Appendix D

Environmental Review

Prepared for

Prepared by

Ramboll Hong Kong Limited

PLANNING APPLICATION FOR PROPOSED MIXED USE DEVELOPMENT AT HUNG SHUI KIU/HA TSUEN (AREA 32C)

ENVIRONMENTAL REVIEW REPORT

Date	**May 2026**
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Signed	
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Signed	
Project Reference	**SHKHSK32EI00**
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CHAPTERS

TABLES

FIGURES

APPENDICES

1. INTRODUCTION

1.1 Background

1.1.1 The Application Site (Area 32C) is in the southern part of the Hung Shui Kiu / Ha Tsuen New Development Area (HSK/HT NDA). It is zoned as "Commercial (2)" ("C(2)") under the current Hung Shui Kiu / Ha Tsuen Outline Zoning Plan ("OZP") No. S/HSK/3 [or known as "Site 4-12a-1 and 4-12b-1" under the Revised Recommended Outline Development Plan (RODP) of the 2016 HSK NDA Planning & Engineering Study (see **Appendix 1.1**)]. The Application Site is shown in **Figure 1.1**.

1.1.2 Ramboll Hong Kong Limited is commissioned by the Applicant / project proponent to prepare an Environmental Review (ER) for the Proposed Development from an environmental aspect. The Proposed Development scheme adopted in the assessment is provided by the project architect.

1.1.3 The ER includes the following major environmental issues;

i. Qualitative air quality impact on the proposed development

ii. Review of the traffic noise impact from the adjacent road networks on the proposed development; and

iii. Review of the railway noise impact on the Proposed Development.

1.1.4 The Proposed Development will have population intake after completion of infrastructure surrounding the Proposed Development. The existing potential fixed noise sources are expected to be demolished before population intake. The future planned fixed noise sources are expected to comply with Hong Kong Planning Standards and Guidelines (HKPSG) criteria which is 5 dB(A) below Acceptable Noise Levels (ANL) or prevailing background noise. Therefore, adverse fixed noise impact is not expected.

1.2 Proposed Development

1.2.1 The Application Site comprises of 2 sub-sites, namely Application Site 32C – Site A and Application Site 32C – Site B

1.2.2 The master layout plan of the Proposed Scheme is shown in **Appendix 1.2**. Details of Proposed Development are summarized in **Table 1.1** below.

Table 1.1 Development Parameters for Proposed Development in Application Site

Development Parameters		Application Site 32C – Site A	Application Site 32C – Site B
Site Area (m^2)		7,089	10,414
Building Height (mPD)		141	136
GFA (m^2)	Residential	28,005 [1]	0
	Clubhouse	1,260	0
	Office / Hotel / Hostel Development	0	112,019
	Commercial	-- [2]	0
Remark: [1] 28,005m^2 of residential GFA in Application Site 32C – Site A can provide 590 no. of residential units. [2] GFA for non-domestic areas subject to detailed design.			

1.2.3 It is anticipated the Proposed Development will be completed in 2033.

1.3 Key Environmental Issues and Study Approach

1.3.1 Key Environmental issues and concerns as identified for the Project include:

Air

1.3.2 The potential air quality impacts arising from the vehicular emissions of the nearby roads and chimney emissions (if any). The detail will be discussed at **Section 2**.

Traffic Noise

1.3.3 The identified key noise sources in the vicinity of the Application Site include the road traffic noise from nearby road network. Practical noise mitigation measures should be recommended where required in order to satisfy the requirement of the HKPSG. The detail will be discussed at **Section 3.**

Railway Noise

1.3.4 EIA report of Agreement No. CE 2/2011 (CE) Hung Shui Kiu New Development Area Planning and Engineering Study – Investigation (HSK NDA P&E Study) is reviewed. Practical noise mitigation measures should be recommended where required in order to satisfy the requirement of HKPSG and Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Site (IND-TM). The detail will be discussed at **Section 4**.

Fixed Noise

1.3.5 Potential fixed noise sources associated with the proposed Development includes mechanical ventilation and air conditioning (MVAC) system equipment. Other building services equipment, such as water pumps, lift machine etc., will be enclosed within the plant rooms. The planned fixed noise sources shall be designed to meet the HKPSG requirement. With the mitigation measures, it is expected there would be no insurmountable noise impact from fixed noise sources of proposed Development to nearby noise sensitive receivers.

2. QUALITATIVE AIR QUALITY IMPACT ASSESSMENT

2.1 Introduction

2.1.1 This section examines the potential air quality impacts arising from the traffic emissions along the road carriageways in the vicinity of the Application Site.

2.2 Environmental Legislation and Guidelines

2.2.1 The following legislation and regulations provide the standards and guidelines for evaluation of air quality impacts and the type of works that are subject to air pollution control:

- Air Pollution Control Ordinance (APCO) (Cap. 311) and the Air Quality Objectives (AQO)
- Environmental Impact Assessment Ordinance (EIAO) (Cap. 499.S16), EIAO-TM, Annexes 4 and 12
- HKPSG

2.3 Impact of Industrial Emission

2.3.1 No chimney operation is expected within 200m from the Application Site after the completion year of the Proposed Development and the HSK NDA.

2.4 Impact of Vehicular Emission

2.4.1 The HKPSG has provided a set of guidelines to assess the potential air quality impacts generated from traffic. According to Table 3.1 in Chapter 9 of HKPSG, a number of horizontal buffer distance between kerb side of roads and sensitive uses is recommended for various types of road.

2.4.2 The Application Site will be bounded by planned roads (Road D7 and Road L22) which are classified as local distributor and Kong Sham Western Highway which is classified as trunk road. According to the Table 3.1 of Chapter 9 of HKPSG, the recommended buffer distance from local distributor is >5m and from trunk road is >20m for active and passive recreational uses. The roads and their recommended buffer distance are shown in **Figure 2.1**.

2.4.3 In **Figure 2.1**, there is >5m buffer distance from local distributor >20m buffer distance from trunk road and to the development within Application Site 32C – Site A and Application Site 32C – Site B.

2.5 Conclusion

2.5.1 As no openable windows, fresh air intakes and recreational uses in the open spaces fall within the 5m buffer distance from local distributor, the Proposed Development will not be subject to unacceptable air quality impacts.

3. TRAFFIC NOISE IMPACT ASSESSMENT

3.1 Introduction

3.1.1 This section assesses the potential road traffic noise impacts on the noise sensitive uses of the Proposed Development. Practical mitigation measures are proposed to mitigate the potential noise impacts, where necessary.

3.2 Road Traffic Noise Impact Assessment

Assessment Criteria

3.2.1 Noise standards are recommended in Chapter 9, "Environment", of the HKPSG for planning against possible noise impact from road traffic, railway and aircrafts. According to the guidelines, the maximum allowed road traffic noise level, measured in terms of $L_{10(1\ hr.)}$, at noise sensitive facades of the Proposed Development is recommended to be 70 dB(A).

3.2.2 In the present scenario, the maximum noise levels due to traffic on the surrounding roads in terms of $L_{10(1\ hr)}$ should not exceed 70 dB(A) at the noise sensitive facades of the Proposed Development. This criterion applies to uses which rely on opened windows for ventilation.

Traffic Noise Review

3.2.3 The Application Site contains two portions, Site B next to the Kong Sham Westen Highway and Site A is located at the eastern portion of the site. Hotel development is proposed to be located at Site B while two residential towers are proposed at Site A. The residential towers are siting on podium.

3.2.4 The hotel development within Application Site 32C – Site B would be equipped with central air-conditioning and would not rely on openable windows for ventilation. No adverse noise impact is anticipated for Application Site 32C – Site B.

3.2.5 As the typical layout of the residential development within Application Site 32C – Site A is not available at this stage, the detailed traffic noise impact assessment would be carried out during the detail design stage under the lease. Nevertheless, a series of precautionary planning have been adopted to minimize the potential traffic noise impact to the residential towers at Site A.

a. Screening by Noise Tolerant Buildings (Hotel Development)

3.2.6 The hotel development within Application Site 32C – Site B is used to protect the residential building within Application Site 32C – Site A from the road traffic noise, especially road traffic noise from Kong Sham Westen Highway. Placing a noise tolerant building (hotel development) in between the road traffic and the residential building causes the noise in the "shadow zone" to be reduced. This brings a reduction in the traffic noise affecting the residents.

3.2.7 **Appendix 3.1** shows the location of the hotel towers at Site B and residential blocks at Site A. From this figure, it is shown that most of the sensitive façade of the residential blocks at Site A are blocked by the hotel towers, and so these façades are expected not to be experiencing the traffic noise exceedance.

b. Building Orientation

3.2.8 The building shall be oriented so that less noise sensitive uses such as kitchen, bathroom and storerooms are facing the major traffic road noise source (Kong Sham Westen Highway).

3.2.9 **Appendix 3.1** shows that the sensitive facades are facing away from the Kong Sham Western Highway.

c. Podium

3.2.10 There shall be at least 3 storeys of podium (2 storeys of carpark and 1 storey of clubhouse) which can provide shielding against traffic noise from the surrounding roads such as the planned Road D7.

