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31 March 2021

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Ms LAU,

**Legislative Council Panel on Transport
Meeting on 15 January 2021**

**6856TH – Flyover from Kwai Tsing Interchange Upramp
to Kwai Chung Road**

In response to Members' request for supplementary information on 6856TH - Flyover from Kwai Tsing Interchange Upramp to Kwai Chung Road (the Project) made at the Panel on Transport meeting of 15 January 2021, our reply in consultation with the Highways Department (HyD) and the Civil Engineering and Development Department (CEDD) is as follows:

(a) Breakdown of the capital cost of the Project

2. HyD initiated parallel tendering for the construction works contract of the Project in January 2021. Based on the tenderers' returned tender prices, the latest estimated construction cost of the Project is \$472.0 million (in money-of-the-day prices), the detailed breakdown of which is at Annex 1. The latest estimated construction cost of the Project is slightly lower than our earlier estimate in the paper submitted to the Panel on Transport, mainly because the latest estimated cost has reflected the prevailing market conditions (i.e. the returned tender prices).

(b) Consultancy reports submitted by the engineering consultants engaged by CEDD and HyD

3. CEDD engaged an engineering consultant in July 2012 to undertake an investigation study. The investigation study mainly involved conducting site investigations, various technical assessments such as the Environmental Impact Assessment (EIA), and preliminary engineering design works for different road improvement options so as to recommend the best option to consult the Traffic and Transport Committee of the Kwai Tsing District Council and prepare for the subsequent detailed design stage. Taking into account factors such as traffic flow and environmental impact, the consultant recommended constructing a separate viaduct on the west side of Tsuen Wan Road near the Kwai Tsing Interchange Up-ramp and widening a section of the east side of Tsuen Wan Road. The investigation study was completed in September 2016.

4. Subsequently, HyD continued the implementation of the Project and engaged another engineering consultant in September 2016 to conduct the detailed design of the Project. Having regard to the actual site conditions and constraints, the consultant considered different construction methods and their traffic impacts on adjacent areas during the construction period. The recommended road improvement option of the above-mentioned investigation study was modified to ensure a smooth implementation of the construction activities while minimizing the impact on the public and existing road traffic. The consultant then carried out

detailed design for the bridge structure (including the vehicular bridge and the footbridge) and associated road works, drainage, and landscaping works, etc. Upon the completion of the detailed design, the consultant updated the estimated construction cost of the Project. With a view to expediting the implementation of the Project as soon as possible, we gazetted the road scheme and plan of the Project under the Roads (Works, Use and Compensation) Ordinance (Cap. 370) at the early stage of the detailed design.

5. The above-mentioned consultancy report of the investigation study and the detailed design is attached at Annex 2 and Annex 3 respectively (both only available in English) for reference. As some of the technical content in the investigation study report and the estimated cost of the Project have been updated, please refer to the discussion paper of the Public Works Subcommittee for the latest information of the Project.

(c) Reasons for the long lead time for undertaking the preliminary work including the investigation study and detailed design works

6. The investigation study undertaken by the engineering consultant engaged by CEDD from July 2012 to September 2016 involved a wide range of work. First, the consultant needed to duly consider the interfaces of the Project with existing structures, conduct an analysis on alignment options, as well as carry out site investigation works and technical assessments on utilities impact, drainage impact, traffic impact, tree survey and land requirements, etc. Besides, as the Project is a designated project under the EIA Ordinance (Cap. 499), an EIA study must be conducted for the Project. During the investigation study, CEDD consulted the Traffic and Transport Committee of the Kwai Tsing District Council on the preliminary alignment option of the Project on 11 December 2014 and obtained their general support. Subsequently, the EIA report for the Project was approved by the Director of Environmental Protection in August 2015. Based on the recommended road alignment option, the consultant carried out the preliminary engineering design and the whole investigation study was completed in September 2016.

7. HyD engaged another engineering consultant to conduct the detailed design for the Project (including the vehicular bridge, the footbridge, as well as other associated road works, drainage, and landscaping works etc.) in September 2016 and the works was substantially completed in December 2019. Various difficulties and challenges were encountered during the detailed design stage. For example –

- (i) The alignments of the new single-lane vehicular bridge and the Tsuen Wan Road southbound traffic lane to be widened were proposed to pass through the gaps of two existing columns of the Mass Transit Railway (MTR) Tsuen Wan Line railway viaduct and two existing columns of the Tsing Kwai Highway flyover. In particular, the gap between the existing columns of the Tsing Kwai Highway flyover was only approximately 22 metres in width, making the construction works more difficult than the other works projects in general. In addition to ensuring the Project's compliance with relevant requirements for carrying out construction works in proximity to existing railway and highway structures, the consultant also needed to liaise and consult the MTR Corporation Limited as well as relevant government departments on various issues such as construction methods and structural monitoring measures during construction so as to address concerns of stakeholders over railway protection and structural safety; and
- (ii) As the proposed construction works were required to be carried out in the reclamation area, marine sediment was anticipated to be encountered during the piled foundation works. The consultant needed to ascertain the actual quantity of marine sediment to be excavated from the piled foundation works on the basis of findings from the ground investigation and environmental laboratory testing works. Since the soil in the reclamation area might mix with marine mud or pollutant such as heavy metal, unlike ordinary ground investigations, we needed to take deep underground soil sample for testing and chemical analysis in order to ascertain the chemicals and potential degree of pollution in the soil. The additional soil sampling process, which involved the use of special equipment and procedures, had lengthened the required time of the entire

ground investigation.

8. To expedite the implementation of the Project, we gazetted the scheme and plan of the Project under the Roads (Works, Use and Compensation) Ordinance (Cap. 370) at the early stage of the detailed design (3 and 10 November 2017). During the statutory period, no objection was received and the scheme was subsequently authorised. The relevant authorisation notice was gazetted on 2 and 9 February 2018. We originally planned to consult the Legislative Council on the funding application of the Project in the 2019-20 legislative year. However, due to the large number of projects pending funding application at that time, the Project was not arranged for discussion.

Yours sincerely,



(Charlotte CHAN)

for Secretary for Transport and Housing

c.c.:

Director of Highways (Attn.: Mr Eric LAU) Fax: 3188 3418

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**Breakdown of the estimated cost of
6856TH – Flyover from Kwai Tsing Interchange Upramp
to Kwai Chung Road**

		\$ million
		(in money-of-the-day prices)
(a)	Construction of a single-lane vehicular bridge	163.4
(b)	Widening of Tsuen Wan Road southbound traffic lane	48.5
(c)	Construction of noise barriers	50.2
(d)	Reprovisioning of the existing footbridge	58.9
(e)	Demolition of the existing footbridge, relocation of the bus stop and associated footpath reconstruction	15.3
(f)	Reconstruction of a section of road at Kwai Chung Road and Container Port Road South and ancillary works including public lighting, drainage, landscaping, etc	26.8
(g)	Environmental mitigation measures and environmental monitoring and audit programme	8.0
(h)	Consultants' fees	2.8
	(i) contract administration	2.3
	(ii) management of resident site staff (RSS)	0.5
(i)	Remuneration of RSS	55.2
(j)	Contingencies	42.9
	Total	472.0

The contents of this report, including technical aspects, cost estimates, programme, etc., have been updated in the subsequent detailed design stage. Please refer to the PWSC paper for updated information about the project.

本報告的內容，包括技術方面、估算費用、時間表等等已在其後的詳細設計階段更新。有關工程計劃的最新資料，請參閱工務小組委員會討論文件。

附件2
Annex 2

Agreement No. CE 8/2012 (HY)

Flyover from Kwai Tsing Interchange Upramp to Kwai Chung Road - Investigation

Executive Summary Report



AECOM

AECOM Consulting Services Limited

August 2016






土木工程拓展署
Civil Engineering
and Development
Department

Agreement No. CE 8/2012 (HY)

Flyover from Kwai Tsing Interchange Upramp to Kwai Chung Road – Investigation

Executive Summary

August 2016

Issue	Description	Prepared by	Checked by	Approved by	Date
0	Draft	Various	Edward SETO	Paul CHU	26.03.2015
1	Revised Draft for Circulation	Various	Edward SETO	Paul CHU	08.04.2016
2	Final for DR's Acceptance	Various	Edward SETO	Paul CHU	03.08.2016
3	Revised Final for DR's Acceptance	Various	Edward SETO	Paul CHU	31.08.2016
Signature					
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Date of Issue:		31 August 2016			



土木工程拓展署
Civil Engineering and
Development Department

AECOM

AECOM Consulting Services Limited

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1. INTRODUCTION

- 1.1 After review on the traffic conditions of Tsuen Wan Road (TWR) near Kwai Tsing Interchange (KT I/C), the Transport Department (TD) forecasted that a section of the southbound carriageway of TWR between KT I/C and Kwai Chung Road (KCR) would deteriorate in the future years due to congestion that would occur during peak hours. TD considered that there is a need to implement the Project to improve the road section to cope with the future traffic growth.
- 1.2 Agreement No. CE 8/2012 (HY) was commissioned by Civil Engineering and Development Department (CEDD) where the objectives are to investigate, development, evaluate, compare, study the feasibility of the road improvement options and recommend the best option for implementation. Based on the recommended road alignment option, the preliminary engineering design is to be carried out in the investigation stage. A cost effective programme for implementation of the recommended road improvement works with due consideration of cost, time, land acquisition programme, ease of project management, minimization of environmental impacts and nuisance to the public, risks and so on is to be formulated as well.
- 1.3 The initial scope of this Project includes:
- (i) provision of an additional traffic lane for the southbound traffic between KT I/C Upramp and KCR;
 - (ii) modification of existing slip roads and interchanges; and
 - (iii) associated environmental mitigation measures, utility diversion, street lighting, traffic aids, traffic and control surveillance, drainage works, landscaping works and other related works.
- 1.4 This Executive Summary provides a summary of findings of the Assignment, which have been identified under separate functional studies, including traffic impact assessment (TIA) Study, site investigation (SI) Report, environmental impact assessment (EIA) Study, Tree Survey and Landscape study, Land Requirement Study, utility impact assessment (UIA) Study, Implementation Strategies, Programme, Cost Estimate, Expenditure Pattern and Overall Financial Implications.

2. DEVELOPMENT AND EVALUATION OF THE IMPROVEMENT OPTIONS

Proposed Road Works

- 2.1 To fulfil the future demand and to prevent traffic congestion in the future during peak traffic flow hours, the recommended road alignment Option 2A is proposed. An additional southbound lane (a separated viaduct) is introduced on TWR and connected to the existing lane on the west side of KCR with design speed of 70 km/hr.
- 2.2 The proposed road works is shown in **Drawing No. 12212/P/IMP/1001**. The basis of design for this proposed flyover is to utilise the remaining capacity currently available on the two segregated KCR carriageways.
- 2.3 In addition, a second structure (approximately 150m long) along the nearside lane of TWR near existing KT I/C Upramp is required to achieve widening at the east side of TWR.
- 2.4 The following facilities to be affected by the Project:
- Existing footbridge NF303 is to be demolished and be re-provided;
 - The area for existing Public Works Regional Laboratory will need to be vacated;
 - Works will be carried out within the existing drainage reserve zone positioned alongside TWR;
 - Existing bus stop outside subway NS10A is needed to be relocated; and
 - Minor modification to the existing KCR involves removal of the existing planter, breaking and reinstating KCR with the new road marking.

Consideration of Alternative Schemes

- 2.5 The potential road improvement options identified are described under this section. Two improvement options, namely Option 1 and Option 2, were identified in the Consultancy Brief. Option 1 introduces an additional southbound lane from KT I/C Upramp which connects to the existing downslope segment of KCR Upramp. Option 2 introduces an additional southbound lane on the west side of TWR and this lane is connected to the existing lane on the west side of KCR. Another improvement option, Option 3, which is based on widening along both nearside and offside lanes of TWR, has been identified under this Study. By improving the road geometry of three options to achieve a design speed of 70km/hr matching the speed limit on the existing TWR, and to merge either the KCR Upramp or the two segregated lanes on KCR for utilization of the remaining capacity currently available, Option 1A, Option 2A, Option 2B and Option 3A have been further developed. The alignments of all options are shown in **Figures 2.1 and 2.2** and listed as follows.
- (i) Option 1: Separate Viaduct on East Side of TWR (Design Speed 50km/hr)
 - (ii) Option 1A: Separate Viaduct on East Side of TWR (Design Speed 70km/hr)
 - (iii) Option 2: Separate Viaduct on West Side of TWR (Design Speed 50km/hr)
 - (iv) Option 2A: Separate Viaduct on West Side of TWR (Design Speed 70km/hr)
 - (v) Option 2B: Separate Viaduct on West Side of TWR and Merging Nearside Lane of TWR with KCR Upramp (Design Speed 70km/hr)

- (vi) Option 3: Widening Along Both Nearside and Offside Lanes of TWR (Design Speed 70km/hr)
- (vii) Option 3A: Widening Along Both Nearside and Offside Lanes of TWR and Merging Nearside Lane of TWR with KCR Upramp (Design Speed 70km/hr)

2.6 The road improvement options are evaluated by assessing different viewpoints including the considerations of the traffic and operation standards, engineering designs, environmental and other aspects. Options 1, Option 1A and Option 2B are screened out and considered as infeasible schemes based on the criteria of compliance with the weaving requirements, Transport Planning and Design Manual (TPDM) standards and feasibility assessment on the proposed bridge scheme. Option 3 and Option 3A are least preferable in the alignment evaluation in view of larger work areas near the noise and air sensitive receivers, higher costs and longer construction periods.

2.7 **Option 2A - Separate Viaduct on West Side of TWR (Design Speed 70km/hr)** is considered as the recommended road alignment option. The result is based on the overall ranking of viewpoints determined. Option 2 is similar to Option 2A except the design speed and the width of the bridge. The evaluation shows Option 2A may have better air quality under a higher vehicle speed scenario during operation phase.

Works Programme

2.8 Construction of the Project under the recommended road alignment Option 2A shall be commenced tentatively in 2018 and complete in 2021.

3. TRAFFIC IMPACT ASSESSMENT STUDY

3.1 A local area traffic model was developed for the purpose of this TIA. The design years adopted in the TIA are 2012 Base Year, 2021 and 2026 Design Years.

3.2 The traffic forecasts in the 2021 and 2026 design years have taken into account all committed highway infrastructure and latest planning parameters, including any planned developments/re-developments within the study area.

3.3 To assess the potential traffic impact due to the various options for the proposed flyover, the following assessments have been conducted:

- Capacity Assessment on the critical links and junctions in the Area of Influence (AOI); and
- Traffic weaving Analysis on the section from TWR SB to KCR southbound.

3.4 Road alignment Options 1, 2 and 3 have been assessed for both 2021 and 2026 design years; and for both the morning and evening peak hours.

Road Link Capacity Analysis

3.5 It is estimated that under all Options 1, 2 and 3, with the introduction of an additional lane, the section of the southbound carriageway of TWR between KT I/C and KCR would be operating within capacity in both the morning and evening peak hours in all design years.

3.6 Option 2 results in a more balanced distribution of traffic on the two segregated carriageways of KCR.

3.7 From a road link capacity perspective, Option 2 is preferred to both Options 1 and 3.

Traffic Weaving Analysis

3.8 Results of the traffic weaving analysis show that Option 2 would require the least number of traffic lanes along KCR for traffic weaving. On the other hand, the number of traffic lanes required for Options 1 and 3 would be more than the actual provision. From a traffic weaving perspective, Option 2 is preferred to both Options 1 and 3.

Junction Capacity Analysis

3.9 The traffic impacts of the Project on the local road junctions during operational stage are considered to be insignificant.

4. PRELIMINARY DESIGN OF HIGHWAY STRUCTURES

4.1 The general arrangement of Option 2A and associated works are shown in **Drawing No. 12212/P/IMP/1001**.

4.2 The construction of the recommended alignment Option 2A under this Study mainly involves a separate flyover structure connecting KT I/C Upramp to KCR, widening of TWR, installation of noise barriers on the aforementioned proposed structures, demolition and reprovision of existing footbridge NF303, vacating the land for the existing Public Works Regional Laboratory (requiring the termination of the allocation), relocation of the bus stop outside subway NS10A and associated works such as utility diversion, street lighting and landscaping works.

Flyover from KT I/C Upramp to KCR (Bridge H)

4.3 The proposed link connecting TWR and KCR is a flyover in the form of a single cell prestressed concrete box girder. It consists of seven spans (maximum span of 54m) supported by piers and an end abutment. The flyover is expected to be constructed by cast in-situ method.

4.4 The proposed flyover will be stitched to the TWR flyover deck to avoid forming a longitudinal joint between the existing structure and the flyover. The monolithic stitched joint will be constructed in the final stages of construction after completion of the superstructure of the proposed flyover.

4.5 Before the viaduct construction can commence, utility diversions will be required at pier and abutment locations.

4.6 The proposed flyover spans over KCR and Container Port Road South (CPRS) and goes under Tsing Kwai Highway (TK H/W). Sufficient horizontal clearance of minimum 2m will be maintained between the proposed flyover and the existing piers.

4.7 The piers are of reinforced concrete supported on piled foundations. Bored piles are proposed for the pier foundations.

Widening of TWR at the Existing Upramp (Bridge G)

4.8 A short section of Kowloon-bound TWR near existing KT I/C Upramp will be widened. It is proposed to construct a new deck adjacent and parallel to the existing TWR bridge deck. The gap between the new and existing decks will be closed by a cast in-situ concrete stitch in the final stage of construction, thus minimizing stress induced by the relative shrinkage and creep movements at the early stage of concrete strength development between the new and the old structures. Concreting of the stitch will be carried out at night and one traffic lane of TWR will be temporarily closed. The structural articulation of the new deck will be compatible with the existing deck.

4.9 The new deck will be supported on reinforced concrete piers and portal frames spanning across the drainage reserve area underneath. Public Works Regional Laboratory (Tsuen Wan) is in the vicinity of the proposed bridge work. Having considered works area for construction of the proposed bridge work and direct impacts to the laboratory buildings, temporary occupation of the laboratory area is required during the construction. The allocation of the land will be terminated before the commencement of the construction of this Project. The area will be reinstated by the allocatee (i.e. CGE/Standards & Testing, CEDD) to Lands Department according to the Engineering Conditions.

