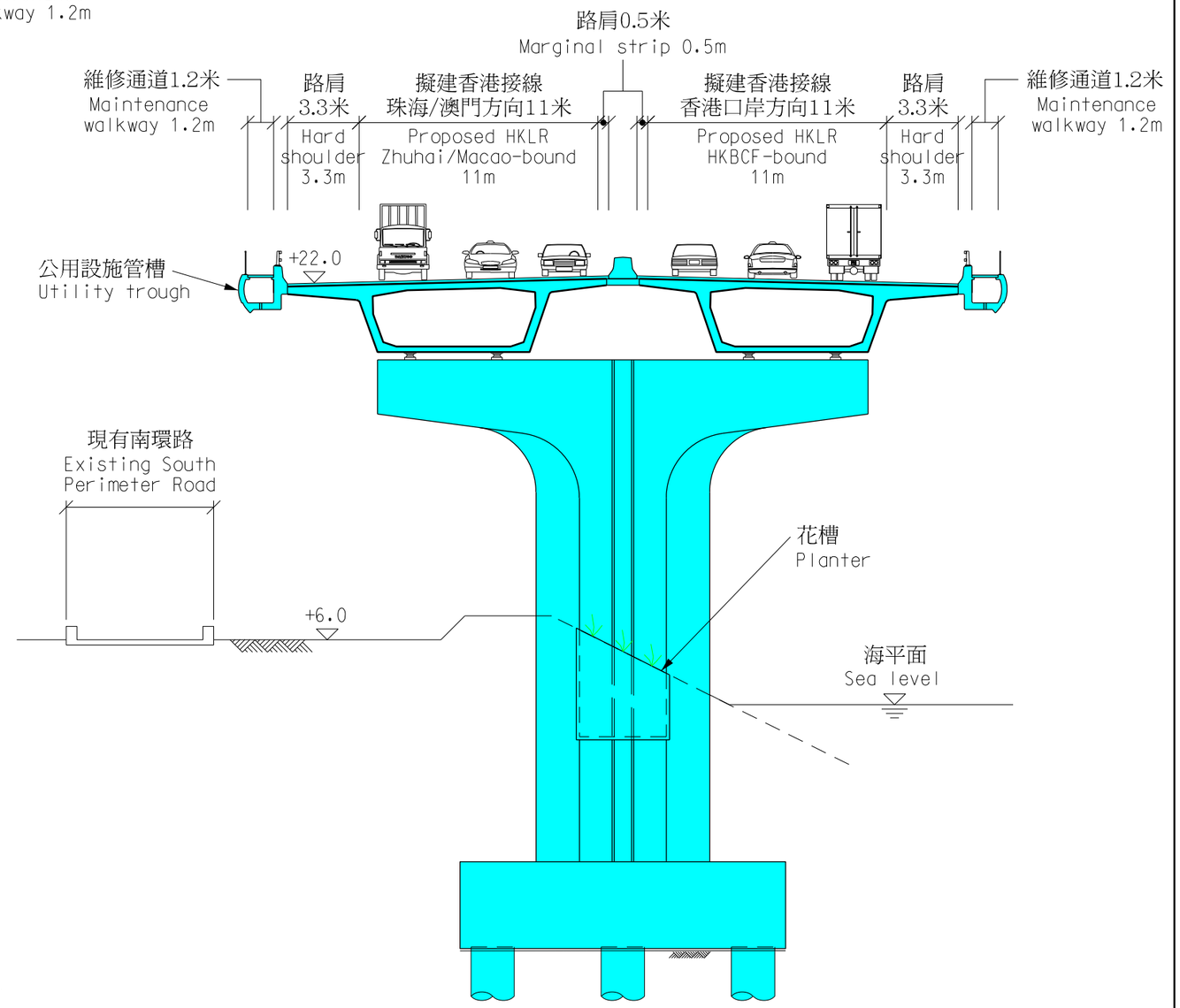


切面 Section 1
比例 Scale1:250 HZM6844TH-SK0024

Notes:

1. 所有水平均以米為單位並在香港水平基準上。
   All levels are in metres above Hong Kong Principal Datum.