3.2.11 Also, residential tower sitting on the podium would increase the buffer distance from the NSR to the noise source. This will also help in further reduce the traffic noise experienced by the NSR.

d. Acoustic Window/Balcony

3.2.12 In case of any exceedance, mitigation measures, such as acoustic window and balcony shall be applied to further mitigate residual exceedance.

3.2.13 According to EPD's ProPECC PN5/23: Application of Innovative Noise Mitigation Designs in Planning Private Residential Developments against Road Traffic Noise Impact, the acoustic attenuation provided by the acoustic window can reach up to 10.5 dB(A) subject to its design and orientation to the road while that provided by the acoustic balcony can also provide up to 12.5 dB(A) acoustic attenuation based on its design. Therefore, with the adoption of this innovative mitigation measures of acoustic window/balcony, the future occupants would not subject to adverse traffic noise impact.

3.3 Conclusion

3.3.1 As the typical layout of the residential development within Application Site 32C – Site A is not available at this stage detailed calculation on the traffic noise level of the Application Site shall be conducted in next stage to further ensure the traffic noise level would not exceed 70dB(A). To minimize the traffic noise impact to the residential development, the residential building will be screened by the hotel development, building orientation and podium will be considered.

3.3.2 In case of any exceedance, mitigation measures, such as acoustic window and balcony shall be applied.

4. RAILWAY NOISE IMPACT ASSESSMENT

4.1 Introduction

4.1.1 This section assesses the potential railway noise impacts on the noise sensitive uses of the Proposed Development. Practical mitigation measures are proposed to mitigate the potential noise impacts, where necessary.

4.2 Railway Noise Impact Assessment

Assessment Criteria

4.2.1 Noise standards are recommended in Chapter 9, "Environment", of the HKPSG for planning against possible noise impact from road traffic, railway and aircrafts. According to the guidelines, an averaged noise level, measured in terms of $L_{eq\ (24\ hr)}$ is recommended to be 65dB(A) and the maximum noise levels due to rail traffic during the night time (2300 – 0700) in terms of L_{max} is recommended to be 85dB(A).

4.2.2 The EIAO-TM and IND-TM stipulate the appropriate ANL for rail noise. The ANLs are dependent on ASRs of the NSRs and are shown in Table 4.4.

Table 4.1 Acceptable Noise Levels for Railway Noise

Time Period	ANL on Different Area Sensitivity Rating for Rail Noise, (L_{eq}, 30min, dB(A))		
	ASR "A"	ASR "B"	ASR "C"
Day (0700 to 1900 hours)	60	65	70
Evening (1900 to 2300 hours)	60	65	70
Night (2300 to 0700 hours)	50	55	60

Assessment Methodology

4.2.3 With reference to the EIA report of Agreement No. CE 2/2011 (CE) Hung Shui Kiu New Development Area Planning and Engineering Study – Investigation (HSK NDA P&E Study), although the railway noise assessment of the Application Site is not conducted in the HSK NDA P&E Study, the railway noise assessment of nearby sites, including Sites 4-25c and 4-29, are conducted. The railway noise results of the nearby sites under unmitigated scenario are summarized in **Table 4.2** and shown in **Appendix 4.1**.

Table 4.2 Railway noise results of the nearby sites - Unmitigated

Site	NSR ID	Area Sensitivity Rating	Predicted Unmitigated Overall Noise Level, dB(A)			
			L_{eq}, 30min, dB(A)		L_{max}	$L_{eq(24\ hr)}$
			Day & Evening (0700 to 2300 hours)	Night (2300 to 0700 hours)		
4-25c	WR-P6a	B	39-52	38-51	40-57	37-52
	WR-P6b	B	39-52	37-51	39-57	37-52
	WR-P6c	B	38-51	37-49	37-55	37-51
4-29	WR-P7a	B	44-56	43-55	49-63	44-56
	WR-P7b	B	47-59	45-**57** *	50-64	47-59
	WR-P7c	B	45-57	44-**56** *	50-64	45-57

Remark:

* **Bold and underline** indicates exceedance of the related criteria.

4.2.4 As shown in **Table 4.2**, there are exceedance at NSR ID WR-P7b and WR-P7c within Site 4-29, hence, mitigation measures are proposed in the HSK NDA P&E Study. The proposed mitigation measures and the railway noise results of the nearby sites under mitigated scenario are summarized in **Table 4.3**.

Table 4.3 Railway noise results of the nearby sites - Mitigated

Site	NSR ID	Proposed Mitigation Measures	Predicted Unmitigated Overall Noise Level, dB(A)			
			$L_{eq(30min)}$, dB(A)		L_{max}	$L_{eq(24\ hr)}$
			Day & Evening (0700 to 2300 hours)	Night (2300 to 0700 hours)		
4-29	WR-P7b	Layout set back to 70m from Tuen Ma Line (TML)	45-57	44-55	48-61	45-57
	WR-P7c	Layout set back to 70m from Tuen Ma Line (TML)	44-56	43-54	48-61	44-56

4.2.5 As the shortest distance between the WRL and the Application Site (~ 351m) is farther than that between the WRL and the Site 4-29 (55m) as well as the recommended setback (70m) under the EIA, no exceedance on $L_{eq(30min)}$ (Day and Evening hours), L_{max} and $L_{eq(24\ hr)}$ is expected.

4.2.6 Detailed calculation on the railway noise level of the Application Site shall be conducted in next stage to further ensure the railway noise level would not exceed the acceptable noise level of $L_{eq(30min)}$ (Day, Evening and Night hours), L_{max} and $L_{eq(24\ hr)}$. In case of any exceedance, mitigation measures, such as layout set back and acoustic fins or provision of acoustic window/balcony shall be applied.

4.3 Conclusion

4.3.1 It is expected that there is no exceedance on Leq(30min) (Day, Evening and Night hours), Lmax and Leq(24 hr).

4.3.2 Detailed calculation on the railway noise level of the Application Site shall be conducted in next stage to further ensure the railway noise level would not exceed the acceptable noise level of $L_{eq(30min)}$ (Day, Evening and Night hours), L_{max} and $L_{eq(24\ hr)}$. In case of any exceedance, mitigation measures, such as layout set back and acoustic fins or provision of acoustic window/balcony shall be applied.

5. CONCLUSION

5.1.1 The key environmental issues associated with operation phase of the Proposed Development are qualitatively reviewed in this report.

5.2 Air Quality

5.2.1 No air-sensitive uses including openable windows, fresh air intakes and recreational uses in the open spaces are allowed within the buffer distance of the surrounding road, the Proposed Development will not be subject to unacceptable air quality impacts.

5.3 Traffic Noise

5.3.1 Detailed calculation on the traffic noise level of the Application Site shall be conducted in next stage to further ensure the traffic noise level would not exceed 70dB(A). In case of any exceedance, mitigation measures, such as acoustic window and balcony shall be applied with reference to the Practice Note ProPECC PN 5/23.

5.4 Railway Noise

5.4.1 It is expected that there is no exceedance on Leq(30min) (Day, Evening and Night hours), Lmax and Leq(24 hr).

5.4.2 Detailed calculation on the railway noise level of the Application Site shall be conducted in next stage to further ensure the railway noise level would not exceed the acceptable noise level of Leq(30min) (Day, Evening and Night hours), Lmax and Leq(24 hr). In case of any exceedance, mitigation measures, such as layout set back and acoustic fins shall be applied.

5.4.3 In conclusion, there are no environmental impacts for the Proposed Development.

5.5 Fixed Noise

5.5.1 The planned fixed noise sources shall be designed to meet the HKPSG requirement. With the mitigation measures, it is expected there would be no insurmountable noise impact from fixed noise sources of proposed Development to nearby noise sensitive receivers.