Demolition and Reprovision of Existing Footbridge NF303

- 4.10 As the existing footbridge NF303 is in conflict with the proposed flyover, relocation of the footbridge is necessary. The new footbridge will be constructed to maintain the pedestrian access across KCR prior to demolition of the existing footbridge. The structural form of the new footbridge will be similar to the existing, i.e. warren truss steel bridge girder. Two lifts will be provided in compliance with the guideline of barrier free access.
- 4.11 Foundation work will commence first. The abutments, piers and table tops construction will follow. The steel truss bridge girder is expected to be fabricated off site. The activity of lifting the bridge girders by the mobile crane will be carried out at night in accordance with the temporary traffic arrangement (TTA) scheme. The temporary closure of the KCR is expected. Construction of the footbridge's furniture, lift tower and staircases will follow.
- 4.12 Once the new footbridge is completed and opened to public, the demolition of the existing footbridge will commence. All non-structural elements such as roof panels and handrails will be firstly removed. The steel truss will be removed at night with temporary road closure. To dismantle the remaining structures including table tops, piers, staircases and abutments, metal scaffolding platform and protective enclosure will be erected.

Construction of Noise Barriers

- 4.13 The noise barriers (a combination of 5.5m high vertical, 5.5m high with 2.5m cantilevered barrier at 45 degree and 5.5m high with 3.5m cantilevered barrier at 45 degree types) are to be provided on the proposed flyover.

5. GEOTECHNICAL INVESTIGATION REVIEW

- 5.1 All site investigation (SI) results including those of the existing records and those carried out additionally under this Assignment for the potential road alignment options were presented in the SI Report.
- 5.2 Four hand excavated trial pits and five rotary cored boreholes were undertaken to confirm the locations of buried services, culverts and foundations.
- 5.3 The SI has shown the ground conditions to comprise Fill material overlying Marine Deposits and Alluvium. Fill material was encountered in all of the boreholes with thicknesses ranging from 2.09m (BH3) to 17.50m (BH1) adjacent to the MTRCL Tsuen Wan line at the northern end of the site. Marine Deposits were recorded below the fill material in thickness between 3.04m (BH1) and 4.2m (BH5). The depths ranged between 11.10m bgl and 20.54m bgl. Alluvium was encountered below the Marine Deposits in thickness of 5.66m (BH1) and 2.69m (BH5) at depths of between 15.30m bgl (BH5) and 26.20m bgl (BH1). The bedrock, comprising Granite, Grandiorite and Rhyolite is encountered at greater depths of up to 48.91m bgl to the west of KCR. Shallower bedrock has been identified in eastern areas of the site towards the existing registered cut slopes. Superficial deposits comprising Alluvium and Marine Deposits are found in most locations beneath the Fill. Water levels during the monitoring period ranged from 3.20m bgl in BH1 and 4.65m bgl in BH5.
- 5.4 Due to extensive fill materials and other superficial deposits underlying the proposed flyover, it is likely that the flyover structure will need to be founded on piles socketed into the bedrock.
- 5.5 No existing slopes and retaining walls within or in vicinity of the project area would affect or be affected by the proposed development under the captioned project. Also, no new slopes and retaining walls will be formed under the project.

6. DRAINAGES, SERVICES AND UTILITIES

- 6.1 The utility companies and government departments have been consulted to identify existing and proposed utilities within the Project during the investigation stage of this Assignment. The affected underground services and utilities have been identified including watermain, drainage pipes, electricity cables, lighting facilities and telecommunication cables. Further coordination and liaison with Water Supplies Department (WSD), Drainage Services Department (DSD), CLP Power Hong Kong Limited (CLP), Towngas Telecommunications Fixed Network Ltd (TGT), Highways Department HyD/Lighting, and other utility companies are necessary to agree the diversion schemes of the affected gas mains, major electricity cables, stormwater and sewer pipes, water mains, telecommunication cables and the street lightings in the detailed design stage.
- 6.2 Both 11kV and 132kV power cables may be in conflict with the possible foundation at Grid G1 to G5, H3 & H7 - H8 of Option 2A and permanent diversion of the cables would likely be required subject to confirmation of the actual routing by additional ground investigation in design and construction stage and the final design of the structures. In case diversion of the 132kV cable is required, 24 months lead time is required by CLP for planning, manufacturing and delivery of the materials from overseas and excavation permit application after the cable alignment is agreed, while 12 months lead time is required by TGT for the telecommunication cables. As the Lands Department cannot formally request the utility companies to carry out the diversion works until the Project is upgraded to Cat B+, therefore the CLP cable diversion that requires 24 months lead time may not be completed before the commencement of the construction of this Project in 2018, and part of the diversion works will be continued in the construction stage.

7. ENVIRONMENTAL REVIEW

7.1 The Project is a Designated Project under the Environmental Impact Assessment Ordinance (EIAO). An application (No. ESB-242/2012) for an Environmental Impact Assessment (EIA) Study Brief under section 5(1)(a) of the EIAO was submitted by the CEDD on 29 February 2012 with a Project Profile (No. PP-459/2012) for the Project. An EIA Study for the Project has been undertaken as part of the Assignment, in accordance with the EIA Study Brief (No. ESB-242/2012) which was issued in April 2012 and the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM).

7.2 The new additional traffic lane (Bridge H) is a designated project under Item A.8 of Part I, Schedule 2 of the EIAO: “A road or railway bridge more than 100m in length between abutments”.

7.3 In addition, there would be modification of existing slip road (Bridge G), which however would not cause any environmental impact likely to affect existing or planned community, or environmental sensitive uses in the vicinity, in particular it would not induce adverse noise impact during operational phase in view of the reduced traffic and hence mitigation measure for Bridge G is anticipated not necessary. Referring to section 6.1 of Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM), the modification of existing slip road (Bridge G) would not be classified as "material" change" under the EIAO.

7.4 The key environmental issues assessed in the EIA and the corresponding results and finding are summarized below:-

Air Quality Impact

7.5 A total of 70 air sensitive receivers (ASRs) are identified within 500m area from the project boundary.

Construction phase

7.6 Potential air quality impacts arising from the construction of the Project would mainly be related to dust nuisance from excavation, material handling and wind erosion of the site. As no massive earthworks and excavation works are required during the construction of the Project, and dust suppression measures as stipulated under the Air Pollution Control (Construction Dust) Regulation, and good site practices should be implemented to further minimise the construction dust generated, significant adverse air quality impact arising from the fugitive dust is not anticipated.

Operation phase

7.7 The potential impacts arising from the background pollutant levels within and adjacent to the Project area, vehicle emissions from open road networks and chimney emissions from the nearby factories were assessed. The results of the operational air quality impact assessment related to vehicular emissions indicated no exceedance of respirable suspended particulates (RSP), fine suspended particulates (FSP) as well as NO₂ hourly average concentration criterion is anticipated. Some air sensitive receivers (ASRs) would exceed annual average NO₂ concentration limit in air quality objectives (AQOs), under both “Without Project” and “With Project” scenarios, which was mainly resulted from the high background pollutants’ concentrations in this district. Marine emission rather than vehicular emission is concluded to be the major contributor to the high background level in most areas, due to the pollutants emitted from the Kwai Chung Container Terminal nearby.

7.8 Comparison study between the two scenarios has been conducted. Results concluded that some environmental benefits would be contributed by the Project to the existing environment,

which is mainly due to the improvement of traffic flow and vehicles travelling speed after the implementation of the proposed Project. As a result, the project is not anticipated in causing any adverse air quality impact and in fact will bring about improvements in terms of air quality impacts to the nearby sensitive receivers, as compared to the existing and future baseline conditions.

Noise Impact

- 7.9 A total of 18 noise sensitive receivers (NSRs) are identified within 300m area from the project boundary.

Construction phase

- 7.10 During construction phase, practical mitigation measures such as the use of quality powered mechanical equipment (QPME), temporary noise barriers, noise jackets, mufflers and limiting the number of plants operated concurrently, are proposed to minimise construction noise impact.
- 7.11 Further mitigation measures including good site practices as well as proper scheduling to avoid noisy construction during school examinations, can be adopted to further minimize the construction noise impact.

Operation phase

- 7.12 In the operational noise impact assessment, potential traffic noise impacts to the identified NSRs within the 300m study area have been evaluated based on the maximum traffic flow projection of 15 years after the completion of the Project (i.e. year 2036). It was predicted that the traffic noise levels arising from the Project at some NSRs exceed the EIAO criteria. As a result, direct noise mitigation measures such as cantilevered noise barriers, vertical noise barrier and low noise road surfacing (LNRS) have been proposed for the compliance of noise criteria under the EIAO-TM. With the incorporation of the proposed direct noise mitigation measure, it is assumed that the noise levels at all of the identified NSRs will comply with the criteria.

Water Quality Impact

- 7.13 A total of four water sensitive receivers (WSRs) are identified within 300m area from the project boundary.

Construction phase

- 7.14 Potential water pollution sources have been identified as construction site run-off, sewage from workforce, and potential risk of chemical spillage. Adverse residual impacts would not be anticipated with the implementation of adequate mitigation measures including the of the construction site practices in accordance with the Environmental Protection Department (EPD)'s ProPECC PN 1/94 Construction Site Drainage, provision and management of portable toilets on-site, and preventive measures to avoid accidental chemical spillages.

Operation phase

- 7.15 During the operation phase, a surface water drainage system with silt traps and road gullies would be provided and properly maintained to collect runoff from the roads during periods of rain. With surface runoff controlled by best management practice and maintenance of drainage system by Highway Department regularly, no adverse impact is anticipated.

Waste Management Implication and Land Contamination

Construction phase

- 7.16 The Project is likely to result in the generation of a variety of wastes and require the management and disposal of inert Construction and Demolition (C&D) material, C&D waste, marine sediment, chemical waste and general refuse during construction phase.

Operation phase

- 7.17 It is not expected for waste generation during operation phase. Provided that the wastes are managed using approved methods described above, no unacceptable adverse environmental impacts will be envisaged.

Landfill Gas Hazard

- 7.18 The Landfill Gas (LFG) hazard assessment is considered not necessary as the proposed project does not fall within the 250m Consultation Zone of the restored Gin Drinkers Bay Landfill.

Culture Heritage Resources

- 7.19 No cultural heritage resource was identified within the Assessment Area of the Project. No impacts to cultural heritage are expected to be anticipated during both construction and operational phases of the Project and no mitigation measures would be required.

Approval of EIA Report

- 7.20 The Director of Environmental Protection gave approval to the submitted EIA Report under the EIA Ordinance on 3rd August 2015.

8. TREE SURVEY AND LANDSCAPE STUDY

- 8.1 A total 85 nos. of existing trees (including 2 nos. of *Leucaena leucocephala*, 銀合歡 found on-site) were identified on-site. A total of 54 nos. (excluding 2 nos. of *Leucaena leucocephala* and 3 nos. of dead trees) of existing trees with an aggregate trunk Diameter at Breast Height (DBH) of 21.17m are found to be in conflict with the proposed works and are recommended to be felled due to a low survival rate after transplanting and/or poor health, poor form and low amenity values. A total of 26 nos. of trees are proposed to be transplanted. No existing tree will be retained.

9. LAND REQUIREMENTS

- 9.1 The Project mainly affects the unallocated government land near Lai King Catholic Secondary School due to the reprovision of footbridge NF303 and the government land lots which are currently used as a Public Works Laboratory (GLA-TKT 1726 and its Vehicular Access Point) and a fee-paying public car park (STT3706K&T and Its Vehicular Access Point) for the construction of flyovers. GLA-TKT 1726 is proposed to be the area for materials and plants storage and site office. Clearance of the existing single storey laboratory buildings and termination of the allocation are necessary for the Project. The allocation of the land will be terminated before the commencement of the construction of this Project. The area will be reinstated by the allocatee (i.e. CGE/Standards & Testing, CEDD) to Lands Department according to the engineering condition.
- 9.2 For the overlapped area of the widening section of the existing TWR and the railway viaduct - Tsuen Wan Line, only the stratum of air space (3m zone from the railway viaduct) is occupied by the MTRCL. This project does not involve any land resumption and easement of the land. Creation of a temporary occupation area within the said stratum of space in the lot may be required during the construction stage. In addition, as part of the proposed work is located within the MTR Railway Protection Boundary, the railway protection requirements as stipulated in Works Bureau Technical Circular No. 19/2002 shall be complied with. Details of the proposed works within the Railway Protection Boundary shall be submitted to MTRCL for comments and agreements.

10. DRAINAGE IMPACT ASSESSMENT STUDY

10.1 The DIA has been carried out to assess the impact to existing drainage system arising from the proposed flyover.

10.2 The findings of the assessment reveals that there would be no modification to the existing box culvert and nullah in the vicinity of the project area as a result of proposed works under the Project, and the increase in surface runoff due to the proposed flyover would only be minimal. Hence, the possible drainage impact on the existing drainage system will only be in a local scale and/or in a temporary nature, which can be avoided / mitigated through the implementation of the proposed mitigation measures. As such, both temporary and permanent works carried out under this Project would not cause unacceptable adverse drainage impact on the existing drainage system.

11. PROJECT IMPLEMENTATION AND COST ESTIMATE

- 11.1 Sequence and timing for relevant statutory procedures, administrative steps and tendering schedule have been considered during the preparation of the implementation programme. Major implementation issues were reviewed and presented as follows:-
- (i) Detailed Design: Q1, 2016 – Q2, 2017
 - (ii) Tree Felling Application: Q2, 2016 – Q4, 2016
 - (iii) Gazetting: Q2, 2016 – Q2, 2017
 - (iv) Diversion of 132kV and Towngas Telecom Cable: Q3, 2016 – Q4, 2018
 - (v) Tendering: Q2, 2017 – Q4, 2017
 - (vi) Construction: Q1, 2018 – Q3, 2021 (excluding the maintenance period)
- 11.2 A 3 years and 8 months construction period (from Q1, 2018 to Q3, 2021) is estimated. The programme has seized the opportunity of concurrent construction activities. The construction activities are spread throughout the period to reduce the construction noise impact. It is noted that for several sensitive receivers adjacent to the work area the cumulative noise impact level is close to the limits although mitigation measures have been used according to the EIA study under this project. Further speed up the construction programme will require more parallel activities which will have adverse impact on construction noise. More information will be provided in the next design stage to fine-tune the programme. Under this project, year 2021 is the targeted operation year of the viaduct for public use.
- 11.3 The conventional Design Led procurement method is recommended. The recommended procurement form is the re-measurement contract. In view of the scale of the Project and similar nature of works in the vicinity, it is recommended to carry out the construction under a single works contract by a skilled contractor with experience in bridge works, especially the prestressing operations.
- 11.4 The preliminary project estimate is HKD\$ 285M at September 2015 price level. The summary of the Project Estimate are shown in the following tables.

Agreement No. CE 8/2012 (HY)

Flyover from Kwai Tsing Interchange Upramp to Kwai Chung Road – Investigation

Executive Summary



Table 11.1 Construction and Project Estimate

	HK\$
Viaduct - Bridge G	24,962,850
Viaduct - Bridge H	81,015,795
Abutment	13,485,585
At-grade carriageway (including road lighting and drainage)	4,098,514
Footpath	181,764
Sub-total of viaducts, abutment & roads	123,744,508
Demolition of existing footbridge NF303	3,358,357
Reprovisioned footbridge	35,286,935
Lifts for reprovisioning footbridge	3,136,955
Sub-total of reprovisioning works	41,782,247
5.5m high vertical noise barrier (anchored on bridge)	1,351,196
5.5m high vertical noise barrier with 2.5m cantilever at 45 degree (anchored on the bridge)	32,428,704
5.5m high vertical noise barrier with 3.5m cantilever at 45 degree (free standing)	4,974,858
Sub-total of noise barriers	38,754,758
Landscaping works	905,200
Sub-total of landscaping works	905,200
Construction cost	205,186,713
Contract Contingencies	20,518,672
Total of construction cost	225,705,385
Ground investigation in the detailed design stage (Note 1)	800,000
Detailed design fee (Note 1)	3,385,581
Project contingency	30,014,936
Consultancy fee at the construction stage	2,257,054
Resident site staff costs for the construction stage	27,084,646
Total of project cost	<u>289,247,602</u>
Total of project cost to be secured under PWP Item 856TH – excludes the costs of ground investigation in the detailed design stage and detailed design fee	285,062,021

Note 1: These costs are included in Block Vote Item.

11.5 The estimated total recurrent cost is estimated to be HK\$1,767,590 per annum at September 2015 price level, with breakdown shown in the table below.

Table 11.2 Breakdown of Recurrent Cost

Departments	Recurrent Cost Estimates (HK\$ p.a.)
HyD	1,486,320
LCSD	273,260
FEHD	8,010
TOTAL	1,767,590

12. PUBLIC CONSULTATION

12.1 Overall Consultation Strategy and Programme

Methodology

- 12.1.1 As the Project is located completely within electoral boundaries of Kwai Tsing District Council (KTDC), it is considered not necessary to consult Tsuen Wan District Council.
- 12.1.2 Prior to attending the formal KTDC meeting, informal meetings/consultations with selected district councillors and representatives of nearby affected housing estates and education institutions were arranged in November 2014. The purpose of these informal meetings is to present the preferred alignment, the associated constraints and issues, and the preliminary results for the environmental assessment together with proposed mitigation measures despite the whole EIA report was not yet completed at that time. Initial public aspirations and concerns were obtained via these meetings.
- 12.1.3 This has provided an opportunity for interactive and direct dialogue with the stakeholders on specific topics of the Project. The informal meetings also aim at building consensus among stakeholders.
- 12.1.4 With the support of stakeholders solicited through these informal meetings and their concerns addressed, we formally presented the refined scheme with the findings of the EIA report, local improvement plan and the proposed construction programme in the Traffic and Transport Committees (T&TC) of KTDC meeting on 11th December 2014. Photomontages and/or animation were shown as a visual aid in the presentation. We also consulted Kwai Tsing Community Affairs Committee in its meeting on 9th December 2014 by circulation of consultation paper.
- 12.1.5 Before formally meeting with the members of KTDC, we also had a pre-meeting with the Chairman and Vice Chairman of T&TC of KTDC to provide brief introduction on the project and present the preferred alignment. Our consultation team also kept liaison with some key District Councillors and get support on the scheme after formal meeting with the members of KTDC.
- 12.1.6 The presentation materials include leaflets, powerpoint presentation, Digital 3-D Model and Animation.

Target Consultees

- 12.1.7 The concerned section between the KTI/C and KCR is located within the electoral boundaries of KTDC and, in particular, within or in close proximity of 3 constituencies of the KTDC including Lai King, Kwai Shing West Estate and Hing Fong.