切面 Section 2
比例 Scale 1:250 HZM6844TH-SK0024

工務計劃項目第844TH號 - 港珠澳大橋香港接線
PWP Item No. 844TH - Hong Kong-Zhuhai-Macao Bridge Hong Kong Link Road

HZM6844TH-SK0033	1:250

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HONG KONG PROJECT MANAGEMENT OFFICE

HIGHWAYS DEPARTMENT HONG KONG 香港 路政署

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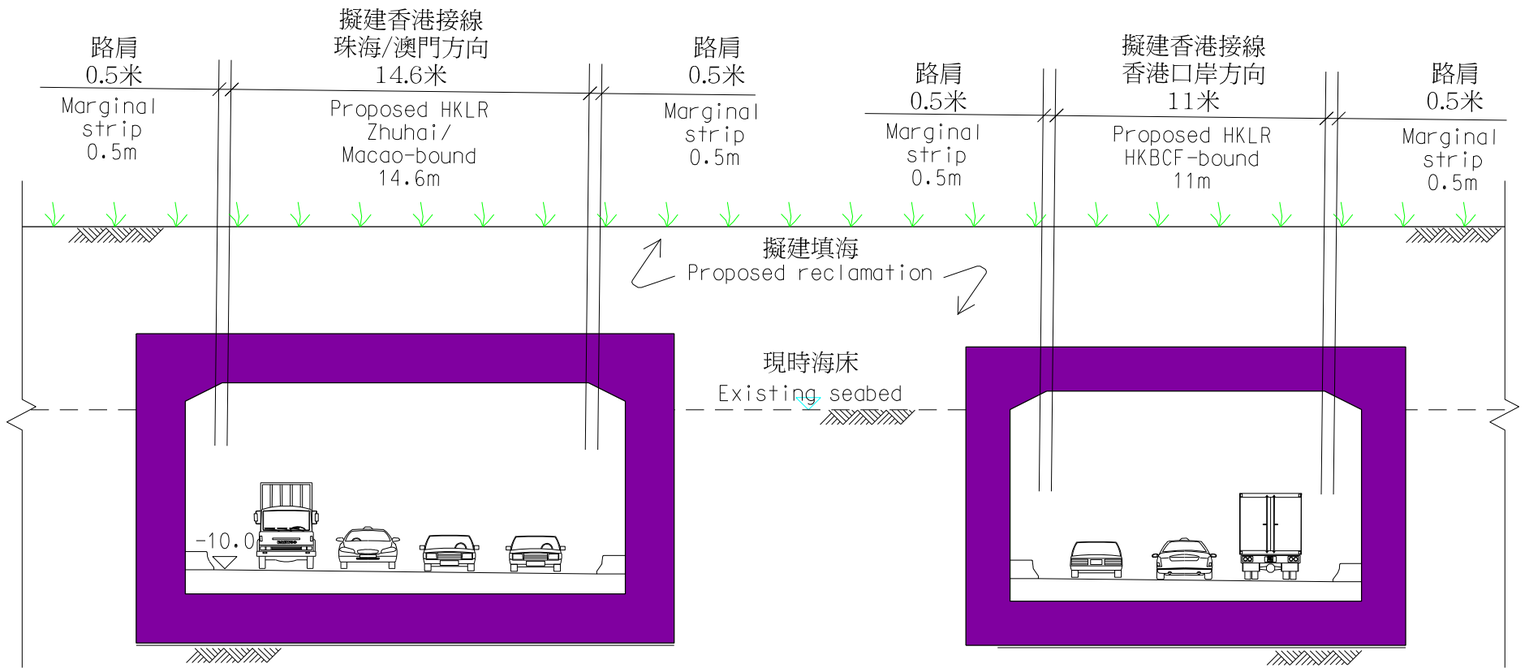
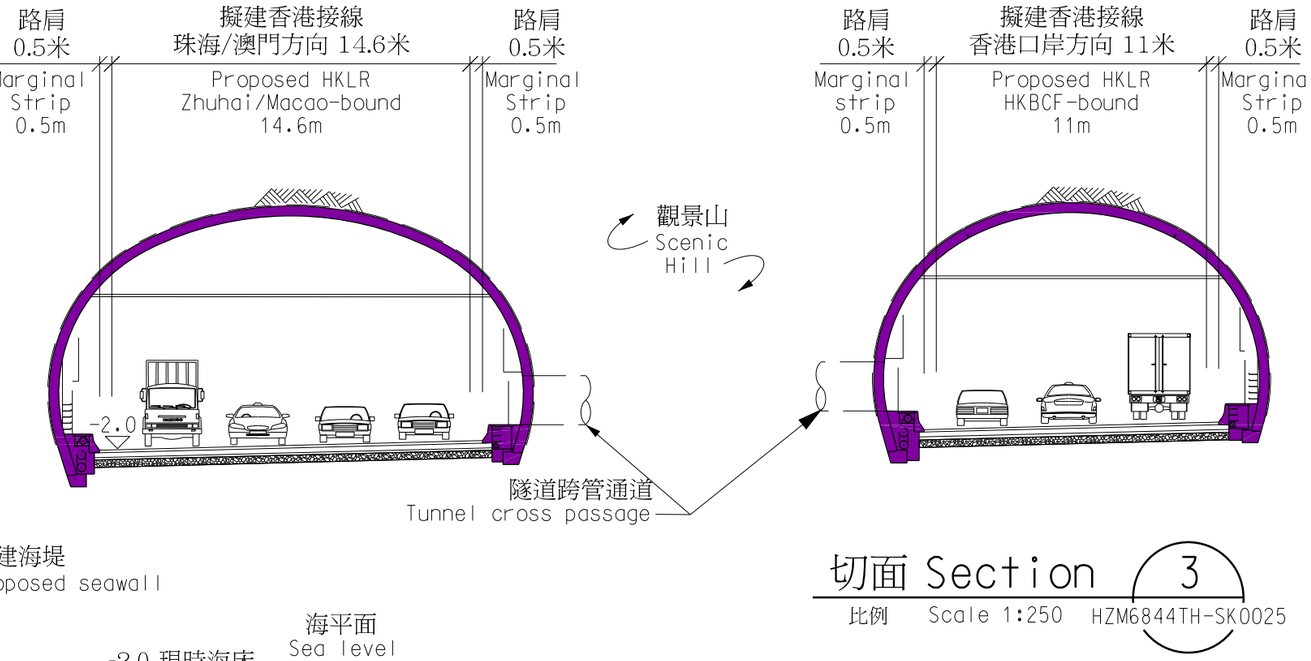
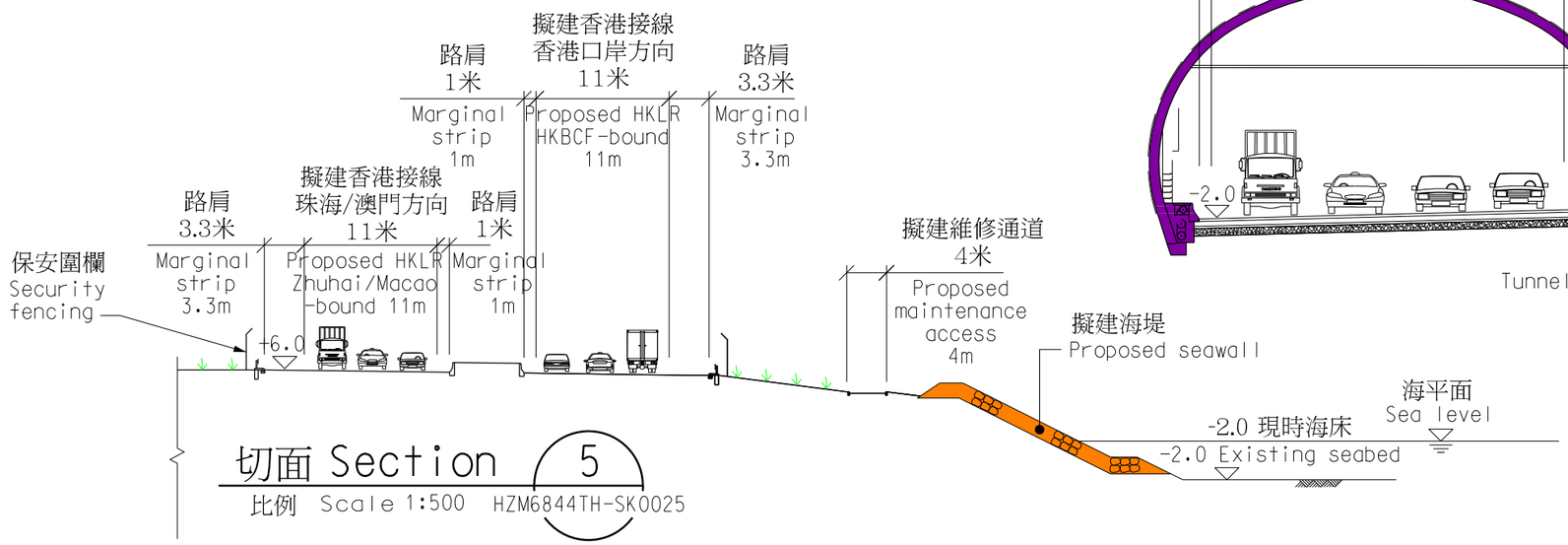
A3 420 x 297