Figures

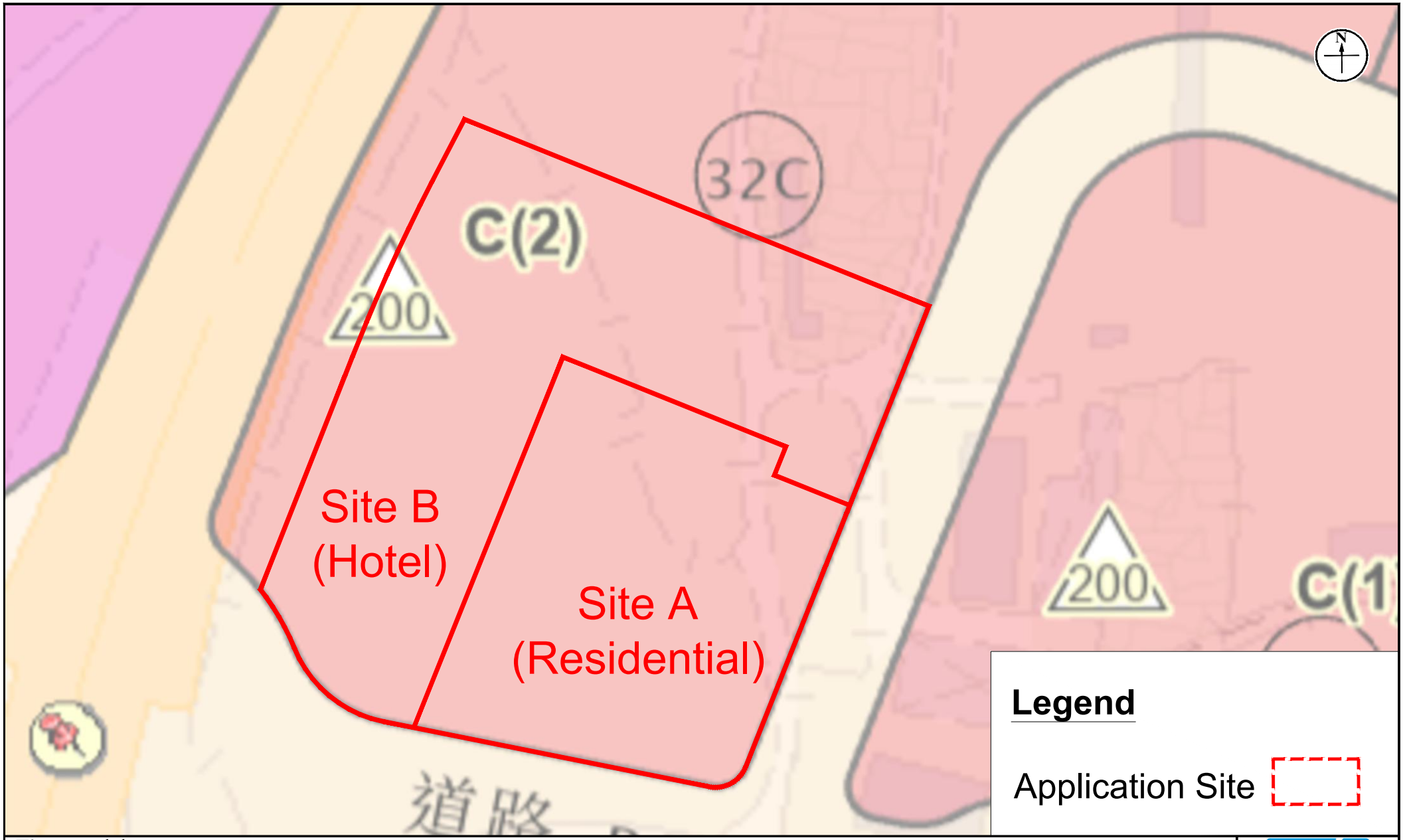

Figure: 1.1	RAMBOLL
Title: Location of Application Site	Drawn by: SC Checked by: TC
Project: Planning Application for Proposed Mixed Use Development at Hung Shui Kiu/ Ha Tsuen (Areas 32C)	Rev.: 1.0 Date: May 2026

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Remark

No air-sensitive uses including openable windows, fresh air intakes and recreational uses in the open spaces are allowed within the buffer zone

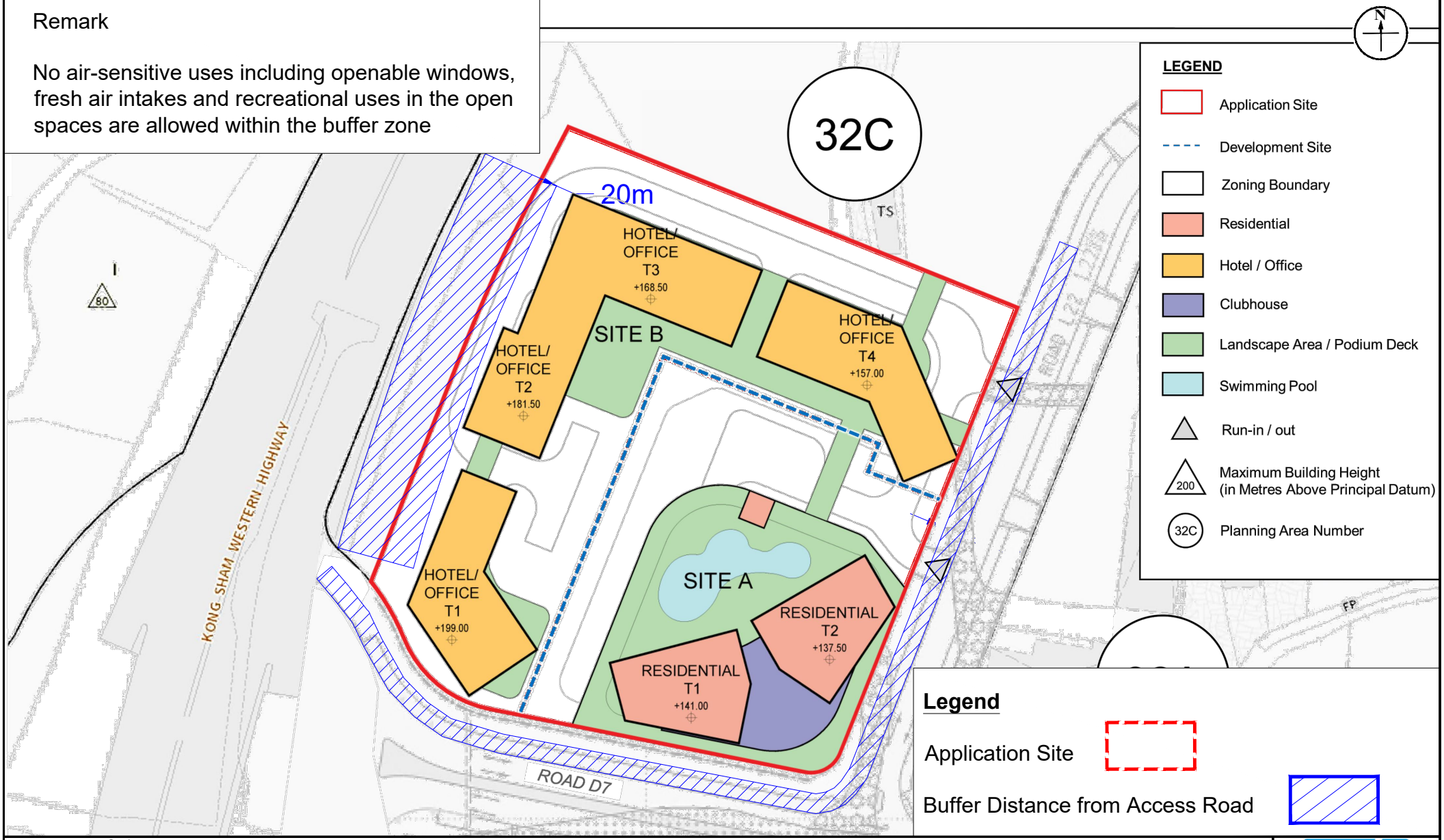

Figure: 2.1

Title: Buffer Distance for the Surrounding Roads

Project: Planning Application for Proposed Mixed Use Development at Hung Shui Kiu/ Ha Tsuen (32C)

RAMBOLL

Drawn by:	SC
Checked by:	TC
Rev.:	1.0
Date:	May 2026

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Appendix 1.1 Revised Outline Development Plan (RODP) for Hung Shui Kiu and Ha Tsuen (No. S/HSK/2) (Southern Area)

NOTE:

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH DRAWING NO. 60222570/TR19A/FIGURE 2.2.

CUT LINE A-A

SEE DRAWING NO. 60222570/TR19A/FIGURE 2.2.1

Application Site

Yuen Tau Shan

Kau Lee Uk Tsuen

San Sang Tsuen

San Uk Tsuen

Sha Chau Lei

Shek Po Tsuen

San Lee Uk Tsuen

Tin Sum Tsuen

Hung Uk Tsuen

Kiu Tau Wai

Chung Uk Tsuen

Sun Fung Wai

Nai Wai

Tsing Chuen Wai

KONG SHAM WESTERN HIGHWAY

CASTLE PEAK ROAD

YUEN LONG HIGHWAY

HUNG FUK ESTATE

COMMUNITY FARMING AND FARMERS' MARKETS

HOSPITAL, SPECIALIST CLINIC/ POLYCLINIC

(COMMERCIAL & RESIDENTIAL DEVELOPMENT WITH LIGHT RAIL FACILITIES)

RETENTION FACILITIES

833000 N

832000 N

816000 E

817000 E

818000 E

ISO A1 594mm x 841mm

Approved:

Checked:

Designer:

Project Management Initials:

Plot File by: ZENGFX
PATH: P:\PROJECTS\60222570\Drawing\REPORT\TR19A\TR19A_714.dgn

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PROJECT
項目

HUNG SHUI KIU NEW DEVELOPMENT AREA PLANNING AND ENGINEERING STUDY - INVESTIGATION

CLIENT
業主

土木工程拓展署
Civil Engineering and Development Department

規劃署
Planning Department

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ISSUE/REVISION
修訂

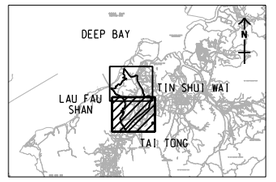
I/R 修訂	DATE 日期	DESCRIPTION 內容摘要	CHK. 核對

STATUS
狀況

SCALE 比例
A3 1 : 10000

DIMENSION UNIT 尺寸單位
METRES

KEY PLAN 索引圖 A3 1 : 500000



PROJECT NO. 項目編號
60222570

AGREEMENT NO. 協議編號
CE2/2011 (CE)