- 12.1.8 Before formal consultation with the members of KTDC, we consulted the District Councillors of the 3 constituencies and the concerned constituencies in informal meetings. The District Councillors of the 3 concerned constituencies are tabulated below:

Name of District Councillor	Constituency	Remarks
Mr CHOW Yick-hay, BBS, JP (周奕希議員)	S17 – Lai King	The Project is located completely within this constituency. Also located within this constituency are Lai King Estate and 2 schools and a kindergarden, namely Lai King Catholic Secondary School, Lingnan Dr. Chung Wing Kwong Memorial Secondary School, and Sin Ching Kindergarden.
Miss LAU Mei-lo (劉美璐議員)	S18 – Kwai Shing West Estate	Constituency boundary located at Hing Fong Road which is within the area of influence in the traffic impact assessment.
Mr NG Kim-sing (吳劍昇議員)	S16 – Hing Fong	Kwai Chung Road, Kwai Foo Road and Hing Fong Road in the constituency are located within the area of influence in the traffic impact assessment.

- 12.1.9 Informal consultations were also conducted with the representatives of the above mentioned schools and kindergarden as well as Lai King Estate – Estate Management Advisory Committee.
- 12.1.10 After formally meeting with the members of KTDC, liaison with some key District Councillors was maintained. Our consultation team solicited and received support from the key District Councillors and representatives on the refined scheme after the formal meeting.

Consultation Team

- 12.1.11 The Consultation Team comprises the Chief Engineer/NTW2 of NTW, CEDD and his team members together with the consultants.
- 12.1.12 All the consultation meetings were led by an officer of CEDD at senior professional or above together with the consultant's representatives. The key members of the consultant's team are:
- (a) Consultation Manager: Mr. Paul Chu
 - (b) Assistant Consultation Manager: Mr. Alan Chan
 - (c) Graphical/3D Modelling: Ms. Can Leung

Outcome of Consultation

- 12.1.13 In its meeting on 11th December 2014, members of T&TC of KTDC unanimously expressed their support to the implementation of the Project.

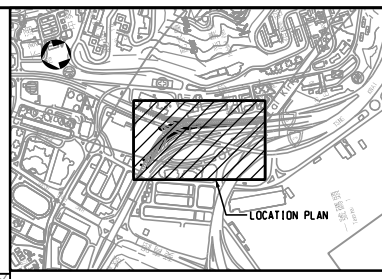
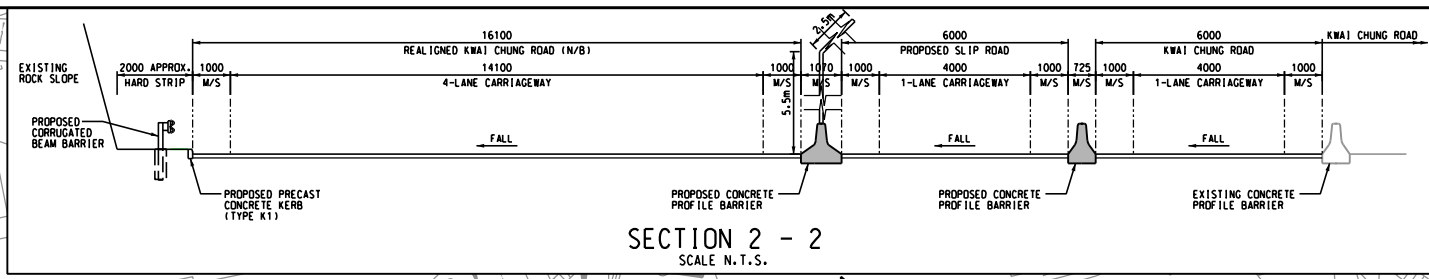
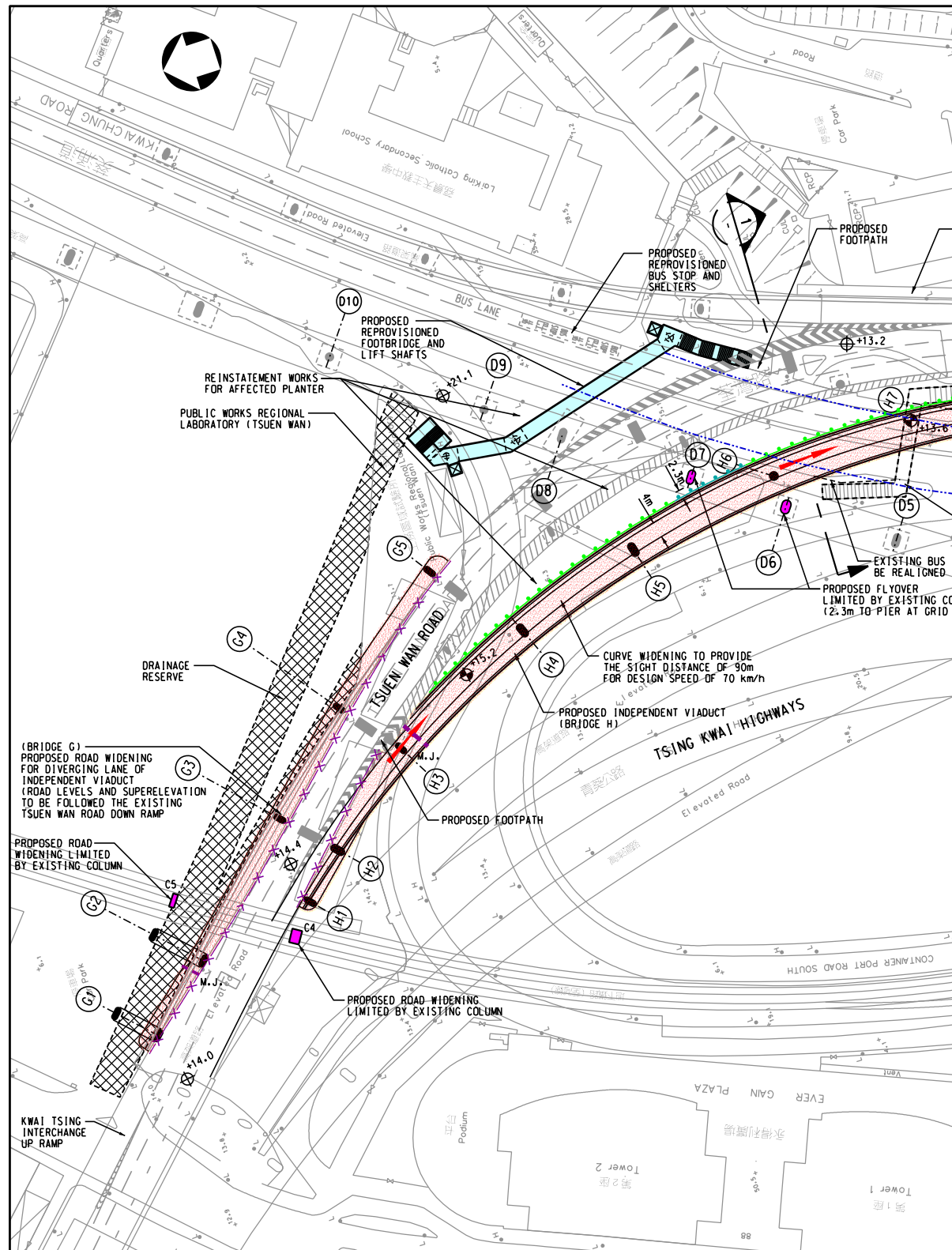
13. CONCLUSION

13.1 Overall Conclusion

13.1.1 Various Technical assessments, including Traffic Impact Assessment, Environment Review, Tree Survey, Geotechnical Assessment, Ground Investigation, Utilities Impact Assessment, etc. were undertaken to ascertain the technical feasibility of the Project. Furthermore, Land Requirement Plan for land clearance application, cost estimate, study on implementation strategy and programme; and the preliminary design of highways and associated structures were delivered to give an overview of the Assignment for the preparation of the gazettal procedure and detailed design stage of the Project.

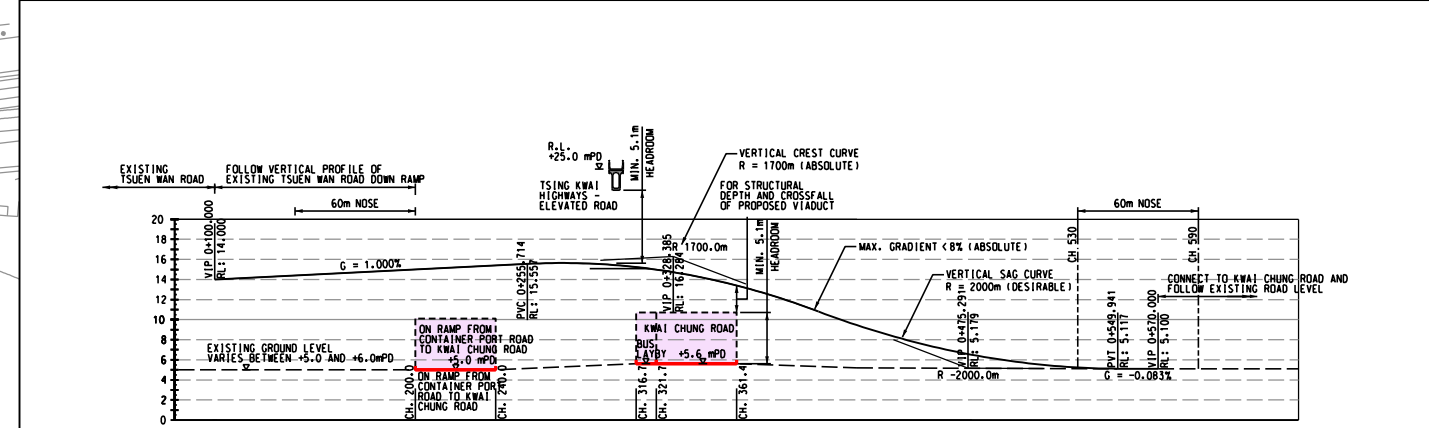
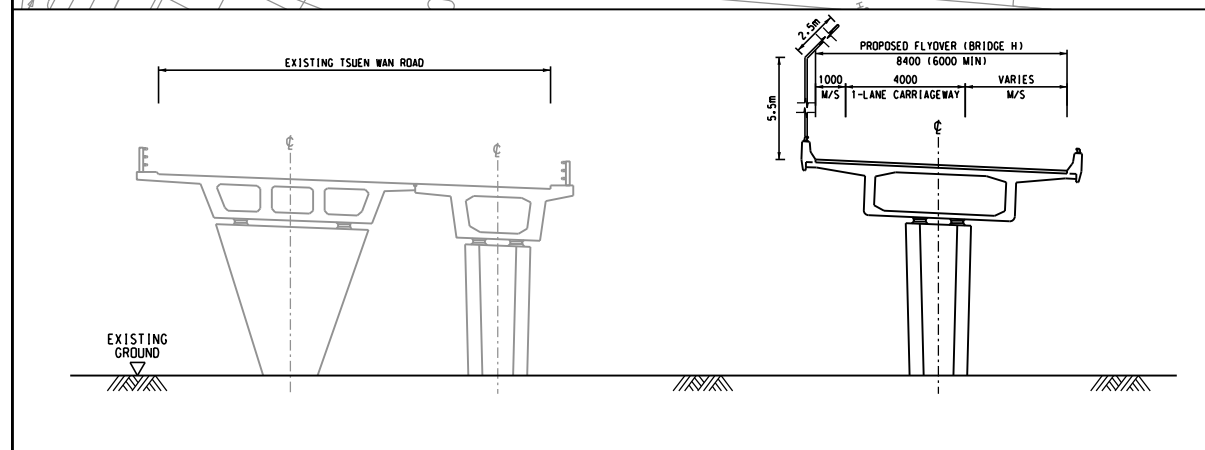
13.1.2 With the capital and recurrent costs considered in the evaluation process, together with other assessment criteria including the considerations of the traffic and operation standards, engineering designs, environmental and other aspects, the recommended Option 2A demonstrates a cost-effective solution having taken into account the various objectives of this Project.

DRAWINGS AND FIGURES



- LEGEND:**
- PROPOSED VIADUCT / WIDENING OF BRIDGE DECK / ABUTMENT
 - OPTION 2A: ROUTING
 - PROPOSED REPROVISIONED FOOTBRIDGE
 - DRAINAGE RESERVE
 - PROPOSED REPROVISIONED FOOTBRIDGE AND LIFT SHAFTS
 - PROPOSED 5.5m HIGH VERTICAL BARRIER
 - PROPOSED 5.5m HIGH BARRIER WITH 2.5m CANTILEVER AT 45 DEG.
 - PROPOSED 5.5m HIGH BARRIER WITH 3.5m CANTILEVER AT 45 DEG.
 - PROPOSED MOVEMENT JOINT BETWEEN EXISTING AND PROPOSED STRUCTURES
 - PROPOSED MONOLITHIC STITCHED JOINT BETWEEN EXISTING AND PROPOSED STRUCTURES
 - EXISTING DECKED NULLAH
 - EXISTING COLUMN
 - PROPOSED COLUMN
 - PROPOSED PORTAL FRAME SPAN ACROSS DRAINAGE RESERVE
 - EXISTING ROAD LEVEL IN mPD (APPROX.)
 - PROPOSED ROAD LEVEL IN mPD (APPROX.)

- ABBREVIATIONS:**
- PVI - POINT OF VERTICAL INTERSECTION
 - PVC - POINT OF VERTICAL CURVATURE
 - PVT - POINT OF VERTICAL TANGENCY
 - RL - FINISHED ROAD LEVEL
 - M/S - MARGINAL STRIP
 - C/M - CENTRAL MEDIAN



CHAINAGE (m)	0+120	0+140	0+160	0+180	0+200	0+220	0+240	0+260	0+280	0+300	0+320	0+340	0+360	0+380	0+400	0+420	0+440	0+460	0+480	0+500	0+520	0+540	0+560	0+580	0+600	0+620
FINISHED ROAD LEVEL (mPD)	14.200	14.400	14.600	14.800	15.000	15.200	15.400	15.595	15.827	15.423	14.984	14.310	13.400	12.253	10.870	9.451	8.233	7.215	6.398	5.782	5.366	5.150	5.108			
VERTICAL ALIGNMENT	$L = 155.140m$ $SIP = 1.000\%$																									
HORIZONTAL ALIGNMENT	$R = 300.000m$ (CURVE) $L = 67.870m$ (STRAIGHT)																									
HORIZONTAL CHAINAGE	$R = 255.000m$ (CURVE) $L = 94.065m$ (STRAIGHT)																									
	$R = 219.500m$ (CURVE) $L = 103.055m$ (STRAIGHT)																									
	$L = 145.140m$																									
	$L = 149.087m$																									
	$L = 224.302m$ (STRAIGHT)																									
	$L = 25.480m$ (STRAIGHT)																									
	$L = 20.000m$																									

SECTION 1 - 1
SCALE N.T.S.

VERTICAL PROFILE OF BRIDGE H
SCALE N.T.S.

Rev. 日期 內容 繪圖 校核

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

OFFICE: NEW TERRITORIES WEST DEVELOPMENT OFFICE

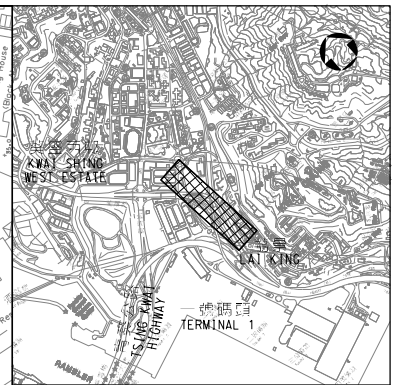
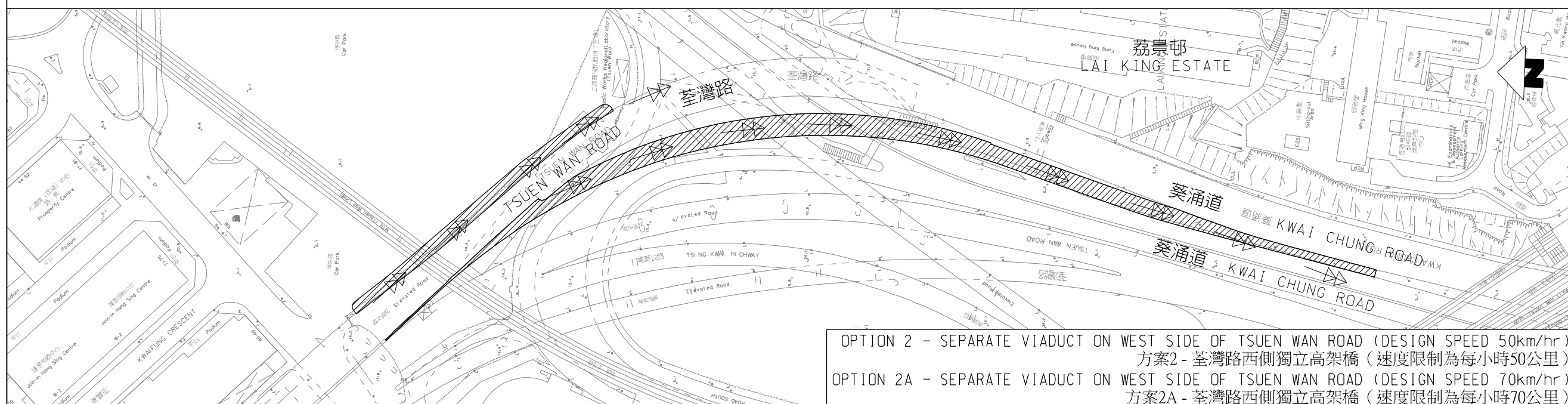
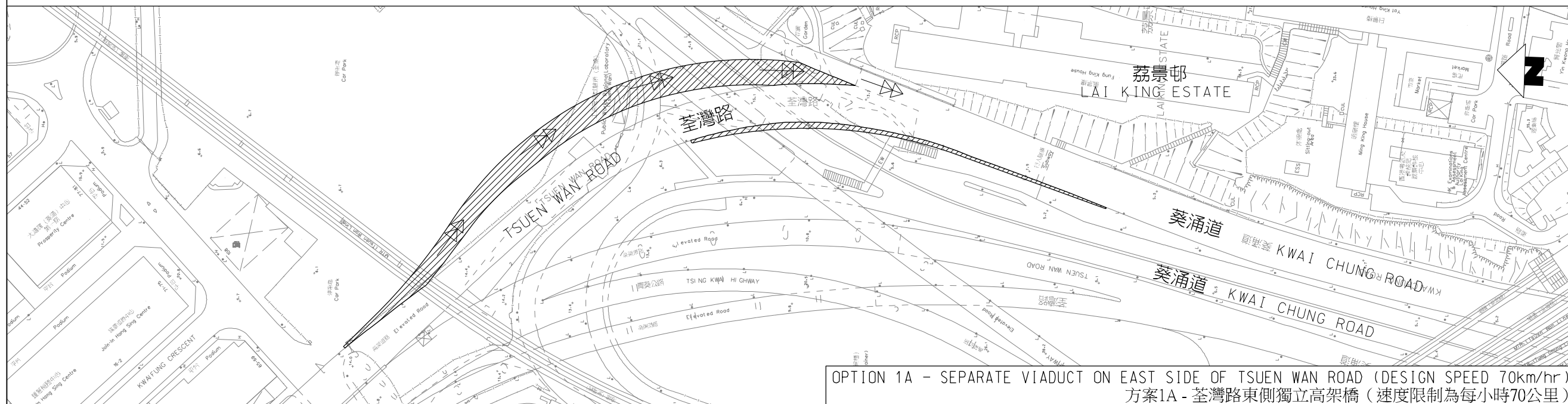
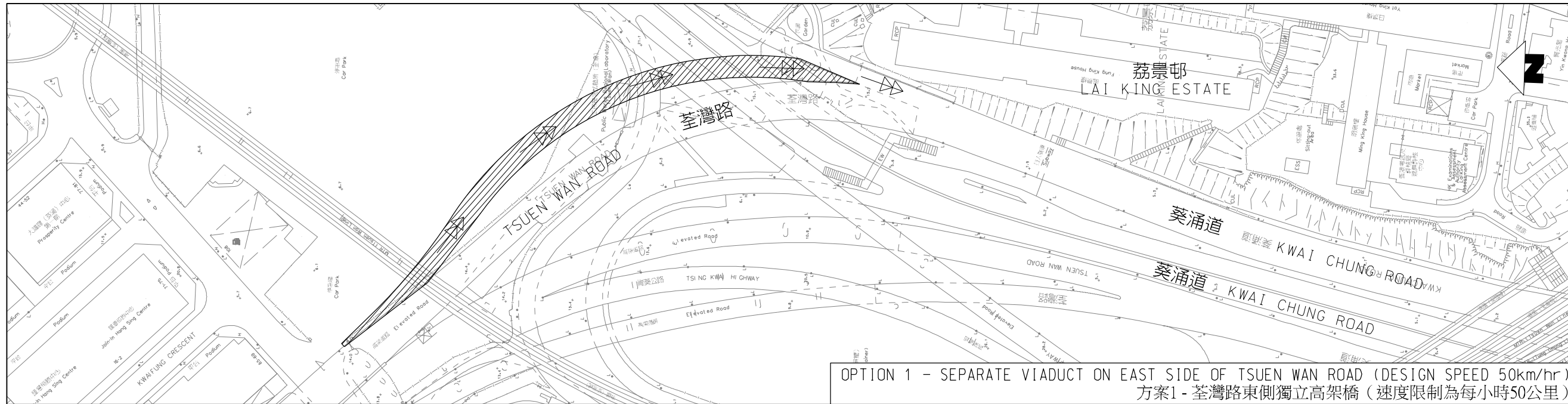
AGREEMENT NO. CE 8/2012 (HY)
 FLYOVER FROM KWAI TSING INTERCHANGE UP RAMP TO KWAI CHUNG ROAD - INVESTIGATION