切面 Section 4
比例 Scale 1:250 HZM6844TH-SK0025



切面 Section 3
比例 Scale 1:250 HZM6844TH-SK0025



切面 Section 5
比例 Scale 1:500 HZM6844TH-SK0025

註釋 Notes:

1. 所有水平均以米為單位並在香港水平基準上。
   All levels are in metres above Hong Kong Principal Datum.

圖例 Legend

擬建環境美化地帶
Proposed landscape area

工務計劃項目第844TH號 - 港珠澳大橋香港接線
PWP Item No. 844TH - Hong Kong-Zhuhai-Macao Bridge Hong Kong Link Road

HZM6844TH-SK0036	As shown

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844TH – Hong Kong – Zhuhai – Macao Bridge Hong Kong Link Road

Comparison between original Approved Project Estimate (APE) and the Revised Project Estimate

A comparison of the APE and the latest project estimate is as follows –

			(A) Approved Project Estimate ($ million)		(B) Latest Project Estimate ($ million)	(B) – (A) Difference ($ million)
(a)	Viaduct structures		7,137.3		11,241.0	4,103.7
	(i) sea viaduct of about 7.2 kilometres (km) long from HKSAR boundary to Airport Island	6,005.3		10,057.7		4,052.4
	(ii) land viaduct of about 2.2 km long along Airport Island to Scenic Hill	1,132.0		1,183.3		51.3
(b)	Tunnel construction works		1,473.0		3,324.4	1,851.4
	(i) tunnel of about 0.5 km long passing through Scenic Hill and underneath Airport Road and Airport Express Line	825.1		2,116.6		1,291.5
	(ii) tunnel of about 0.5 km long underneath the new reclamation area	647.9		1,207.8		559.9
(c)	Seawall of about 2.3 km long along the east coast of the Airport		752.5		251.5	(501.0)
(d)	Reclamation of about 17 hectares (ha) at the east coast of the Airport		387.3		920.8	533.5
(e)	At-grade roads within the reclamation		312.9		299.9	(13.0)
(f)	Drainage works for HKLR (including box culverts, pipe works and pump sumps)		139.7		155.7	16.0
(g)	Building		201.9		280.2	78.3
	(i) tunnel portal ventilation building	44.8		72.6		27.8
	(ii) administration building	147.9		140.2		(7.7)
	(iii) other buildings	9.2		67.4		58.2

			(A) Approved Project Estimate ($ million)		(B) Latest Project Estimate ($ million)	(B) – (A) Difference ($ million)
(h)	Building services		65.6		114.5	48.9
	(i) tunnel portal ventilation building	23.2		29.1		5.9
	(ii) administration building	40.7		85.4		44.7
	(iii) other buildings	1.7		0.0[1]		(1.7)
(i)	Landscaping works		46.2		46.4	0.2
(j)	Electrical and mechanical works for viaduct, tunnel and at-grade roads		482.1		1,049.0	566.9
(k)	TCSS		169.0		169.0	0.0
(l)	Reprovisioning/ relocation/provision of existing weather station, wind profiler station and anemometers		16.7		16.4	(0.3)
(m)	Environmental mitigation measures including environmental monitoring and auditing		241.6		262.4	20.8
(n)	Consultants' fees		62.4		62.4	0.0
	(i) detailed design and contract administration	32.5		32.5		
	(ii) management of resident site staff (RSS)	26.5		26.5		
	(iii) independent Environmental Project Office (ENPO)[2] and independent environmental checker services	3.4		3.4		
(o)	Remuneration of RSS		841.4		841.4	0.0

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[1] The latest cost estimate for building services for other buildings have been included into the total latest cost estimate for building services ($114.5 million).

[2] The Environmental Permit for the HKLR project requires the setting up of an independent ENPO before the commencement of the HKLR construction to oversee the cumulative environmental impact arising from the HKBCF project and other concurrent projects in the adjoining area and to liaise closely with the Mainland project teams for the HZMB Main Bridge.

		(A) Approved Project Estimate ($ million)	(B) Latest Project Estimate ($ million)	(B) – (A) Difference ($ million)
(p)	Electrical and Mechanical Services Trading Fund (EMSTF) charges [3]	10.8	10.8	0.0
(q)	Contingencies	1,234.0	1,904.6	670.6
	Sub-total	13,574.4 (in September 2011 prices)	20,950.4 (in September 2011 prices)	7,376.0
(r)	Provision for price adjustment	2,615.5	4,096.8	1,481.3
	Total	16,189.9 (in MOD prices)	25,047.2 (in MOD prices)	8,857.3

2. It can be seen from the above analysis that the parts involving the largest increase[4] are: (a) viaduct structures, (b) tunnel construction works, (j) electrical and mechanical works for viaduct, tunnel and at-grade roads, as well as (g) and (h) building and building services. Their latest cost estimates represent 44.9%, 13.3%, 4.2% and 1.6% of the total construction cost respectively.