SHEET TITLE
圖紙名稱

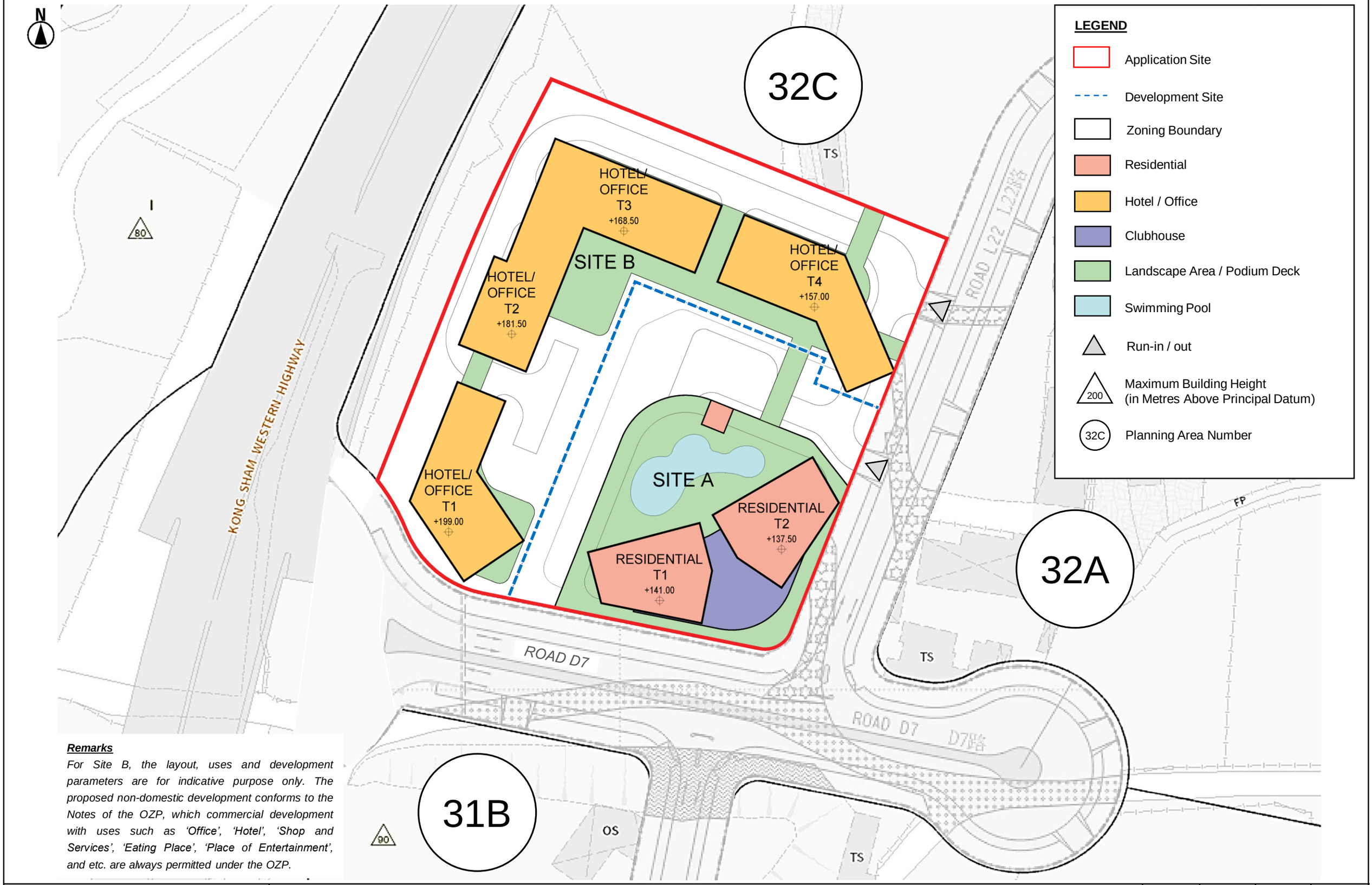
REVISED RECOMMENDED OUTLINE DEVELOPMENT PLAN (RODP) (SOUTHERN AREA)

SHEET 2 OF 2

SHEET NUMBER
圖紙編號

60222570/TR19A/FIGURE 2.2.2

Appendix 1.2 Master Layout Plan of the Proposed Development



Remarks

For Site B, the layout, uses and development parameters are for indicative purpose only. The proposed non-domestic development conforms to the Notes of the OZP, which commercial development with uses such as 'Office', 'Hotel', 'Shop and Services', 'Eating Place', 'Place of Entertainment', and etc. are always permitted under the OZP.

	Title	Checked		Drawn	
	Master Layout Plan	Rev		Date	
		Scale		Figure	

Remarks

For Site B, the layout, uses and development parameters are for indicative purpose only. The proposed non-domestic development conforms to the Notes of the OZP, which commercial development with uses such as 'Office', 'Hotel', 'Shop and Services', 'Eating Place', 'Place of Entertainment', and etc. are always permitted under the OZP.

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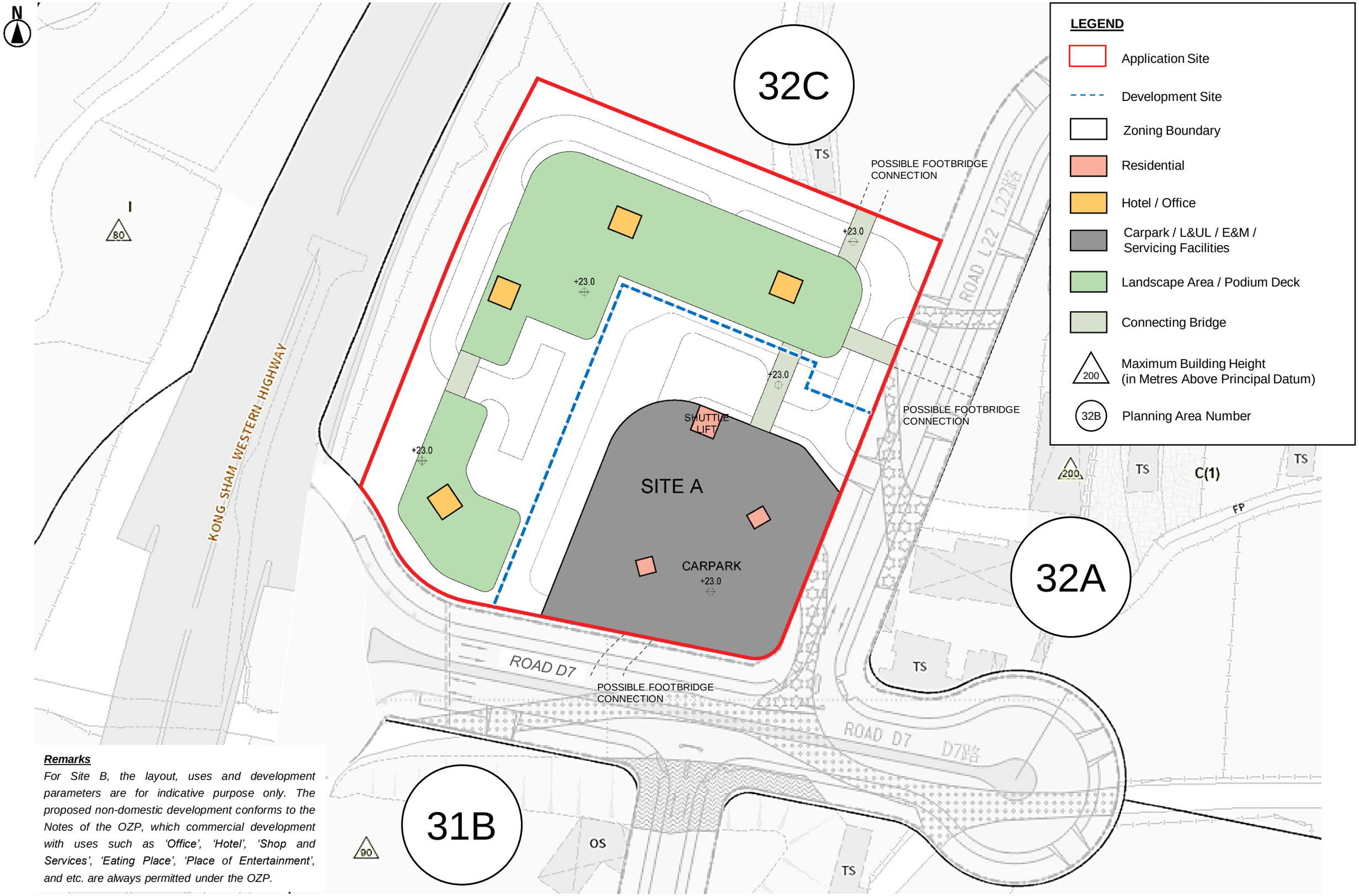
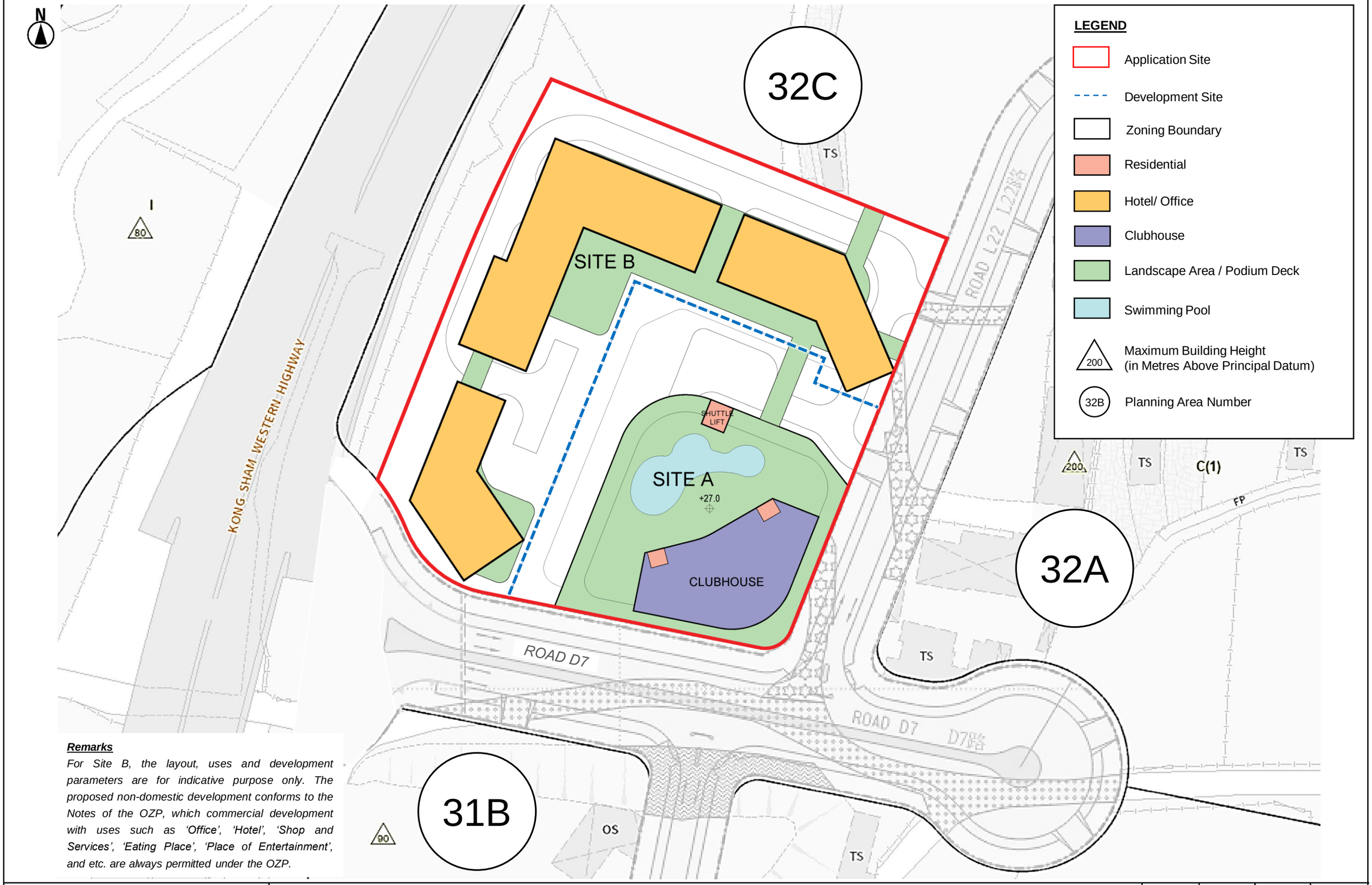
	G/F Plan	Rev		Date	
		Scale		Figure	