OPTION 2A: SEPARATE VIADUCT ON WEST SIDE OF TWR (DESIGN SPEED 70KM/H)

Drawing No. 12212/P/IMP/1001
 圖則編號

Designed 設計 HC 繪圖 CMH 校核 HCKL 比例 1:750 (A11)
 Approved 批准 TSN 日期 06/12 狀態 PRELIMINARY

AECOM



KEY PLAN 位置圖
 SCALE 1 : 50000 比例 1 : 50000

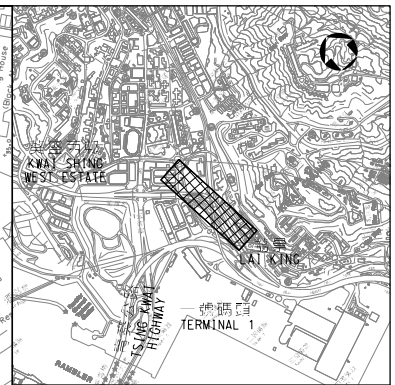
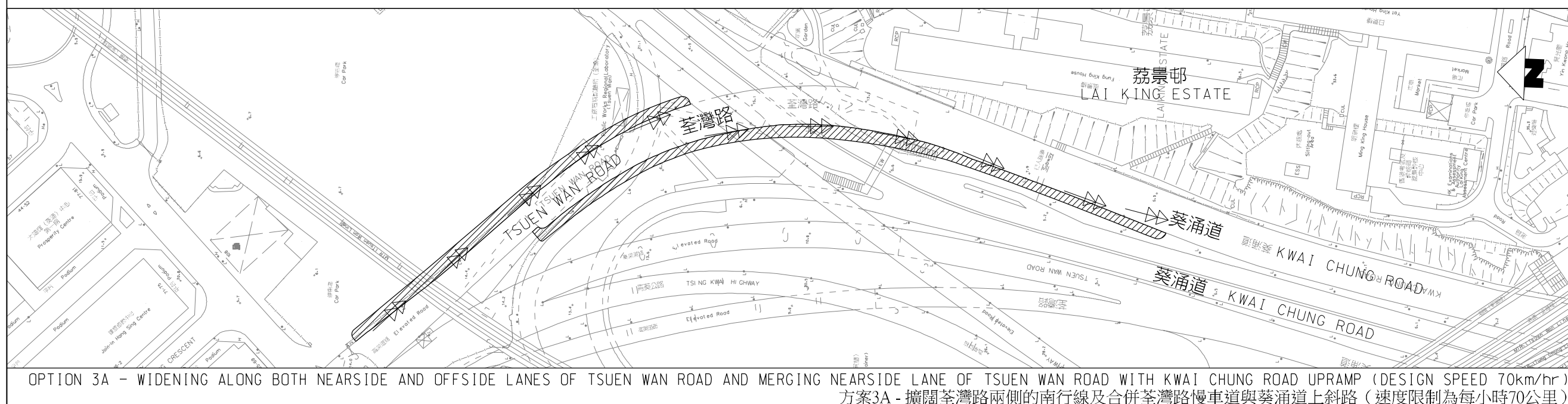
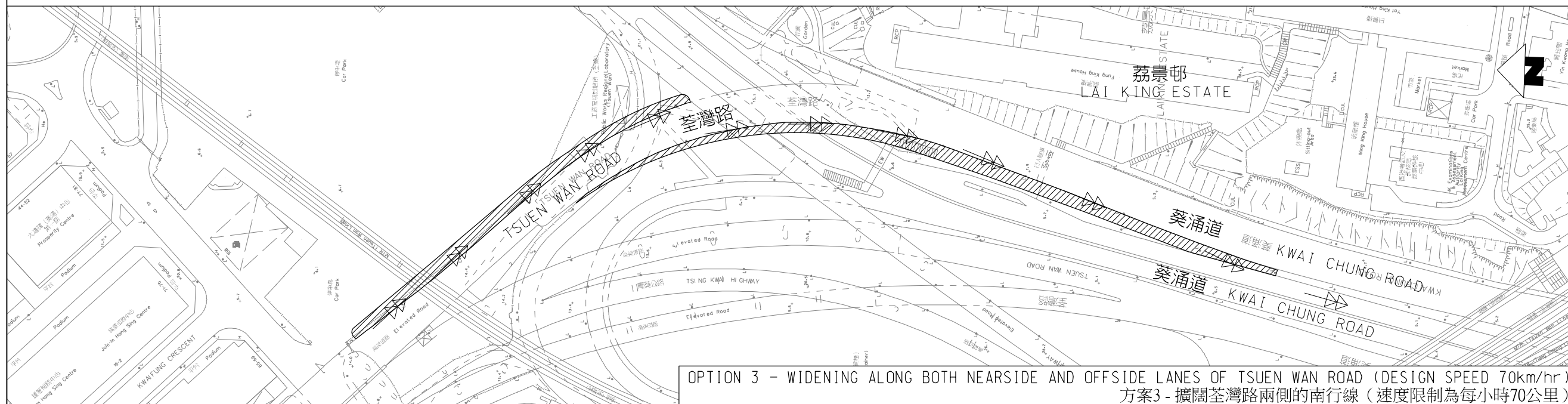
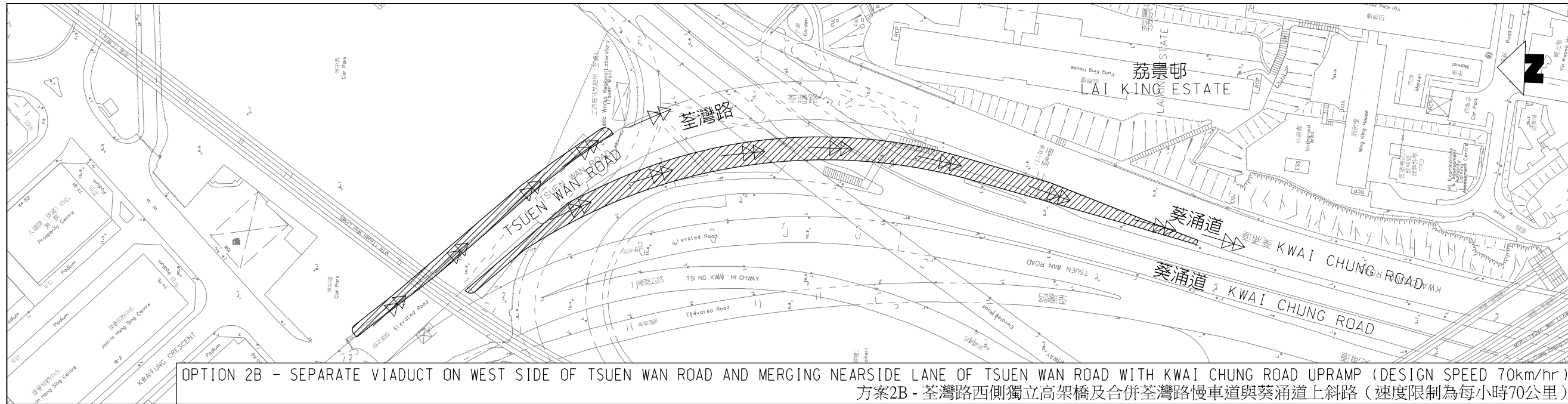
LEGEND: 圖示:

- TRAFFIC DIRECTION
行車方向
- PROPOSED ROAD
擬建道路

Rev. 修訂	Date 日期	Description 內容摘要	Drawn 繪圖	Checked 校核
土木工程拓展署 Civil Engineering and Development Department				
OFFICE: NEW TERRITORIES WEST DEVELOPMENT OFFICE				
AGREEMENT NO. CE 8/2012 (HY) FLYOVER FROM KWAI TSING INTERCHANGE UPRAMP TO KWAI CHUNG ROAD - INVESTIGATION				
ROAD ALIGNMENT OPTIONS (SHEET 1 OF 2) 道路走線方案 (第一頁, 共二頁)				
Drawing No. 圖號	FIGURE 2.1 (圖 2.1)			
Designed 設計	AYNS	Drawn 繪圖	HAX	Checked 校核
Approved 批准	KLC	Date 日期	02/14	Status 狀態
				PRELIMINARY

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KEY PLAN 位置圖
 SCALE 1 : 50000 比例 1 : 50000

- LEGEND: 圖示:
- TRAFFIC DIRECTION 行車方向
 - PROPOSED ROAD 擬建道路

Rev.	Date	Description	Drawn	Checked

土木工程拓展署
 Civil Engineering and Development Department

OFFICE: NEW TERRITORIES WEST DEVELOPMENT OFFICE

AGREEMENT NO. CE 8/2012 (HY)
 FLYOVER FROM KWAI TSING INTERCHANGE UPRAMP TO KWAI CHUNG ROAD - INVESTIGATION

ROAD ALIGNMENT OPTIONS (SHEET 2 OF 2)
 道路走線方案 (第二頁,共二頁)

Drawing No. 圖號: FIGURE 2.2 (圖 2.2)

Designed 設計: AYNS	Drawn 繪圖: HAX	Checked 校核: AYNS	Scale 比例: 1:2000 (A3)
Approved 批准: KLC	Date 日期: 02/14	Status 狀態: PRELIMINARY	

AECOM
 AECOM Consulting Services Limited

The contents of this report, such as cost estimates, have been updated. Please refer to the PWSC paper for updated information about the project.

本報告的內容，例如估算費用，已被更新。有關工程計劃的最新資料，請參閱工務小組委員會討論文件。



HIGHWAYS DEPARTMENT
WORKS DIVISION

Agreement No. CE 72/2015 (HY) **Flyover from Kwai Tsing Interchange Upramp to** **Kwai Chung Road - Design and Construction**

Report for Design Phase (Issue 2)



Agreement No. CE 72/2015 (HY)

Flyover from Kwai Tsing Interchange Upramp to Kwai Chung Road - Design and Construction

Report for Design Phase

March 2021

Revision	Date	Prepared by	Checked by	Approved by
Draft Issue 1	July 2020	Jimmy Lok	Stephen Ho	Y W YEUNG
Final Issue 1	December 2020	Tom Kong	Stephen HO	Y W YEUNG
Final Issue 2	March 2021	Tom Kong	Stephen HO	Y W YEUNG

REPORT FOR DESIGN PHASE (ISSUE 2)

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DRAWINGS

APPENDIX A

Geological Sections

APPENDIX B

Works Programme

1. INTRODUCTION

1.1 Background

1.1.1 Transport Department (TD) reviewed the traffic condition of Tsuen Wan Road (TWR) and found that the volume to capacity (v/c) ratio of a section of the southbound carriageway of TWR between Kwai Tsing Interchange (KTI) and Kwai Chung Road (KCR) would approach its capacity in the future years. It is considered that the merging capacity at the said exit slip road is at its practical limit in the morning peak period. The high merging flow has already caused disruption to the flow on the inner lane of southbound TWR on the main line, thereby reducing its handling capacity. To resolve the capacity problem, an additional traffic lane and widening of existing carriageway of TWR from KTI connecting to KCR are proposed to be constructed. TD considers that there is a genuine need to implement the project to improve the road section to cope with the future traffic growth.

1.1.2 On 21 September 2016, WSP (Asia) Limited (formerly named as Parsons Brinckerhoff (Asia) Ltd.) was appointed by Highways Department (HYD) to undertake the project, Agreement No. CE72/2015 (HY) “Flyover from Kwai Tsing Interchange Upramp to Kwai Chung Road – Design and Construction”.

1.2 Scope of the Project

1.2.1 The scope of works under the Project comprises:

- (i) construction of an approximately 370 meters(m) long single-lane vehicular bridge between the southbound fast lane of Tsuen Wan Road (near Kwai Tsing Interchange upramp) and Kwai Chung Road;
- (ii) widening of an approximately 85m long section of the southbound traffic lane of Tsuen Wan Road between Kwai Tsing Interchange upramp and Kwai Chung Road;
- (iii) construction of noise barriers at the vehicular bridge as stated in (i) above;
- (iv) demolition and reprovisioning of the existing Footbridge NF303, and provisioning of lifts;
- (v) relocation of bus stop next to Footbridge NF303 and associated footpath modification works;
- (vi) reconstruction of sections of Kwai Chung Road and Container Port Road South; and
- (vii) ancillary works including public lighting, drainage, landscaping and environmental mitigation measures.

1.3 **Scope of this Report**

1.3.1 This Report for Design Phase, prepared in accordance with Annex C20 of the Brief, consists of the following:

- (i) A brief summary of all the detailed design works which have been carried out including civil and structural, bridgeworks, E&M, geotechnical, traffic and transportation, landscaping, drainage, environmental, utility installation and diversion, etc.;
- (ii) Detailed design output including all relevant key engineering information, cost estimates, implementation strategy, contract strategy, possible entrustment works and packing works, programme information and response to comments, etc; and
- (iii) A summary of public consultation/ engagement activities carried out.

2. PROJECT DESCRIPTIONS

2.1 General

2.1.1 This Project comprises the widening of Tsuen Wan Road at the Existing Up-ramp (Bridge G) and construction of a flyover from Tsuen Wan Road to Kwai Chung Road (Bridge H), re-provisioning of Footbridge NF303 and other ancillary works. The location of the site is shown in the **Drawing no. HY202008/AB/0001**.

2.2 Bridge G

2.2.1 Bridge G is an elevated road bridge which is a widening section on the east side of elevated Tsuen Wan Road connecting Kwai Tsing Interchange up-ramp. One traffic lane shall be provided with carriageway width about 4m carriageway width. The superstructure shall be a single prestressed concrete box girder with maximum span about 42m. Pre-bored socketed H-piles shall be adopted for the foundation of the structure.

2.2.2 General arrangement of Bridge G is shown on **Drawing No. HY202008/G/C01/0011**.

2.3 Bridge H

2.3.1 Flyover from Kwai Tsing Interchange Upramp to Kwai Chung Road (Bridge H) is a single lane viaduct connecting west side of Tsuen Wan Road to Kwai Chung Road. The standard width of the Bridge H is 6m. Local widening up to 8m is required to fulfil the sightline requirement.

2.3.2 The superstructure of the Bridge H shall be a single prestressed concrete box girder with maximum span about 54m. Pre-bored socketed H-piles shall be adopted for the foundation of the structure.

2.3.3 General arrangement of Bridge H is shown on **Drawing No. HY202008/H/C01/0011**.

2.4 Noise Barrier

2.4.1 Noise Barrier will be constructed along the Bridge H to fulfil the requirement of the EIA report in the Investigation Phase. The Noise Barrier at Bridge H is steel frame structure composed of vertical steel post and / or cantilever steel member. The height and the cantilever length of the vertical steel post and cantilever steel member are about 5m and 3.5m in maximum respectively. Bolt connection shall be adopted at the concrete parapet of the Bridge H.

2.5 **Re-provisioning of Footbridge NF303**

2.5.1 Existing footbridge NF303, which is currently located at Kwai Chung Road adjacent to Lai King Estate, is proposed to be demolished and re-provisioned. The location of the re-provisioned footbridge NF303 is adjacent to the LKCSS (Eastern landing) and the Container Port Road South footpath (Western landing).

2.5.2 The general arrangement of footbridge is shown in **Drawing No. HY202008/FB/C01/0011**.

3. SUMMARY OF THE WORKS

3.1 Structural Design

3.1.1 The structural designs of the Bridge G, Bridge H, Noise Barrier, re-provisioning of Footbridge NF303 and associated structures have been carried out and circulated to HyD and other relevant departments for review.