3. As regards **items 1(a) and (b) (viaduct structures and tunnel construction works)**, the increase of $5,955.1 million[5] is mainly due to the surge in construction prices since mid-2011 and the higher-than-expected risk assessment by tenderers.

4. As regards **items 1(c) to (f) (seawall of about 2.3 km long along the east coast of the Airport, reclamation of about 17 ha at the east coast of the Airport, at-grade roads within the reclamation, and drainage works for HKLR (including box culverts, pipe works and pump sumps))**, the items are covered by the same contract, and the total increase of $35.5 million is mainly due to the surge in construction prices since mid-2011.

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[3] Since the establishment of the EMSTF on 1 August 1996 under the Trading Funds Ordinance (Cap. 430), the EMSTF charges government departments for design and technical consultancy services for electrical and mechanical (E&M) installations provided by Electrical and Mechanical Services Department. The services rendered for this project include checking consultants' submissions on all E&M installations and providing technical advice to the Government on all E&M works and their impact on the project.

[4] Items (c) "Seawall of about 2.3 km long along the east coast of the Airport" and (d) "Reclamation of about 17 ha at the east coast of the Airport" form the same part of works, the difference in cost is $32.5 million ($533.5 million - $501.0 million)

[5] The increase of item 1(a) has included the allowance for difference from the geotechnical baseline.

5. As regards **items 1(g), (h) and (j) (building works, building services works and electrical and mechanical works for viaduct, tunnel and at-grade roads)**, the increase of $694.1 million is mainly due to the surge in construction prices since mid-2011.

6. As regards **items 1(i), (l) and (m) (landscaping works, reprovisioning/relocation/ provision of existing weather station, wind profiler station and anemometers, and environmental mitigation measures, including environmental monitoring and auditing)**, the increase of $20.7 million is mainly due to the surge in construction prices since mid-2011.

7. As regards **items 1(q) (contingencies)**, the increase of $670.6 million is due to the increased estimates of the works items mentioned in paragraph 3 to 6 above.

8. As regards **items 1(r) (provision for price adjustment)**, the increase of $1,481.3 million is due to the corresponding increase in provision of price adjustment as a result of the increased APE.

844TH – Hong Kong–Zhuhai–Macao Bridge Hong Kong Link Road

Provision for price adjustment

Table 1 – Cashflow and Price Adjustment contained in PWSC(2011-12)31

Year	Original project estimate (September 2011 prices) ($million)	Original price adjustment factors (October 2011)[#]	Approved Project Estimate (money-of-the-day (MOD) prices) ($million)	Provision for price adjustment ($million)
	A	B	C	D = C-A
2011-2012	1.7	1.00000	1.7	0.0
2012-2013	1,447.5	1.05375	1,525.3	77.8
2013-2014	3,048.6	1.11171	3,389.2	340.6
2014-2015	3,845.6	1.17285	4,510.3	664.7
2015-2016	2,752.5	1.23736	3,405.8	653.3
2016-2017	1,221.1	1.30541	1,594.0	372.9
2017-2018	836.7	1.37721	1,152.3	315.6
2018-2019	420.7	1.45296	611.3	190.6
Total	13,574.4		16,189.9	2,615.5

Table 2 – The Latest Cashflow and Price Adjustment based on the Latest Project Estimate and Latest Price Adjustment Factors

Year	Latest project estimate (September 2011 prices) ($million)	Latest price adjustment factors (March 2012)##	Latest project estimate (MOD prices) ($million)	Latest provision for price adjustment ($million)	Net increase in provision for price adjustment ($million)
	a	b	c	d	e
2011-2012	1.3	1.00000	1.3^	d = c-a	e = d-D
2012-2013	2,432.7	1.05325	2,562.2		
2013-2014	5,126.6	1.11118	5,696.6		
2014-2015	4,282.1	1.17229	5,019.9		
2015-2016	3,908.3	1.23677	4,833.7		
2016-2017	3,732.9	1.30479	4,870.7		
2017-2018	884.3	1.37656	1,217.3		
2018-2019	582.2	1.45227	845.5		
Total	20,950.4		25,047.2	4,096.8	1,481.3

Note:

Price adjustment factors promulgated in October 2011 were based on the movement of prices for public sector building and construction output at that time, which were assumed to increase by 5% per annum in 2011 and by 5.5% from 2012 to 2021.

Price adjustment factors promulgated in March 2012 were based on the latest movement of prices for public sector building and construction output, which are assessed to increase by 4.8% in 2011 (actual) and by 5.5% per annum for the period between 2012 and 2022.

^ As at 31 March 2012, the actual expenditure is $1.3 million.