Remarks

For Site B, the layout, uses and development parameters are for indicative purpose only. The proposed non-domestic development conforms to the Notes of the OZP, which commercial development with uses such as 'Office', 'Hotel', 'Shop and Services', 'Eating Place', 'Place of Entertainment', and etc. are always permitted under the OZP.

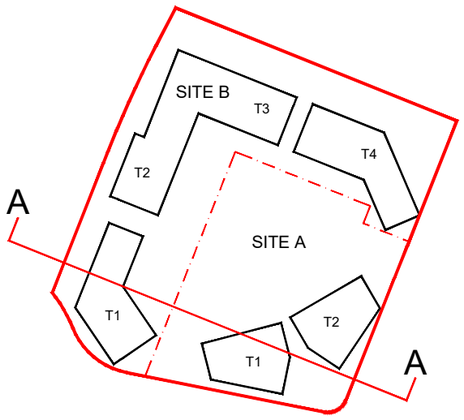
	Title: 1/F Plan	Checked		Drawn	
		Rev		Date	
		Scale		Figure	



Remarks

For Site B, the layout, uses and development parameters are for indicative purpose only. The proposed non-domestic development conforms to the Notes of the OZP, which commercial development with uses such as 'Office', 'Hotel', 'Shop and Services', 'Eating Place', 'Place of Entertainment', and etc. are always permitted under the OZP.

	Title		Checked	Drawn
	2/F Plan		Rev	Date
			Scale	Figure



HOTEL/ OFFICE
T1
(FUTURE)
(AT THE BACK)
+199.00

HOTEL/OFFICE
T2
(FUTURE)
(AT THE BACK)
+181.50

HOTEL/OFFICE
T3
(FUTURE)
(AT THE BACK)
+168.50

HOTEL/ OFFICE
T4
(FUTURE)
(AT THE BACK)
+157.00

SITE B

SITE A

HOTEL/OFFICE
T1
+136.00

HOTEL/OFFICE
T2
(AT THE BACK)
+122.00

HOTEL/OFFICE
T3
+109.00

RESIDENTIAL
T1
+141.00

RESIDENTIAL
T2
(AT THE BACK)
+137.50

+200.0

INDICATIVE
DEVELOPMENT
@ AREA 32A

TRANSFER PLATE

TRANSFERPLATE

+28.0

LOBBY & CLUBHOUSE

LOBBY

+23.0

+23.0

CARPARK

LOBBY

CARPARK &
L&UL

+17.0

+17.0

CARPARK &
L&UL

DOMESTIC
HOTEL/OFFICE
CARPARK/L&UL

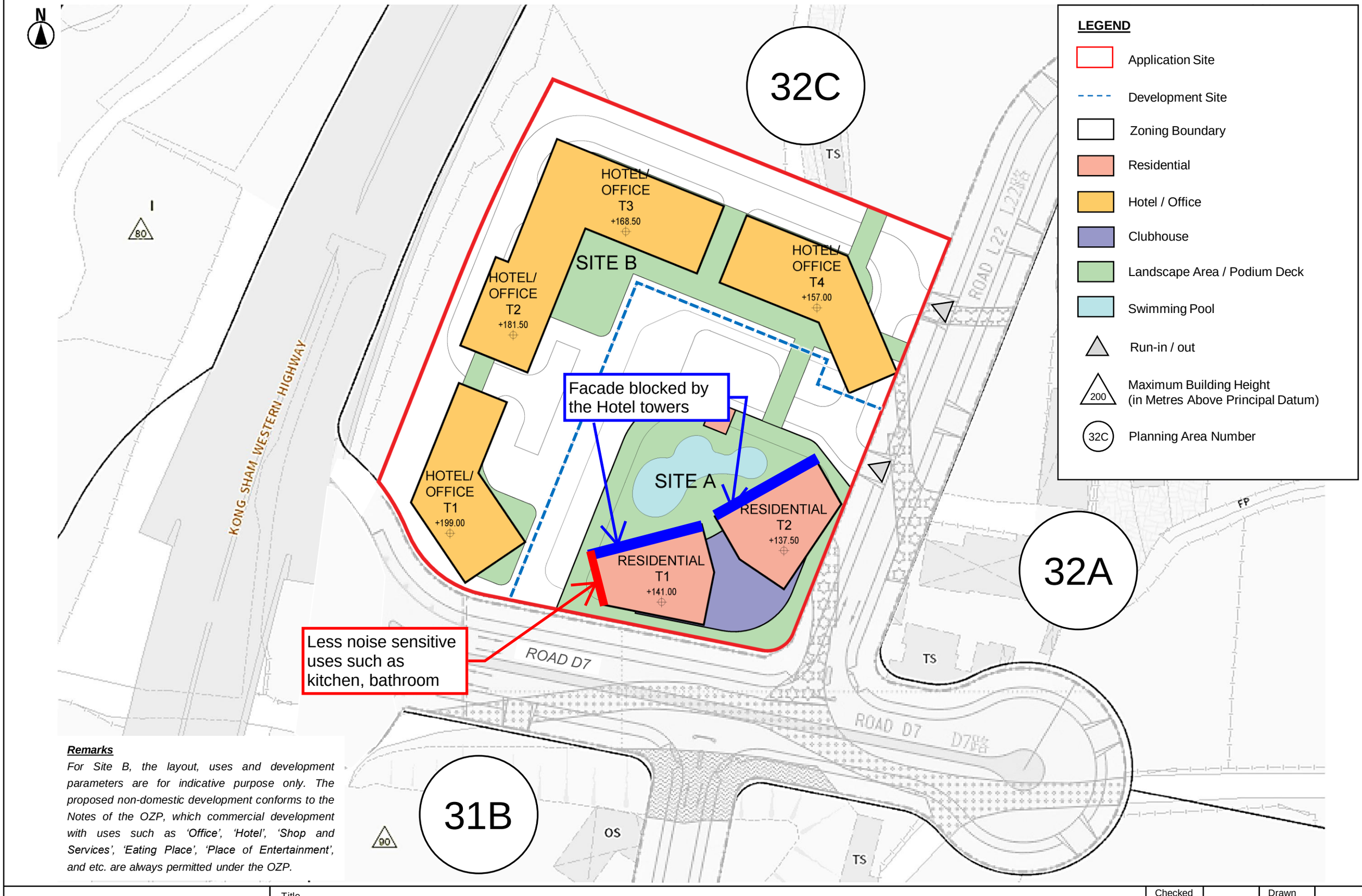
HSK

2026/05/12 1:700(A3)

32C SECTION AA

LWK
+PARTNERS

Appendix 3.1 Precautionary Planning for Traffic Noise



Remarks

For Site B, the layout, uses and development parameters are for indicative purpose only. The proposed non-domestic development conforms to the Notes of the OZP, which commercial development with uses such as 'Office', 'Hotel', 'Shop and Services', 'Eating Place', 'Place of Entertainment', and etc. are always permitted under the OZP.