3.1.2 In the design, the design actions and the partial factors for the design values of actions and effects of actions to be adopted for the ultimate limit state and serviceability limit state are proposed as follows.

- Dead Loads
- Superimposed Dead Loads
- Wind actions
- Live Loads
- Soil Loads
- Surcharge for substructure
- Temperature Effect
- Actions on Pedestrian Parapets (for Bridge G and H)
- Seismic Actions
- Accidental Actions
- Creep and Shrinkage Effect
- Differential Settlement
- Parapet Loads (for Bridge G and H)
- Combinations of Actions, Partial Factors and Factors for Actions
- Vibration Serviceability
- General Stability
- Lateral Pressure

3.1.3 Concrete section design has been carried out in accordance with requirements of BS EN 1992-1-1, BS EN 1992-2, the UK NAs to BS EN 1992-1-1, and BS EN 1992-2, PD 6687-1 and PD 6687-2, unless otherwise specified in the SDMHR 2013 Edition.

3.1.4 Steel section design has been carried out in accordance with the requirement of BS EN 1993-1, BS EN 1993-2, the UK NAs to BS EN 1993-1 and BS EN 1993-2, PD6695-1-9, PD6695-1-10 and PD 6695-2, unless otherwise specified in the SDMHR 2013 Edition.

3.1.5 Prestressing analysis for Bridge G and Bridge H has been carried out.

3.1.6 SAP2000 version 17.1.1 has been used for modelling and analysing the structure of superstructure including piers and noise barrier, foundation and abutment of Bridge H.

- 3.1.7 OASYS AdSec version 8.2 has been used to design for the ULS capacity and crack width respectively for piers or columns.
- 3.1.8 Foundation design has been carried out in accordance with the requirements in SDM2013 Clause 10, and in accordance with the recommendations of BS 8004, GEO Publication No. 1/2006 – Foundation Design and Construction.
- 3.1.9 Further details of the structural design are documented in the relevant submission of Draft Design Calculations, Drawings and Certificates of the Works.
- 3.1.10 Based on the result of the checking, it is concluded that the structural behaviours of the Bridge G, Bridge H and re-provisioning of Footbridge NF303 is structurally acceptable.

3.2 **Geotechnical Design**

- 3.2.1 The site is located within a reclamation area. The existing ground conditions have been determined in accordance with the Hong Kong Map and previous ground investigation records in the vicinity.
- 3.2.2 Geological sections depicted the geological condition of the site are at **Appendix A**.
- 3.2.3 The design geotechnical parameters adopted for the design of the works under this project are determined based on the ground investigation records.
- 3.2.4 According to the proposed road works arrangement, no existing slopes will affect or be affected by the proposed works, and no slope works and retaining wall are proposed.
- 3.2.5 There is neither registered slope feature affect or be affected nor new man-made features will be formed by the proposed works. At such, no geotechnical works are envisaged under this Project.

3.3 **Electrical and Mechanical (E&M) Design**

- 3.3.1 Public lighting provisions in compliance with HyD's Public Lighting Design Manual will be installed to the proposed vehicular bridges and footbridge. 3 nos. of pillar boxes will also be provided as part of the lighting provisions.
- 3.3.2 2 nos. of lifts with necessary E&M provisions will be installed for the proposed footbridge.

3.4 **Traffic and Transportation**

- 3.4.1 Roadwork design has been carried out in compliance with the Transport Planning & Design Manual and HyD standards.
- 3.4.2 The design speed limit of the proposed vehicular bridges is 70km/h. Proper road markings and signage will be provided and are designed to achieve the safety standards required.
- 3.4.3 Temporary traffic management schemes are developed to minimize the disruptions to the public during the construction period.

3.5 **Landscaping**

- 3.5.1 Landscaping design has been carried out and agreed with HyD, LCSD and relevant departments.
- 3.5.2 In this Project, 130 nos. of tree are found to be impractical to be retained during construction, including 24 nos. of tree to be transplanted and 106 nos. of tree to be felled.
- 3.5.3 Shrub planting is proposed at an amenity area adjacent to the re-provisioning of Footbridge NF303.

3.6 **Drainage**

- 3.6.1 Drainage design has been carried out in compliance with the standards of the Drainage Services Department and HyD.

3.7 **Utility**

- 3.7.1 The proposed works of Bridge H, Bridge G and re-provisioned footbridge NF303 will have conflicts with the existing utilities. These utilities include stormwater drains, road drains, PCCW telecom cables, CLP power cables, Towngas (Telecom) cables, Trax telecom cables, New world cables, existing lighting poles and lighting. Diversion and re-provision of some of the existing utilities and services will be anticipated.
- 3.7.2 The existing 132kV CLP cables near the Public Works Regional Laboratory (Tsuen Wan) conflict with the proposed Bridge G. The associated diversion will be carried out prior to the construction.

The Project Estimate in this report is estimated based on the current design and construction programme during the design stage. It was further updated according to the returned tender prices in order to reflect the prevailing market condition. Please refer to the PWSC paper for updated information about the project.

本報告中的工程計劃費用估算是根據於設計階段的當前設計和施工計劃估算的，它已根據回標價格進一步更新，以反映目前的市場狀況。有關工程計劃的最新資料，請參閱工務小組委員會討論文件。

3.8 Cost Estimates

3.8.1 The Pre-tender Estimate (PTE) is estimated to be \$422.36 million (in MOD prices). The breakdown is presented as follows:-

		\$ million		
1.	Preliminaries		84.32	
2.	Site Clearance		8.19	
3.	Main Scope of Works		187.66	
	(i) Ground Investigation Works	8.46		
	(ii) Bridges G and H	66.72		
	(iii) Noise Barrier	11.59		
	(iv) Re-provision of footbridge	26.77		
	(v) Foundation	74.12		
4.	Associated works		12.29	
	Landscape works	6.67		
	Road, drainage, utilities and public lighting works etc.	5.62		
5.	Contractor's Design		25.95	
6.	Pay for Site Safety		3.09	
	Sub-total		321.50	(in September 2020 prices)
7.	Contingency sum for Defined Cost for compensation event		34.50	
8.	Contingency sum for Fee for compensation event		5.87	
9.	Provision for performance-tied payment item under PFSPMS		4.43	
	Sub-total		366.30	(in September 2020 prices)
	Provision for price adjustment		56.06	
	Total		422.36	(in MOD prices)

The Project Estimate in this report is estimated based on the current design and construction programme during the design stage. It was further updated according to the returned tender prices in order to reflect the prevailing market condition. Please refer to the PWSC paper for updated information about the project.

本報告中的工程計劃費用估算是根據於設計階段的當前設計和施工計劃估算的，它已根據回標價格進一步更新，以反映目前的市場狀況。有關工程計劃的最新資料，請參閱工務小組委員會討論文件。

3.8.2 The Project Estimate (PE) is estimated to be \$536.35 million (in MOD prices). The breakdown is presented as follows:-

		\$ million		
(a)	Pre-tender Estimate (in September 2020 prices)		366.30	
(b)	Consultant's fees and on-costs		2.43	
(c)	Resident site staff cost		54.00	
(d)	Project Contingency		38.22	
(e)	Environmental Monitoring and Audit		4.2	
	Sub-total		465.15	(in September 2020 prices)
	Provision for price adjustment		71.20	
	Total		536.35	(in MOD prices)

3.9 Implementation and Contract Strategy

3.9.1 This Project will be undertaken by HyD/Works under a single contract. No entrustment works is required. Advance division works of the existing 132kV CLP Cable will be carried out by CLP prior to the construction of this Project.

3.9.2 NEC contract form will be adopted. The recommended NEC Option is NEC3 ECC Option B due to the below benefits:-

- Contract administration similar to traditional re-measurement contract;
- The BQ rate to form the basis of assessing the quotation for compensation event.
- More reasonable tender return price due to Employer's sharing risk related to quantities;
- Allow a few foreseeable changes during the construction stage.

- 3.9.3 The recommended NEC3 ECC Option B Secondary Option Clauses for the procurement of the Contract are listed as below:
- a. Option X1: Price adjustment for inflation
 - b. Option X5: Sectional Completion
 - c. Option X7: Delay damages
 - d. Option X15: Limitation of the Contractor's liability for his design to reasonable skill and care
 - e. Option X16: Retention
 - f. Option X20: Key Performance Indicators

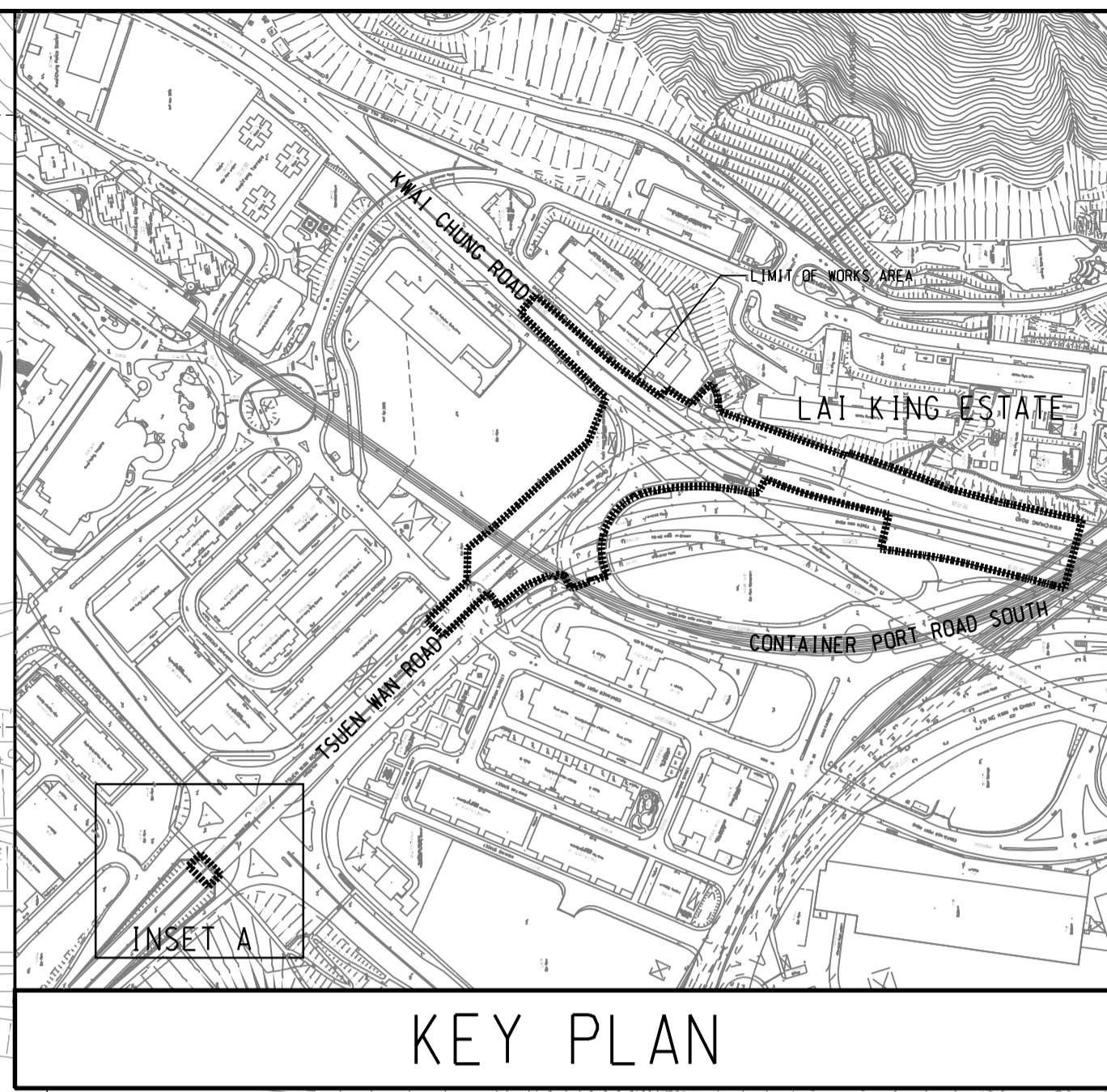
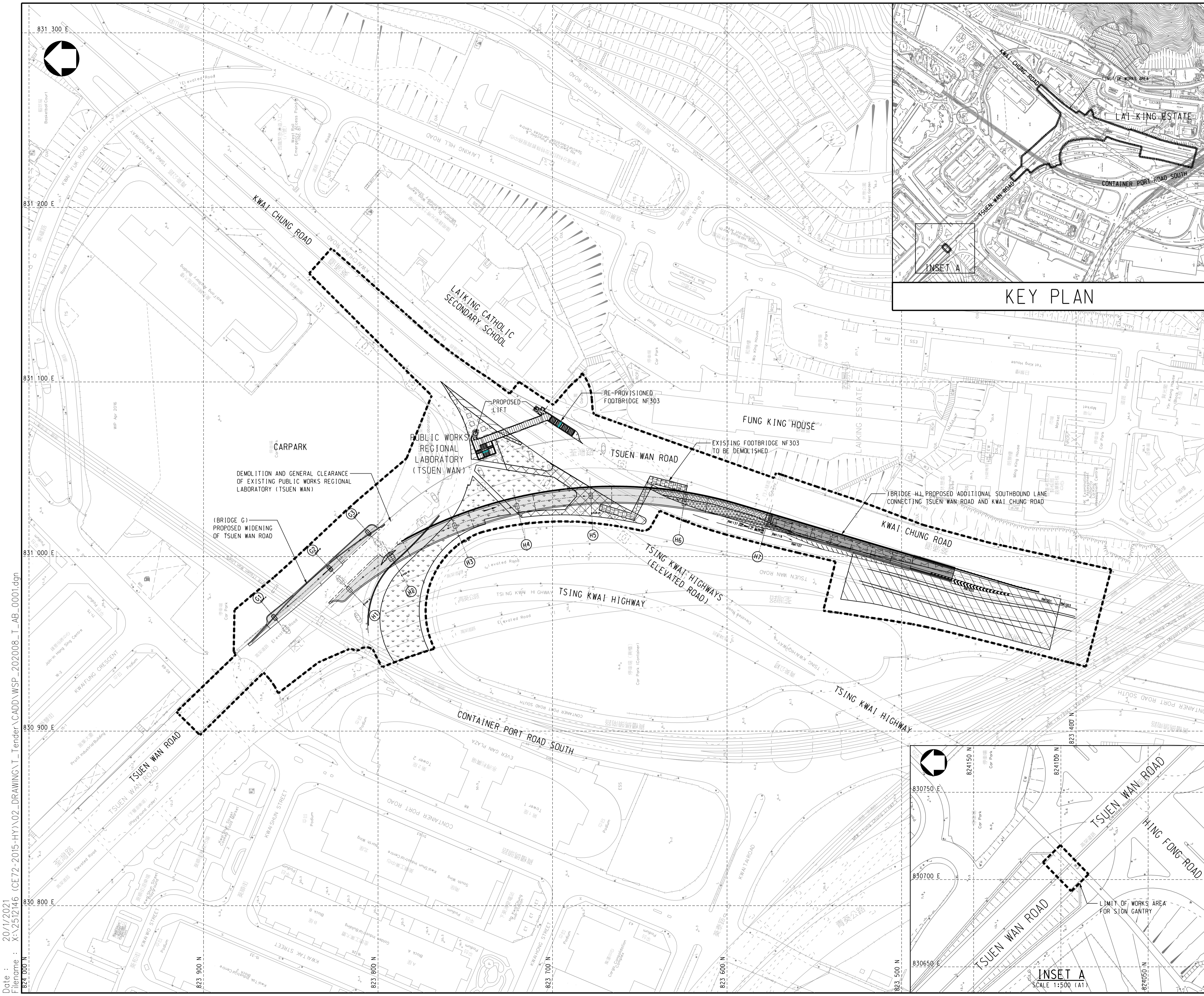
3.10 **Programme**

- 3.10.1 The Works would be commenced in the Q3 2021 for completion in Q1 2025. The detailed works programme is enclosed in **Appendix B**.

3.11 **Public Consultation**

- 3.12 In the investigation phase, the Project was presented to the Traffic and Transport Committee of the Kwai Tsing District Council on 11 December 2014 and was supported by the Committee.
- 3.13 The proposed road works under the Roads (Works, Use and Compensation) Ordinance (Cap. 370) was gazetted on 3 November 2017. No objection was received.
- 3.14 The Advisory Committee on the Appearance of Bridges and Associated Structures (ACABAS) was consulted on the aesthetic design of the proposed works on 19 June 2018, and the Committee has accepted the aesthetic design

DRAWINGS



KEY PLAN

- NOTES :
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
 2. ALL LEVELS ARE APPROXIMATE VALUES AND IN METRES ABOVE HONG KONG PRINCIPAL DATUM.
 3. SECTIONS OF THE EXISTING CARRIAGEWAYS AND FOOTPATHS WITHIN THE LIMIT OF WORKS AREA MAY BE TEMPORARILY CLOSED IN PHASES AS AND WHEN REQUIRED.

- LEGEND :
- LIMIT OF WORK SITE
 - PROPOSED COLUMN
 - PROPOSED ELEVATED CARRIAGEWAY
 - PROPOSED ABUTMENT
 - EXISTING BUS LAYBY TO BE PERMANENTLY CLOSED
 - EXISTING FOOTBRIDGE TO BE PERMANENTLY CLOSED AND DEMOLISHED
 - PROPOSED FOOTBRIDGE
 - PROPOSED AMENITY AREA
 - PROPOSED FOOTPATH
 - EXISTING AMENITY AREA TO BE RETAINED
 - EXISTING FOOTPATH TO BE PERMANENTLY CLOSED
 - EXISTING AT-GRADE CARRIAGEWAY TO BE TEMPORARILY CLOSED AND RECONSTRUCTED
 - EXISTING CENTRAL MEDIAN WITHIN AMENITY AREA TO BE DEMOLISHED AND CONVERTED TO FLYOVER ABUTMENT
 - EXISTING AMENITY AREA TO BE PERMANENTLY CLOSED
 - EXISTING AMENITY AREA TO BE DEMOLISHED AND CONVERTED TO FOOTPATH
 - EXISTING AMENITY AREA TO BE PERMANENTLY DEMOLISHED AND CONVERTED TO BUS LAYBY
 - PROPOSED NOISE BARRIER
 - PROPOSED LIFT

-	ISSUE FOR TENDER	EW	01/21
Rev	Description	By	Date

Consultant

Project title
 CONTRACT NO. HY/2020/08
 FLYOVER FROM KWAI TSING INTERCHANGE
 UP-RAMP TO KWAI CHUNG ROAD

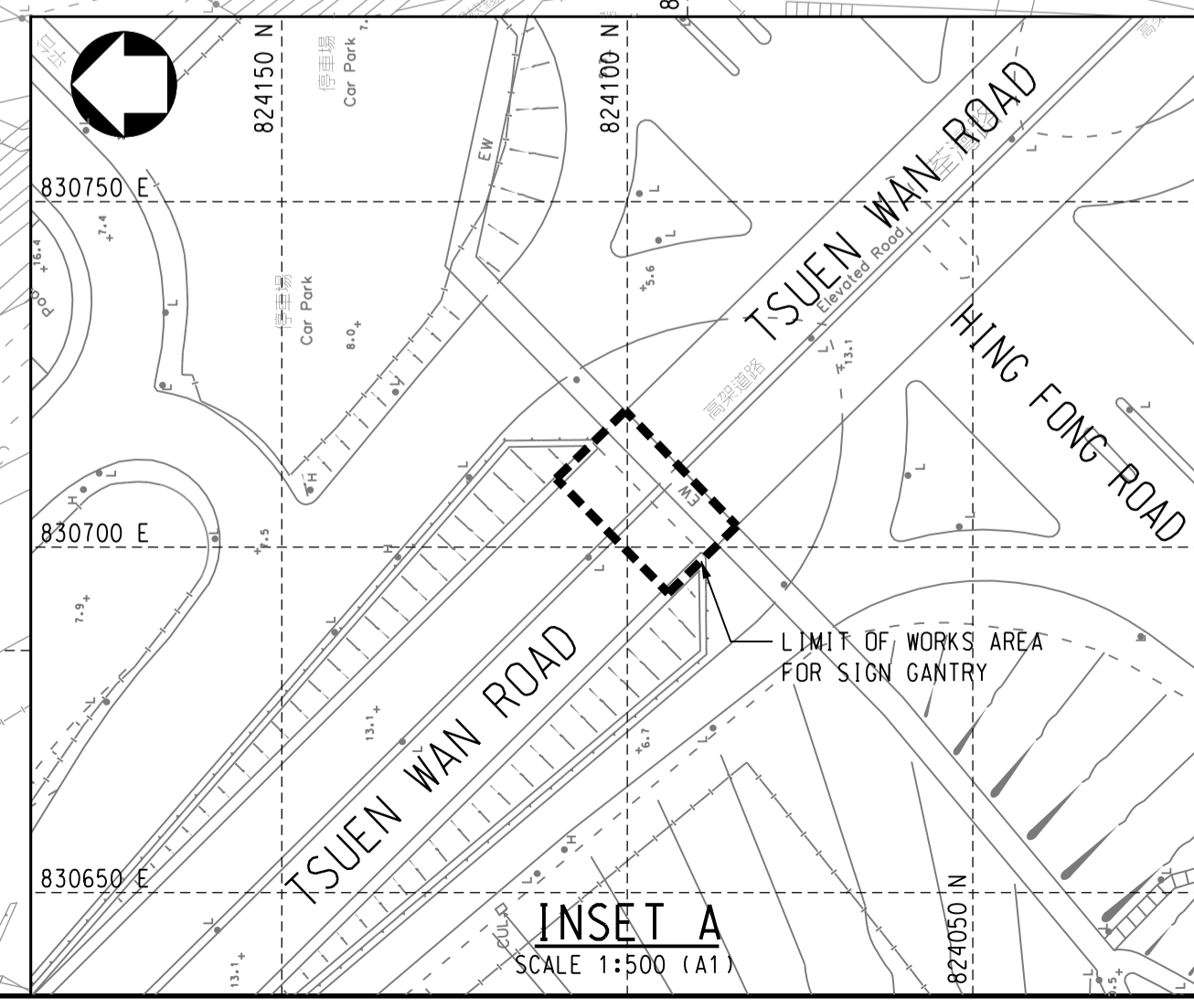
Drawing title
 GENERAL LAYOUT PLAN

Drawing no. HY202008/AB/0001		Rev. -	
Drawn CSL	Date 29/11/2019	Checked SH	Approved EW
Scale 1:1000 (A1)	Status TENDER		

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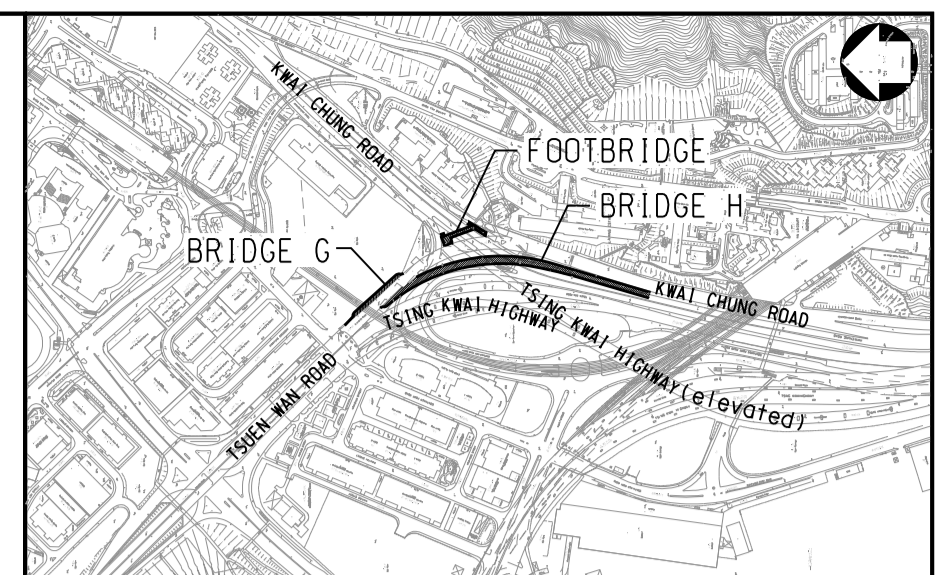
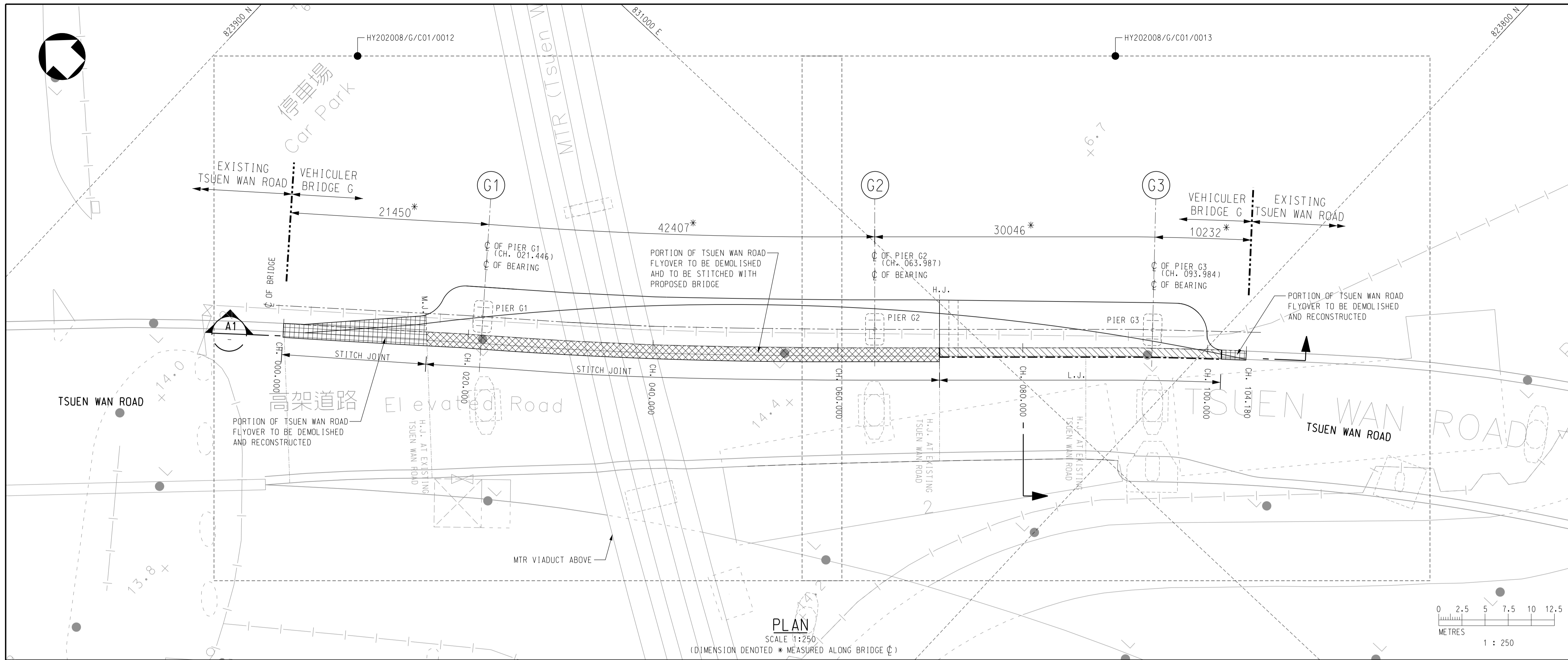
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 WORKS DIVISION

Date : 20/1/2021
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INSET A
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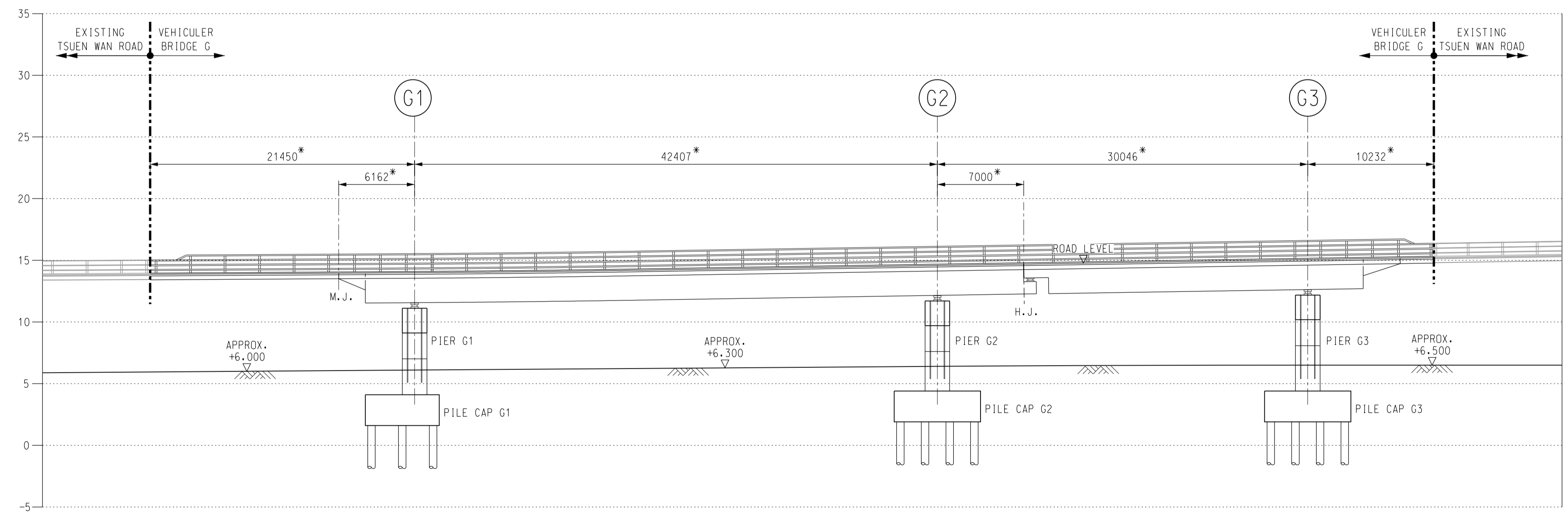
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- NOTES :**
- FOR GENERAL NOTES AND LEGEND, REFER TO DRAWING NOS. HY202008/G/C01/0001 TO 0006.
 - ALL CHAINAGES ARE MEASURED PERPENDICULARLY FROM SETTING OUT LINE.
 - FOR FOUNDATION LAYOUT, REFER TO DRAWING NOS. HY202008/G/C19/0011.
 - FOR DETAILS OF PIER, REFER TO DRAWING NOS. HY202008/G/C10/0011.
 - FOR PARAPET DETAILS, REFER TO DRAWING NOS. HY202008/GN/C01/0011 TO 0012.
 - FOR DECK GENERAL ARRANGEMENT, REFER TO DRAWING NOS. HY202008/G/C01/0012 & 0013.
 - FOR ROAD PROFILES, REFER TO DRAWING NO. HY202008/G/C02/0011.

- LEGEND :**
- PORTION OF TSUEN WAN ROAD FLYOVER TO BE DEMOLISHED
 - PORTION OF TSUEN WAN ROAD FLYOVER TO BE DEMOLISHED AND TO BE STITCHED WITH PROPOSED BRIDGE
 - PORTION OF TSUEN WAN ROAD FLYOVER TO BE DEMOLISHED AND RECONSTRUCTED

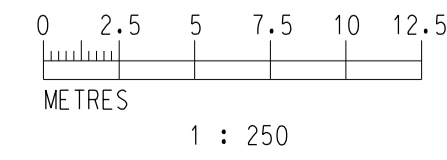
- ABBREVIATION :**
- L.J. LONGITUDINAL JOINT
 - M.J. MOVEMENT JOINT
 - H.J. HALVING JOINT
 - C.J. CONSTRUCTION JOINT

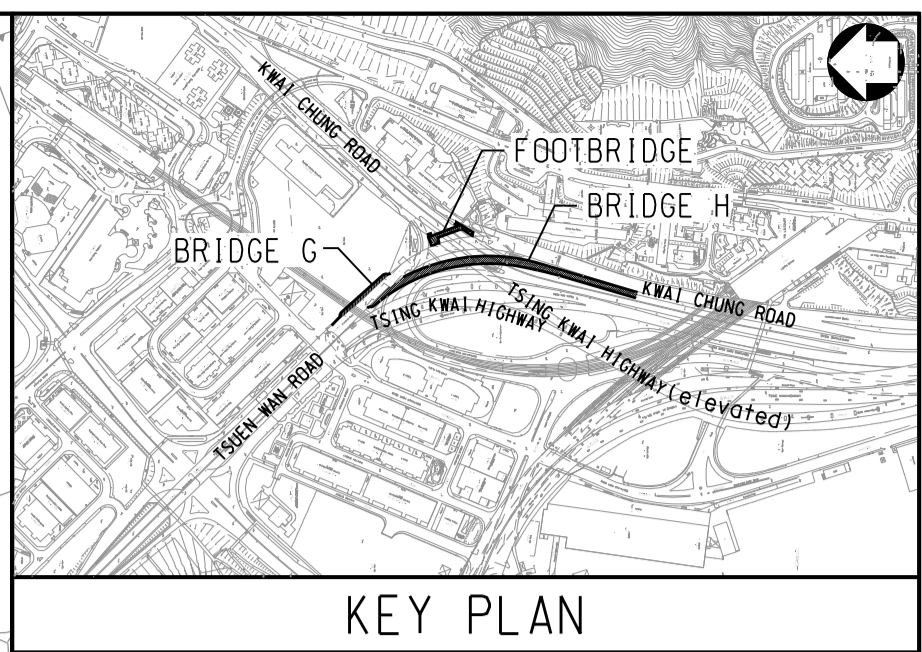
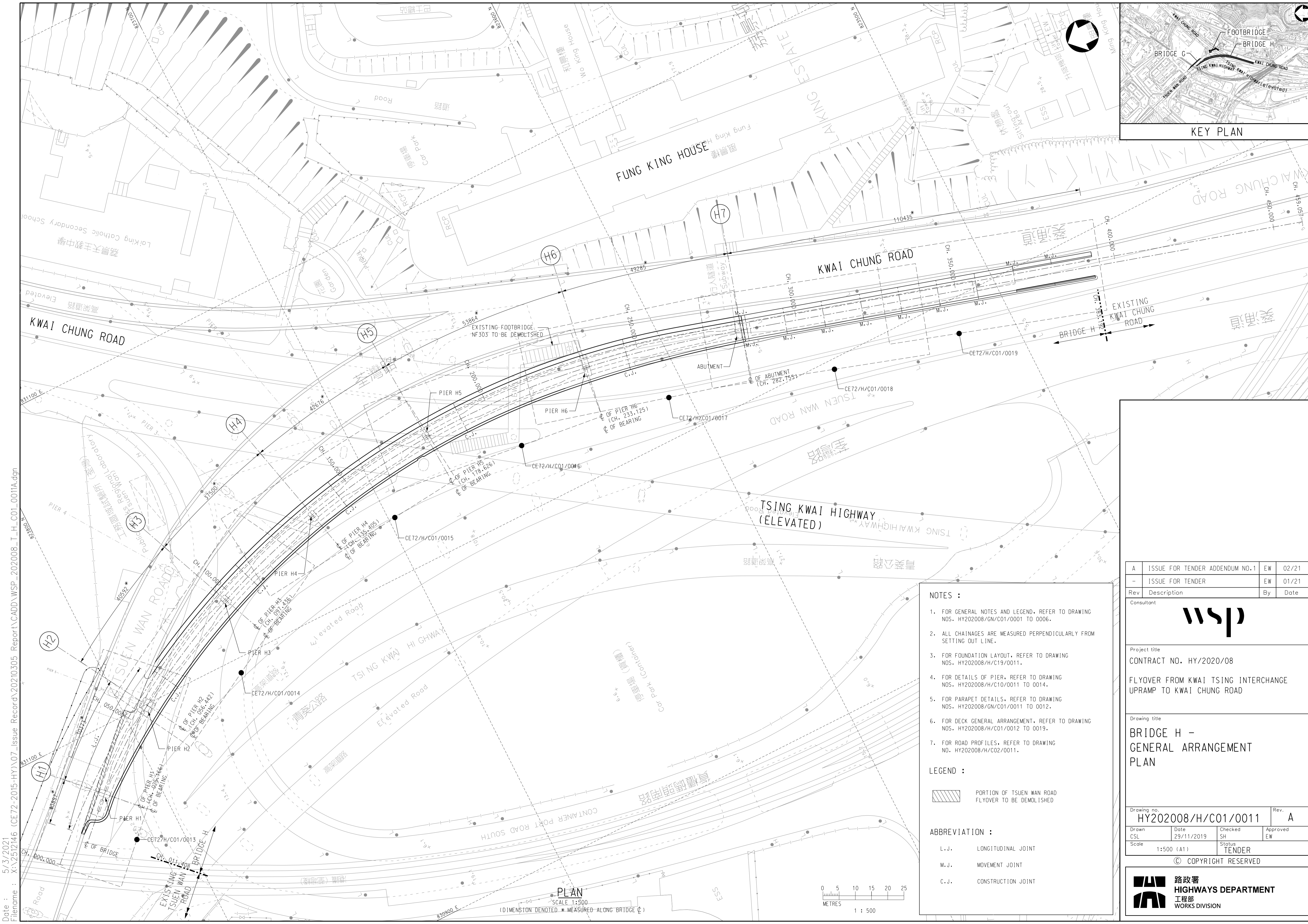


-	ISSUE FOR TENDER	EW	01/21
Rev	Description	By	Date
Consultant			
Project title			
CONTRACT NO. HY/2020/08			
FLYOVER FROM KWAI TSING INTERCHANGE UPRAMP TO KWAI CHUNG ROAD			
Drawing title			
BRIDGE G - GENERAL ARRANGEMENT PLAN AND ELEVATION			
Drawing no.		Rev.	
HY202008/G/C01/0011		-	
Drawn	Date	Checked	Approved
CSL	29/11/2019	SH	EW
Scale	Status		
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NOTES :

- FOR GENERAL NOTES AND LEGEND, REFER TO DRAWING NOS. HY20208/GN/C01/0001 TO 0006.
- ALL CHAINAGES ARE MEASURED PERPENDICULARLY FROM SETTING OUT LINE.
- FOR FOUNDATION LAYOUT, REFER TO DRAWING NOS. HY20208/H/C19/0011.
- FOR DETAILS OF PIER, REFER TO DRAWING NOS. HY20208/H/C10/0011 TO 0014.
- FOR PARAPET DETAILS, REFER TO DRAWING NOS. HY20208/GN/C01/0011 TO 0012.
- FOR DECK GENERAL ARRANGEMENT, REFER TO DRAWING NOS. HY20208/H/C01/0012 TO 0019.
- FOR ROAD PROFILES, REFER TO DRAWING NO. HY20208/H/C02/0011.