	Title		Checked	Drawn
	Master Layout Plan		Rev	Date
			Scale	Figure

Appendix 4.1 Railway Noise Result in HSK NDA P&E Study

4.8 Rail Noise Assessment

Assessment Approach and Methodology

Train Noise Source Term for Rail Noise Assessment

4.8.1 The key noise impact from the railway would be the train induced airborne noise at viaduct and at grade section of WRL and LRT respectively across the Project area. Three noise sources have been identified from train operation are listed below:

- Rolling noise from train wheel and rail interaction;
- Noise from air conditioning unit on top of the each train cars; and
- Structure re-radiated noise from the viaduct structure during train passing.

4.8.2 The WRL viaduct structure including the multi plenum system and the above noise source propagation path are further illustrated with diagram in **Appendix 4.8.1**.

WRL Source Terms Reference Review

4.8.3 The rail noise source terms of WRL were referred from the "West Rail Operation Noise Assessment Report" prepared by MTR Corporation Limited in July 2015. The report aims to assess the noise impact of WRL due to the change from 7 cars to 8 cars in accordance with the Environmental Permit (FEP-24/004/1998/J). Noise measurement has been conducted to obtain the in-situ noise source terms for trains running on typical viaduct sections with the installation of multi plenum system. The air conditioning units on top of the WRL train and the structure re-radiated noise from the viaduct were also measured during the study. All three train noise source terms are considered as the latest information and adopted in the WRL noise assessment for this Project.

LRT Source Terms Reference Review

4.8.4 The source term of LRT was adopted from the previous EIA Report No. EIA-027/1999 entitled "Light Rail Transit (LRT) works for Tin Shui Wai Reserve Zone and Grade Separation of the LRT with Pui To Road and Tsing Lun Road in Tuen Mun" under a EIA Study Brief No: ESB-027/1999. The Sound Exposure Level (SEL) of the LRT was evaluated from the Lmax referenced from the previous EIA report. Air conditioning noise and re-radiated noise are considered insignificant contribution compared with the rolling noise of a LRT in this Project.

Rail Noise Assessment Procedures

4.8.5 The rail noise assessment was carried out to assess the worst case scenario under normal, abnormal, transient and emergency operation. The rail noise from the noise source to the NSRs will be corrected by distance, angle of view, barrier, speed, frequency, façade etc. The railway track was divided into segments and the respective noise level of each segment was calculated. The assessment procedure is listed in **Table 4.34** summarised the steps and assumption of the rail noise calculation. Major assessment parameters are including train frequency and speed are provided by MTRC and summarised in **Table 4.35**.

Table 4.34 Rail Noise Assessment Procedures

Description	Assumptions / Remarks	Ref.
Locate the NAPs which would most likely be affected by air-borne noise from the rail operation	The first layer of existing/planned NSRs located in the vicinity of WRL and LRT, have been selected as representative NAPs for rail noise prediction and evaluation	Section 4.4
Identify the train noise sources origination	The rolling noise source is located from the gap between the train and the walkway on the viaduct. Part of the train wheel rail interaction noise had been absorbed by a multi-plenum system and the effect of the system has been included in the source measurement in previous study A/C noise located on the roof of each car and source level was measured in previous study Structural re-radiated noise generated from the vibration of the viaduct during event was measured in previous study	**Appendix 4.8.1**
Identify the train frequency and make appropriate frequency correction	+10 log10 (N) where N = Train frequency per 30 min per Direction	A
Identify the train speed for correction	+20 log10 (V/Vref) where V = Train speed, Vref = Reference train speed	A
Identify the distance from the NSR to the train and make distance correction	-10 log10 (d'/dref) where d' = Slant distance from track to NSR and dref = Reference distance	A

Description	Assumptions / Remarks	Ref.
Identify the train type and the source term of the train	Relevant noise level referred to previous study	B & C
Identify the angle of view and make appropriate angle of view correction	+10 log10 ($\pi\theta/180 - \cos 2\alpha \sin\theta$) -5 where θ= Angle of View and α= Acute angle between a line drawn through the NSR, parallel to the track, and the line bisecting the angle of view, θ	A
Incorporate Façade Correction	+2.5 dB(A)	A
Incorporate Track Wear Correction	+3 dB(A)	A
Incorporate Joint/Turnout Correction	With conservative assumption, +7.0dB(A) for a representative 20 m segment	A
Incorporate Barrier Correction	Shadow Zone: -21dB(A) for δ > 2.5 m where δ is the Path Difference in metre -7.75 log10 (5.2 + 203 δ) dB(A) for 0≤ δ <2.5 m Illuminated Zone: 0dB(A) for δ > 0.4 m 0.88 + 2.14 log10 (10-3 + δ) dB(A) for 0≤ δ <0.4 m	Chart 6(a) of A
Calculate the overall noise level from all rail segments including rolling noise, A/C noise and structural re-radiated noise	Standard acoustic principal	-
Calculate the Lmax	SEL = Lmax + 10log(L/V) +10.5 – 10log[(4D/(4D2+1)) + 2tan-1(1/(2D))]	Equation 15.21 of D
Calculate the Leq, 24hr	Standard acoustic principal	-
Model validation	On site measurement was carried out to record the in-situ noise level and compared against the modelled results.	**Appendix 4.8.2**

Reference:
A - Calculation of Railway Noise (1995).
B - "West Rail Operation Noise Assessment Report" prepared by MTR Corporation Limited in July 2015.
C - "Light Rail Transit (LRT) works for Tin Shui Wai Reserve Zone and Grade Separation of the LRT with Pui To Road and Tsing Lun Road in Tuen Mun" under a EIA Study Brief No: ESB-027/1999.
D - Transportation Noise Reference Book.

Table 4.35 Rail Noise Assessment Input Summary

Parameters	WRL	LRT
Train Type and No. of Car	SP1900, 9 cars total 225 m in accordance with the VEP-45/2001	LRV, 2 cars of total 40 m as conservative scenario
Rolling Noise	SEL Northbound = 81.4 dB(A) [a] SEL Southbound = 80.7 dB(A) [a] (8 cars running 130kph at 25 m)	Lmax = 65 dB(A) [b] (2 cars running 50kph at 25 m)
Air Conditioning Noise	Lmax at Viaduct = 48.8 dB(A) [a] Lmax at Station = 54.8 dB(A) [a] (8 cars at 25 m)	Not applicable as insignificant contribution
Structure Re-radiated Noise	$L_{eq\ 30mins}$ = 40.6 dB(A) Viaduct [a]	Not applicable as LRT in HSK is at grade
Train Frequency per 30 min per Direction	14 number during peak daytime; 10 number during peak night-time	Between Nai Wai LRT Station to HSK LRT Station: Southbound: 20 number during peak daytime; 13 number during peak night-time Northbound: 20 number during peak daytime; 24 number during peak night-time From Tin Shui Wai LRT Station to Hang Mei Tsuen LRT Station: Southbound: 14 number during peak daytime; 13 number during peak night-time Northbound: 14 number during peak daytime; 18 number during peak night-time
Train Frequency per 24hrs both directions	680 trains	Between Nai Wai LRT Station to HSK LRT Station: 917 trains From Tin Shui Wai LRT Station to Hang Mei Tsuen LRT Station: 717 trains
Train Speed	Refer to speed profile in Appendix 2.1 in [a] • Station speed, 50 kph • Approach and leaving Station, 80 kph • Other viaduct section, 100 kph	LRT speed was measured on site. • Section near planned NSR, 60 kph • Section approaching and leaving junctions and stations, 40 kph • Section near NAP LR-E1, 50 kph • Section near NAP LR-E2, 36 kph

Notes:
[a] "West Rail Operation Noise Assessment Report" prepared by MTR Corporation Limited in July 2015.
[b] "Light Rail Transit (LRT) works for Tin Shui Wai Reserve Zone and Grade Separation of the LRT with Pui To Road and Tsing Lun Road in Tuen Mun , 1999".

Proposed HSK Station

4.8.6 A new HSK railway station (HSK Station) is proposed within the Project area. No detail layout is available at this EIA stage. The new station should match the existing West Rail alignment such that station platforms would be constructed on both sides of the tracks (i.e. sided platform design) and enclosed by 4 m screen doors, side wall and top cover. The track section of the station is remain uncovered in the centre. The assumed layout of proposed HSK Station is shown in **Figure 4.8.1**.