LEGEND :

PORTION OF TSUEN WAN ROAD FLYOVER TO BE DEMOLISHED

ABBREVIATION :

L.J. LONGITUDINAL JOINT
 M.J. MOVEMENT JOINT
 C.J. CONSTRUCTION JOINT

A	ISSUE FOR TENDER ADDENDUM NO.1	EW	02/21
-	ISSUE FOR TENDER	EW	01/21
Rev	Description	By	Date

Consultant

Project title
 CONTRACT NO. HY/2020/08
 FLYOVER FROM KWAI TSING INTERCHANGE
 UPRAMP TO KWAI CHUNG ROAD

Drawing title
**BRIDGE H -
 GENERAL ARRANGEMENT
 PLAN**

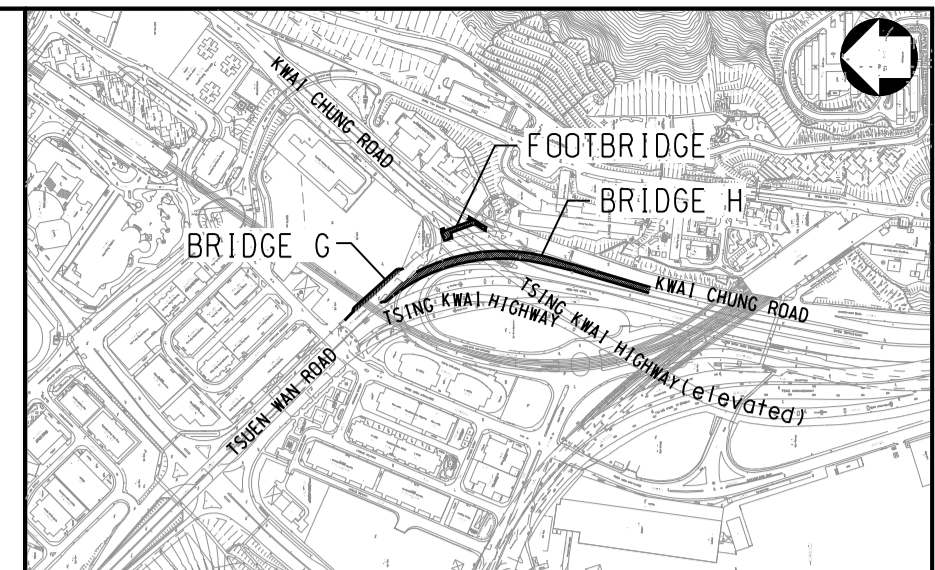
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KEY PLAN

NOTES:

1. ALL DIMENSION ARE IN MILLIMETERS AND LEVELS ARE IN mPD UNLESS OTHERWISE STATED.
2. FOR NOTES AND LEGEND REFER TO DRAWING NO. HY202008/GN/C01/0001 TO 0004.
3. THIS DRAWING TO BE READ IN CONJUNCTION WITH DRAWING NO. HY202008/FB/C01/0012 TO 0013.
4. GENERAL ARRANGEMENT OF STAIRCASE REFER TO DRAWING NO. HY202008/FB/C01/0031 TO 0032.
5. GENERAL ARRANGEMENT OF LIFT 1 & 2 REFER TO DRAWING NO. HY202008/LT/C01/0011 TO 0012.
6. THE MAIN DECK STEEL WORKS REFER TO DRAWING NO. HY202008/FB/C11/0011 TO 0014.

LEGEND :

- PROPOSED LIFT
- PROPOSED STAIRCASE
- STAIRCASE FLOOR LEVEL IN mPD

SETTING OUT POINT TABLE

	EASTING	NORTHING
SOP1	831065.84	823741.19
SOP2	831079.82	823703.65
SOP3	831070.39	823744.23
SOP4	831084.20	823709.09
SOP5	831061.71	823742.73
SOP6	831058.00	823741.35
SOP7	831060.43	823734.81
SOP8	831078.81	823700.89
SOP9	831070.74	823688.41

Rev	Description	By	Date
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-	ISSUE FOR TENDER	EW	01/21

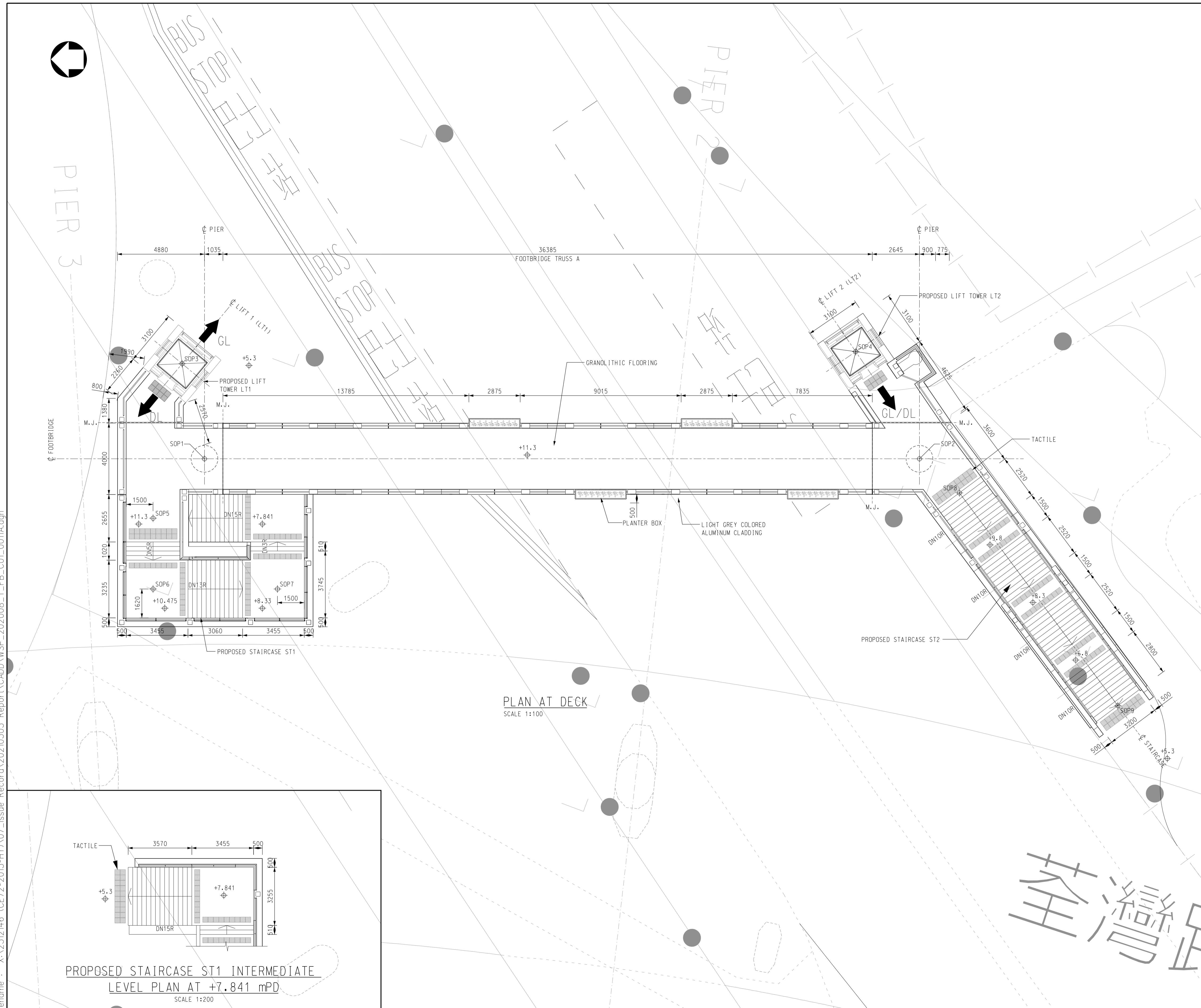
Consultant
wsp

Project title
CONTRACT NO. HY/2020/08
FLYOVER FROM KWAI TSING INTERCHANGE
UPRAMP TO KWAI CHUNG ROAD

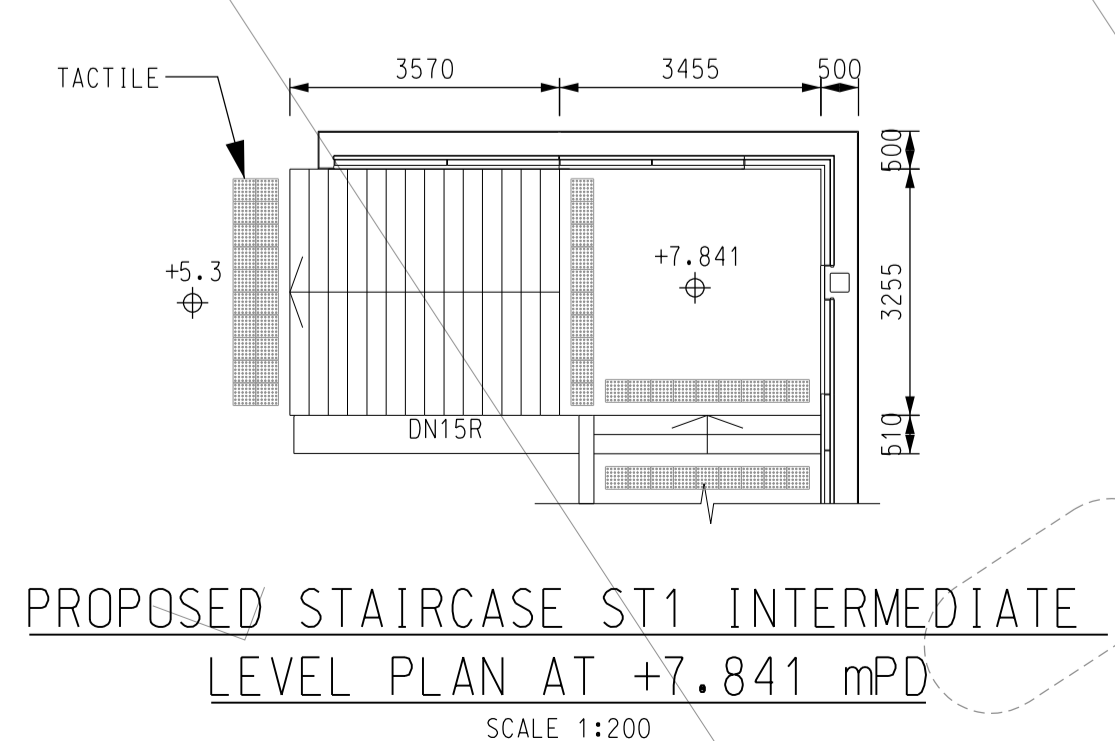
Drawing title
FOOTBRIDGE -
GENERAL ARRANGEMENT
SHEET 1

Drawn	Date	Checked	Approved
CSL	29/11/2019	SH	EW
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Status TENDER			

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PLAN AT DECK
SCALE 1:100

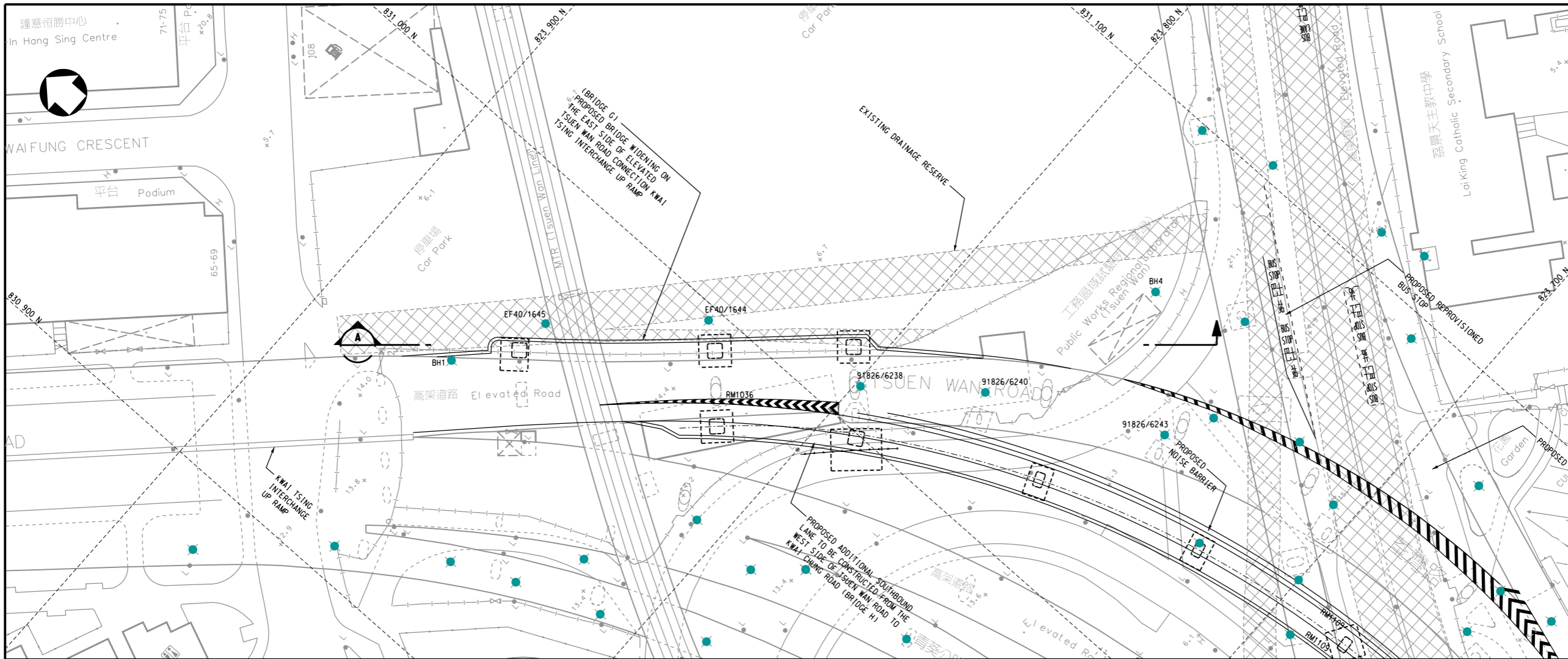


PROPOSED STAIRCASE ST1 INTERMEDIATE
LEVEL PLAN AT +7.841 mPD
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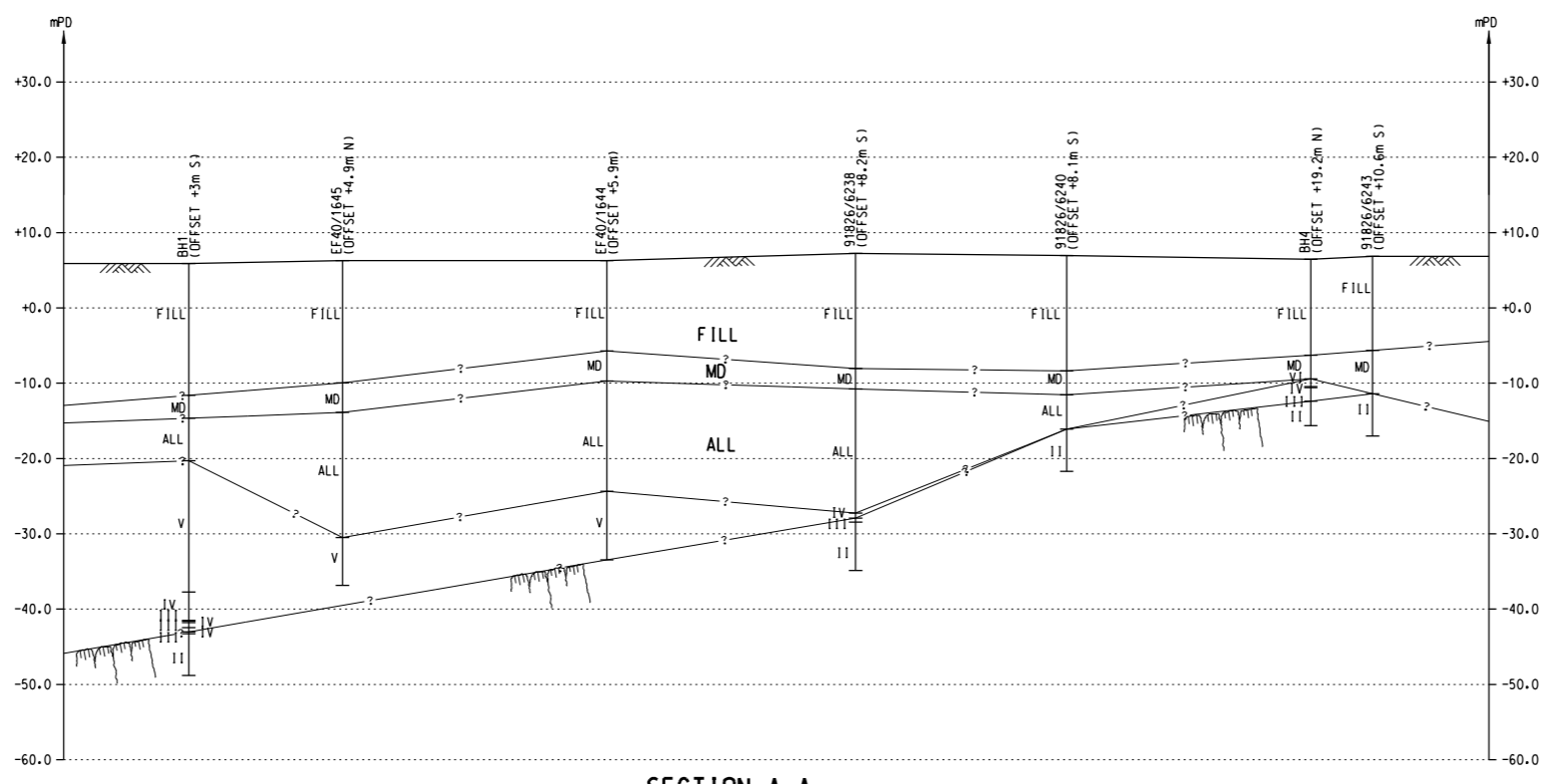
APPENDIX A

GEOLOGICAL SECTION



LEGEND :

FILL	FILL
MD	MARINE DEPOSITS
AL	ALLUVIUM
V	COMPLETELY DECOMPOSED
IV	HIGHLY DECOMPOSED
III	MODERATELY DECOMPOSED
II	SLIGHTLY DECOMPOSED
I	FRESH
	EXISTING BOREHOLE
	INFERRED ROCK HEAD LINE
	INFERRED GEOLOGY BOUNDARY LINE
	PROPOSED COLUMN / PILE CAP



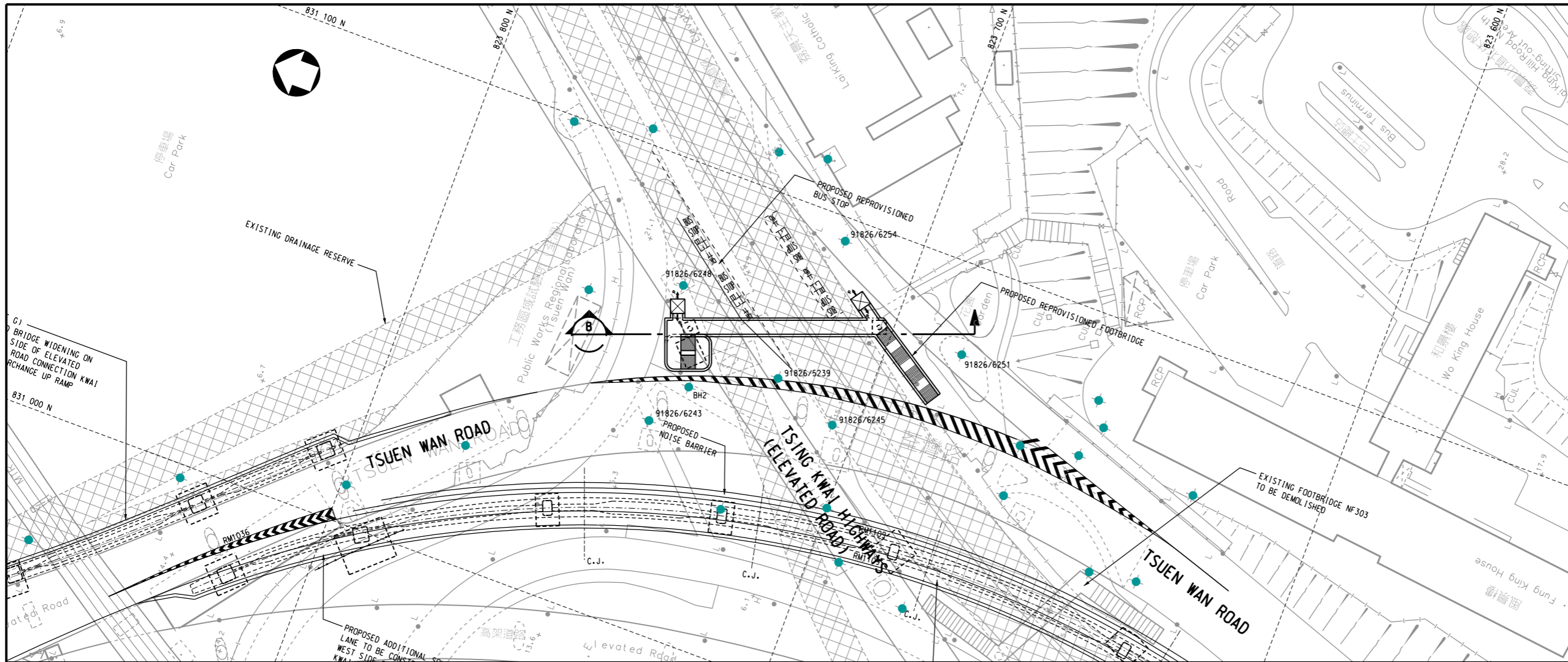
SECTION A-A
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SCALE HOR 1:1000

Rev	Description	By	Date
Consultant			
Project title			
AGREEMENT NO.CE72/2015(HY)			
FLYOVER FROM KWAI TSING INTERCHANGE UP RAMP TO KWAI CHUNG ROAD - DESIGN AND CONSTRUCTION			
Drawing title			
GEOLOGICAL SECTION A			
Drawing no.			Rev.
CE72/GS/001			-
Drawn	Date	Checked	Approved
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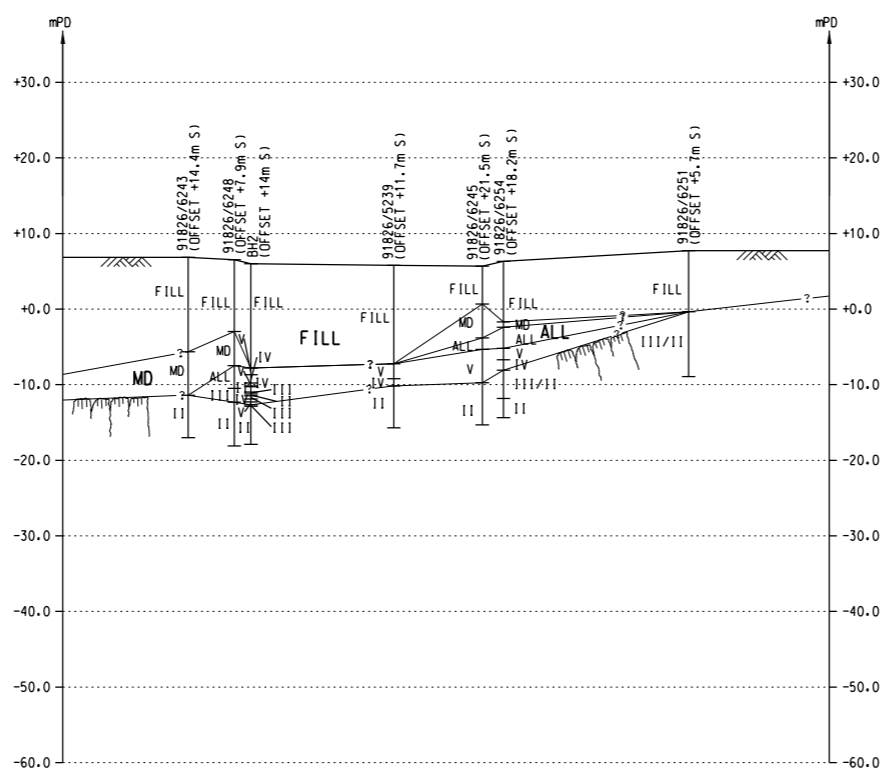


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Date : 19/12/2016
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- LEGEND :**
- FILL FILL
 - MD MARINE DEPOSITS
 - AL ALLUVIUM
 - V COMPLETELY DECOMPOSED
 - IV HIGHLY DECOMPOSED
 - III MODERATELY DECOMPOSED
 - II SLIGHTLY DECOMPOSED
 - I FRESH
 - EXISTING BOREHOLE
 - INFERRED ROCK HEAD LINE
 - INFERRED GEOLOGY BOUNDARY LINE
 - PROPOSED COLUMN / PILE CAP

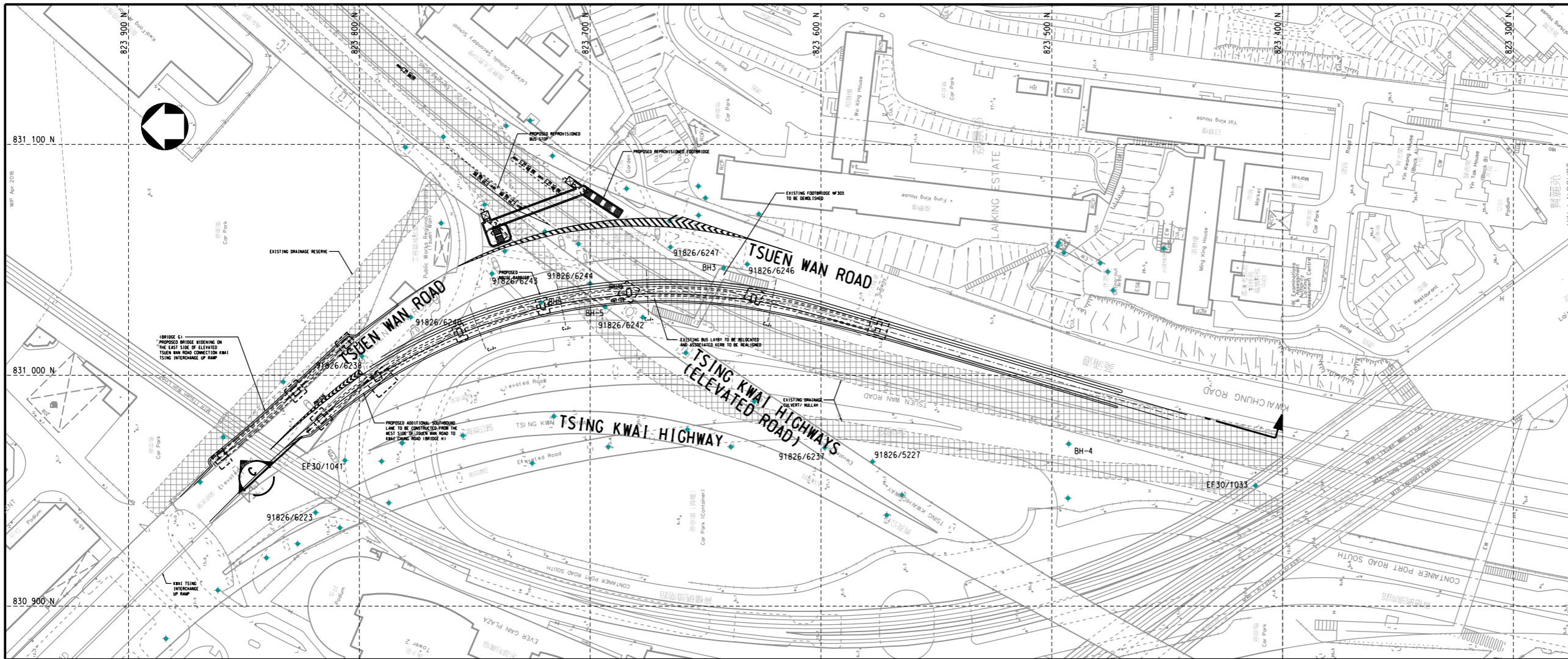


SECTION B-B
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Rev	Description	By	Date
Consultant			
Project title			
AGREEMENT NO.CE72/2015(HY)			
FLYOVER FROM KWAI TSING INTERCHANGE UPRAMP TO KWAI CHUNG ROAD - DESIGN AND CONSTRUCTION			
Drawing title			
GEOLOGICAL SECTION B			
Drawing no.		Rev.	
CE72/GS/002		-	
Drawn	Date	Checked	Approved
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Scale	Status		
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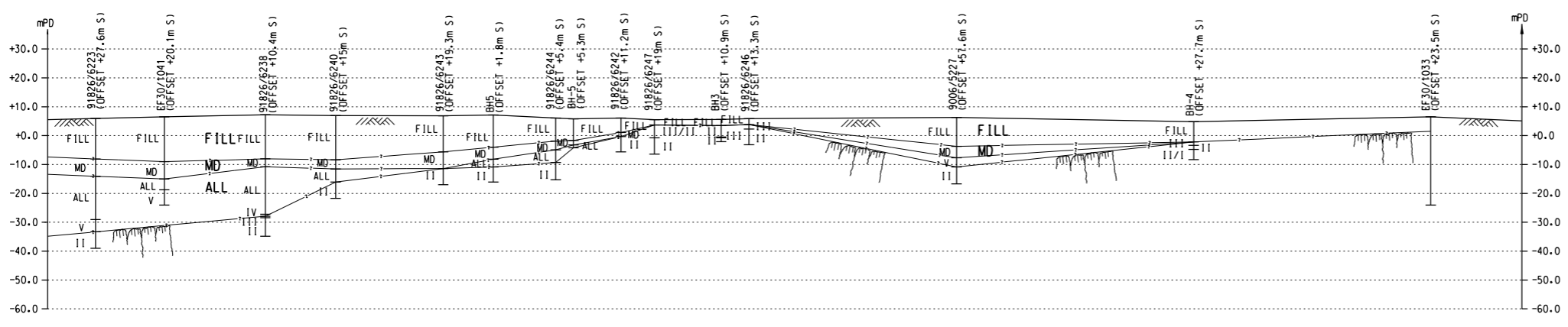
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LEGEND :

FILL	FILL
MD	MARINE DEPOSITS
AL	ALLUVIUM
V	COMPLETELY DECOMPOSED
IV	HIGHLY DECOMPOSED
III	MODERATELY DECOMPOSED
II	SLIGHTLY DECOMPOSED
I	FRESH
	EXISTING BOREHOLE
	INFERRED ROCK HEAD LINE
	INFERRED GEOLOGY BOUNDARY LINE
	PROPOSED COLUMN / PILE CAP



SECTION C-C
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 SCALE HOR 1:2000

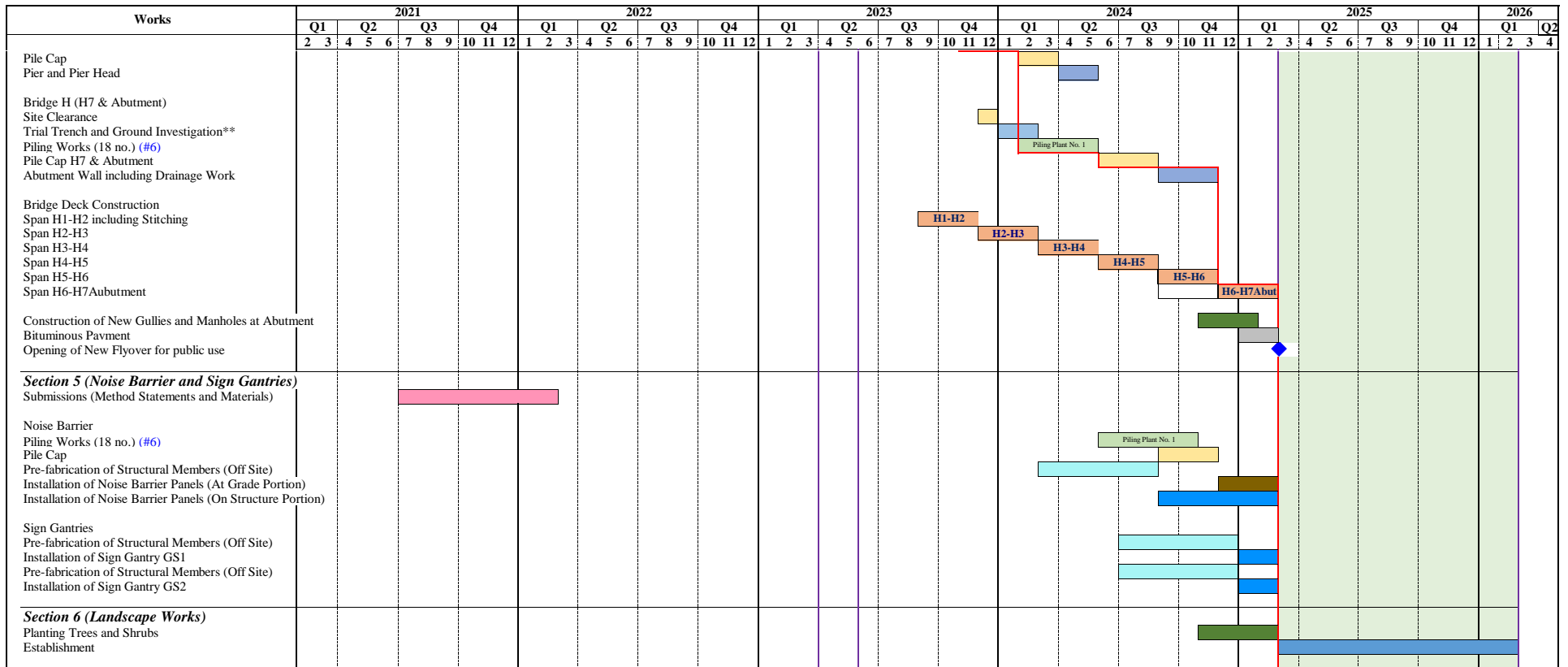
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Consultant			
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Drawing title GEOLOGICAL SECTION C			
Drawing no. CE72/GS/003			Rev. -
Drawn CAD	Date -	Checked -	Approved -
Scale 1:2000 (A3)		Status -	

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APPENDIX B

WORKS PROGRAMME



Complete Section 1 of the Works in 640 days

Completion of Section 2 of the Works in 700 days

Complete Sections 3 to 5 of the Works in 1340 days

Complete Section 6 of the Works in 1705 days

#1 Cable duct laying work by CLP except the location of pile cap at H2 should be completed prior to the commencement of the Contract
 #2 Subject to the site possession of the works area occupied by existing regional laboratory's office

#4 Two sets of piling plant and associated equipment are assumed to work concurrently for G1, G2 & G3
 #5 Two sets of piling plant and associated equipment are assumed to work concurrently for H2, H3 & H4
 #6 One set of piling plant and associated equipment is assumed
 **Including soil sampling and testing and UU diversion