4.8.7 As mentioned in **Section 2.4.44**, the proposed HSK Station is a separate DP under Item A.2 of Schedule 2 of EIAO-TM, a separate EIA study would be conducted by the rail operator to fulfil all the statutory requirements and procedures under the Ordinance.

Phasing of HSK Development

4.8.8 The site layouts for rail noise assessment have been confirmed with Planning Department. Commercial developments Site 5-18 of 125 mPD are strategically planned to protect planned residential Site 5-17 of 115 mPD. Therefore Site 5-18 should be developed prior to Site 5-17 in purpose. This phasing approach also applied to the HSK WRL Station which should be developed before or concurrent with the residential development Sites 4-25 and 4-29 nearby. A review would be conducted for the environmental noise performance of the sites if the above development phasing programme cannot meet the specific arrangement.

Prediction and Evaluation of Noise Impacts

WRL Noise

4.8.9 The predicted air-borne noise levels from WRL with respect to the representative site layouts confirmed with relevant departments are presented in **Table 4.36**. The predicted noise level with full mPD level of all NSRs are shown in **Appendix 4.8.3.** Exceedances were predicted at representative NSRs WR-P5d, P5e, P5f, P7b & P7c at night-time period. While exceedance of day time criteria was predicted at WR-P10. It is predicted that a total of about 155 planned dwellings will be exposed to WR noise impact under unmitigated scenario. Mitigation measures are therefore required to reduce the rail noise impact for above NSRs during WRL operation.

Table 4.36 WRL Noise Calculation Summary – Unmitigated

NAP	Description	Area Sensitivity Rating	Noise Criteria, dB(A)		mPD	Leq, 30min, dB(A)		L_{max}, dB(A)	Leq, 24 hrs, dB(A)
			0700-2300 hrs	2300-0700 hrs		0700-2300 hrs	2300-0700 hrs		
Existing WRL NSRs									
WR-E1	Premises to the southwest of Yick Yuen Tsuen	A	60	50	8.7	50	48	57	49
WR-E2	Premises to the east of Oakland Court	A	60	50	8.5	48	47	54	48
WR-E3	Premises to the southwest of Tin Sum Tsuen	A	60	50	7.7	43	41	48	43
WR-E4	Premises to the West of San Lee Uk Tsuen	A	60	50	6.5	47	46	51	47

NAP	Description	Area Sensitivity Rating	Noise Criteria, dB(A)		mPD	Leq, 30min, dB(A)		L_{max}, dB(A)	Leq, 24 hrs, dB(A)
			0700-2300 hrs	2300-0700 hrs		0700-2300 hrs	2300-0700 hrs		
WR-E5	Premises to the West of San Lee Uk Tsuen Block 3,Galore Garden	A	60	50	6.9-9.9	47-48	46-47	52-54	47-48
WR-E6	Shek Po Tsuen Village House Premises to the southwest of Yick Yuen Tsuen Premises to the east of Oakland Court	A	60	50	6.4-15.4	47-49	45-47	51-54	47-49
WR-E7	Premises to the southwest of Tin Sum Tsuen	A	60	50	5.2-8.2	45	44	46-47	45
Project Planned WRL NSRs									
WR-P1	Residential Development in Site 4-6	B	65	55	10.0-141.0	42-52	41-51	42-53	42-52
WR-P2	School in Site 4-8	B	65	[a]	11.0-47.0	42-47	[a]	41-48	42-48
WR-P3	Residential Development in Site 4-10	B	65	55	11.0-166.0	43-54	41-52	43-55	43-54
WR-P4	Residential Development in Site 4-20	B	65	55	11.0-19.0	50-54	48-53	56-62	49-54
WR-P5a	Residential Development in Site 4-22	B	65	55	11.0-127.0	42-53	41-52	48-62	40-53
WR-P5b	Residential Development in Site 4-22	B	65	55	11.0-127.0	41-53	40-51	49-64	40-53
WR-P5c	Residential Development in Site 4-2	B	65	55	11.0-127.0	39-49	39-48	45-60	36-49
WR-P5d	Residential Development in Site 4-22	B	65	55	11.0-127.0	45-58	44-**56**	51-67	44-58
WR-P5e	Residential Development in Site 4-22	B	65	55	11.0-127.0	46-58	45-**57**	51-65	45-58
WR-P5f	Residential Development in Site 4-22	B	65	55	11.0-127.0	47-59	46-**58**	52-66	47-59
WR-P6a	Residential Development in Site 4-25	B	65	55	12.0-178.0	39-52	38-51	40-57	37-52
WR-P6b	Residential Development in Site 4-25	B	65	55	12.0-178.0	39-52	37-51	39-57	37-52
WR-P6c	Residential Development in Site 4-25	B	65	55	12.0-178.0	38-51	37-49	37-55	37-51

NAP	Description	Area Sensitivity Rating	Noise Criteria, dB(A)		mPD	Leq, 30min, dB(A)		L_{max}, dB(A)	Leq, 24 hrs, dB(A)
			0700-2300 hrs	2300-0700 hrs		0700-2300 hrs	2300-0700 hrs		
WR-P7a	Residential Development in Site 4-29	B	65	55	13.0-171.0	44-56	43-55	49-63	44-56
WR-P7b	Residential Development in Site 4-29	B	65	55	13.0-171.0	47-59	45-**57**	50-64	47-59
WR-P7c	Residential Development in Site 4-29	B	65	55	13.0-171.0	45-57	44-**56**	50-64	45-57
WR-P8	School in Site 4-36	B	65	[a]	12.0-48.0	43-52	[a]	46-56	43-52
WR-P9a	Residential Development in Site 5-17	B	65	55	7.0-111.0	42-54	41-53	48-61	42-54
WR-P9b	Residential Development in Site 5-17	B	65	55	7.0-111.0	44-55	42-54	49-62	44-55
WR-P10	School in Site 5-21	B	65	[a]	6.0-43.0	49-**67**	[a]	56-74	48-**67**
WR-P11	School in Site 5-34	B	65	[a]	7.0-43.0	42-46	[a]	42-47	42-46

Notes:
[a] Educational use is not considered as a night-time NSR.
Numbers in bold denote exceedances of the noise criteria.

LRT Noise

4.8.10 The predicted air-borne noise levels from LRT with respect to the representative site layouts confirmed with relevant departments are presented in **Table 4.37**. The full list of predicted levels with respect to mPD is shown in **Appendix 4.8.4.** It is noticed that low level of the NSRs LR-P5a & P6 would exceed the night-time criteria. It is predicted that a total of about 30 planned dwellings will be exposed to LRT noise impact under unmitigated scenario. Mitigation measures are required to reduce the rail noise impact during LRT operation.

Table 4.37 LRT Noise Calculation Summary – Unmitigated

NAP	Site No.	Area Sensitivity Rating	Noise Criteria, dB(A)		mPD	Leq, 30min, dB(A)		Lmax, dB(A)	Leq, 24 hrs, dB(A)
			0700-2300 Hrs	2300-0700 hrs		0700-2300 hrs	2300-0700 hrs		
Existing LRT NSRs									
LR-E1	Parkview Garden Block 24 - 27	C	70	60	12.5-21.5	60-61	60	71-72	59
LR-E2	Tak Cheung Building	C	70	60	11.6-29.6	57-60	57-60	66-70	56-59
LR-E3	Beauty Court Block 1	C	70	60	10.4-46.4	54-57	54-57	61-66	53-56
LR-E4	Coronet Court	C	70	60	10.1-46.1	55-58	55-58	62-67	54-57
LR-E5	Park Nara Tower 1	C	70	60	10.6-46.6	55-58	54-58	62-68	53-57
LR-E6	Village House in Hung Uk Tsuen facing Kiu Hung Road	C	70	60	5.5-14.5	58	58	64	57
LR-E7	Ling Liang Church	C	70	[a]	13.5-16.5	58	[a]	66	56-57
Project Planned LRT NSRs									
LR-P1	Residential Development in Site 4-22	C	70	60	11.0-127.0	48-51	48-51	49-55	46-50
LR-P2	Residential Development in Site 4-26	C	70	60	12.0-152.0	49-54	48-54	48-58	47-52
LR-P3a	Residential Development in Site 4-28	C	70	60	13.0-144.0	51-57	51-57	55-66	50-55
LR-P3b	Residential Development in Site 4-28	C	70	60	13.0-144.0	50-58	50-57	55-68	49-56
LR-P4	School in Site 4-33	C	70	[a]	12.0-48.0	59-64	[a]	69-78	58-63
LR-P5a	Residential Development in Site 5-7b	B	65	55	5.0-142.0	50-55	50-**56**	49-61	50-55
LR-P5b	Residential Development in Site 5-7b	B	65	55	5.0-142.0	49-55	49-55	49-60	49-55
LR-P5c	Residential Development in Site 5-7b	B	65	55	5.0-142.0	48-54	49-55	50-62	49-54
LR-P6	Residential Development in Site 5-9	B	65	55	5.0-152.0	50-56	51-**56**	52-63	50-56

Notes:
[a] Educational use and church is not considered as a night-time NSR.
Numbers in bold denote exceedances of the noise criteria.

Rail Noise Mitigation Measures Options

4.8.11 Based on the assessment results, those rail noise level of exceeding the criteria are less than 3 dB(A), the acoustic fins, non-sensitive use or fixed glazing and layout set back at the NSR are considered effective to reduce the noise impact. Moreover, planning strategy including commercial buildings screening and residential buildings orientation are considered against rail noise during the development of the revised RODP. Predicted noise levels of mitigated NSRs are enclosed in **Appendix 4.8.5**. None of the dwellings will exceed the noise criteria due to rail noise under mitigated scenario.

Architectural Fins

4.8.12 Architectural fins are typical noise mitigation measure for buildings units impacted by traffic or rail noise. For NSR WR-P5d and LR-P5a, 2 m fins has been proposed for the dwellings to narrow the angle of view to the railway track. The noise level of the NSR screened by architectural fins were assessed and the mitigated noise level satisfy the noise criteria as shown in **Table 4.38** and **Figure 4.8.2 – 4.8.4**.

Non-Sensitive Use or Fixed Glazing

4.8.13 For those façade NAP with exceedance, the NAP would be relocated to another positions with smaller angle of view facing the railway and the façade NAP with exceeded the criteria are designed as non-sensitive use or fixed glazing. The noise level of relocated NAPs at WR-P5e, P5f and LR-P6a are satisfied the noise criteria and shown in **Table 4.38** and **Figure 4.8.2 & 4.8.4**.

Layout Setback

4.8.14 Some of the proposed development sites has a potential of shifting the layout as well as set-back away from the existing railway line. The setback provides a sufficient buffer distance and attenuation in terms of noise propagation. It was proposed to setback the layout of Site 4-29 and Site 5-21 from the WRL to a distance of 70 m and 25 m as shown in **Figure 4.8.5 and Figure 4.8.6 respectively**, the assessed noise level at NAP WR-7b, WR-P7c and WR-P10 would satisfy the noise criteria as shown in **Table 4.38**.

Table 4.38 Rail Noise Calculation Summary – Mitigated

NAP	Proposed Mitigation Measures	Noise Criteria, dB(A)		mPD	Leq, 30min, dB(A)		Lmax, dB(A)	Leq, 24 hrs, dB(A)
		Daytime /evening	Night-time		0700-2300 hrs	2300-0700 hrs		
WR-P5d	2 m Architectural fin	65	55	11.0-127.0	42-51	41-50	45-60	37-51
WR-P5e.1	1.5 m Architectural fin + Relocation to non-sensitive use or fixed glazing	65	55	11.0-127.0	43-55	42-54	49-63	43-55
WR-P5f.1	Relocation to non-sensitive use or fixed glazing	65	55	11.0-127.0	45-57	43-55	51-65	44-57
WR-P7b	Layout Set Back to 70 m from WRL	65	55	13.0-171.0	45-57	44-55	48-61	45-57
WR-P7c	Layout Set Back to 70 m from WRL	65	55	13.0-171.0	44-56	43-54	48-61	44-56
WR-P10	Layout Set Back to 25 m from WRL	65	[a]	6.0-43.0	48-63	[a]	54-70	47-63
LR-P5a	2 m Architectural fin	65	55	5.0-142.0	49-54	49-55	49-61	49-54
LR-P6.1	Relocation to non-sensitive use or fixed glazing	65	55	5.0-152.0	48-53	49-54	53-63	48-53

NAP	Proposed Mitigation Measures	Noise Criteria, dB(A)		mPD	Leq, 30min, dB(A)		Lmax, dB(A)	Leq, 24 hrs, dB(A)
		Daytime /evening	Night-time		0700-2300 hrs	2300-0700 hrs		
LR-P6.2	1.3 m Architectural fin + Relocation to non-sensitive use or fixed glazing	65	55	5.0-152.0	47-53	48-54	51-62	47-53
LR-P6.3	Relocation to non-sensitive use or fixed glazing	65	55	5.0-152.0	49-55	49-55	52-63	49-55

Notes:
[a] Educational use is not considered as a night-time NSR.

Rail Noise Impact Assessment for Development Sites

4.8.15 For the new developments in the OZP, the future development proponents should conduct a stand-alone Railway Noise Impact Assessment (RNIA) to assess the potential noise impacts from rail operations on future occupants, and implement the aforesaid or other specific designed noise mitigation measures at their respective development sites to the satisfaction of EPD, to ensure full compliance with the statutory noise limits. The above development requirements would be imposed through relevant Planning Briefs or Land Lease conditions to be fulfilled by the future development proponents. Sites require RNIA include: 4-6, 4-8, 4-10, 4-22, 4-25c, 4-26, 4-28, 4-29, 4-31, 4-32, 4-33, 4-36, 5-7b, 5-9, 5-17, 5-21, 5-32 and 5-34.

Environmentally Friendly Transport Services

4.8.16 An EFTS is proposed to be introduced to operate within the Project. The alignment of EFTS is shown in **Figure 4.8.7.**

4.8.17 Several modes of EFTS, including LRT, trolley bus, automatic people mover (APM), monorails, modern tramway and electric / LPG bus, will be investigated in later stage. No updated information was available at the time of preparing this report. For conservative noise assessment, the rail based EFTS was assumed for rail noise impact assessment. As shown in **Figure 4.8.7**, all of the NSRs are planned with at least 10 m buffer distance from the proposed alignment for EFTS. A reference scheme was developed with the assumptions and assessed level shown in **Table 4.39**.

Table 4.39 Rail based EFTS Reference Scheme

Items	Description
Type of source	Automated guideway transit, steel wheel, welded rail
Noise source level	SEL 80 dB(A) at 50 feet and 50 mph Ref: Table 5-1 Transit Noise and Vibration Impact Assessment FTA-VA-90-1003-06 May 2006 by Office of Planning and Environment Federal Transit Administration
NSR Distance from track	10 m
Operating speed	Assumed 40 kph
Frequency	Assumed 5 trains per headway
Calculated Noise level at NSR boundary	57.2 dB(A) > night-time noise criteria of 55 dB(A)
Track enhancement	• Embedded rail of 3 dB(A) reduction • Green track with vegetation 2 dB(A) reduction Reference material as shown in **Appendix 4.8.6**
Noise level at NSR after track enhancement	< 55 dB(A) complied with night-time noise criteria of HSKNDA

4.8.18 In case a rail cross or joint is designed for the EFTS, such cross joint location should be located at the section with largest distance between the track and the NSR. Alternatively, erect a noise barrier or enclosure at the cross joint section to control the noise impact to the nearby NSRs.

4.8.19 There is no design and operation detail of the EFTS during this Schedule 3 EIA. In any case there are changes to the assumption in **Table 4.39** and causing an exceed of the noise level compared with the criteria, the EFTS project proponent should implement further noise mitigation measures such as noise barrier and enclosure to control the noise impact by the EFTS to satisfy the noise criteria. Noise barrier and enclosure are effective and traditional mitigation measures to reduce rail noise by 10 dB(A) and 15 dB(A) respectively.

4.8.20 As discussed in **Chapter 2** of this report, the proposed EFTS is a Schedule 2 DP under the EIAO. The proposed EFTS will be designed, constructed and operated by the others. The associated environmental impacts will be adequately addressed in a further detailed EIA study to be prepared and submitted under the EIAO by the respective project proponent. Adverse noise impacts from EFTS are therefore not expected.

Cumulative Impact

4.8.21 The existing WRL is running at the centre of the Project area and the LRT is running along Castle Peak Road close to the southern Project area. The cumulative impact is not anticipated by both existing rail to the planned and existing NSRs. However, the proposed EFTS would run from the southern Project area near Nai Wai LRT station to the northern of the Project area and end at TSW Station. As shown in the EFTS alignment, there is potential cumulative rail noise impact to those NSRs by both EFTS, LRT and WRL for Site 4-22 at the southern Project area. If the cumulative noise level to Site 4-22 evaluated by the EFTS project proponent exceeds the noise criteria, the noise level of the EFTS should be further mitigated by means of measure mentioned in **Section 4.8.17** to a level of ANL-10 dB(A) at the Site 4-22 NSR.

Evaluation of Residual Environmental Impacts

4.8.22 WRL would be the major mass transit railway for the Project area. A new HSK Station would be built to serve the community to and from urban area. The operation of WRL will generate noise impact to some of the planned development. Noise control measure should be considered during the planning of the land use and the design of building. Different noise mitigation measures such as layout set back, relocation of noise sensitive uses or implementation of fixed glazing and architectural fins are considered effective mitigation measures. With the mitigation measures in place, the predicted noise level of all dwellings would satisfy the noise criteria in the TM.

4.8.23 LRT will continue running in Castle Peak Road along the southern Project area. Planned developments may expose to the LRT noise without any screening obstacles and result in noise impact. Mitigation measures such as architectural fin and relocation of habitable windows are suggested to abate the rail noise impact.

4.8.24 In conclusion, the future development proponents should conduct a stand-alone Noise Impact Assessment (NIA) to assess the potential noise impacts from rail operations on future occupants, and implement the aforesaid or other specific designed noise mitigation measures at their respective development sites to the satisfaction of EPD, to ensure full compliance with the statutory noise limits. The above development requirements would be imposed through relevant Planning Briefs or Land Lease conditions to be fulfilled by the future development proponents.