

Application No. :
Reference No. :
(For official use)

FORM 5
ENVIRONMENTAL IMPACT ASSESSMENT ORDINANCE
(CHAPTER 499)
SECTION 13(1)

Application for Variation of an Environmental Permit

PART A PREVIOUS APPLICATIONS

No previous application for variation of an environmental permit.
 The environmental permit was previously amended.
Application No. : VEP- 559/2019

PART B DETAILS OF APPLICANT

B1. Name : (person or company)
Drainage Services Department
[Note : In accordance with section 13(1) of the Ordinance, the person holding an environmental permit or a person who assumes responsibility for the designated project may apply for variation of the environmental permit.]
B2. Business Registration No. : [REDACTED]
(if applicable)
B3. Correspondence Address :
[REDACTED]
B4. Name of Contact Person : [REDACTED]
B5. Position of Contact Person : [REDACTED]
B6. Telephone No. : [REDACTED]
B7. Fax No. : [REDACTED]
B8. E-mail Address : (if any) [REDACTED]

PART C DETAILS OF CURRENT ENVIRONMENTAL PERMIT

C1. Name of the Current Environmental Permit Holder :
Drainage Services Department
C2. Application No. of the Current Environmental Permit : EP-456/2013/A
C3. The Current Environmental Permit was Issued in : month / year
03 / 2019

Important Notes : Please submit the application together with
(a) 3 copies of this completed form; and
(b) appropriate fee as stipulated in the Environmental Impact Assessment (Fees) Regulation
to the Environmental Protection Department at the following address :
The EIA Ordinance Register Office,
27th floor, Southorn Centre, 130 Hennessy Road,
Wan Chai, Hong Kong.

Tick (✓) the appropriate box



PART D PROPOSED VARIATIONS TO THE CONDITIONS IN CURRENT ENVIRONMENTAL PERMIT

<p>D1. Condition(s) in the Current Environmental Permit :</p> <p>Figure 2: Works Sections</p>	<p>D2. Proposed Variation(s) :</p> <p>Refer to Section 2.4 of ERR, Figure 2 of the EP to be replaced with Appendix A.2b of the Environmental Review Report (ERR).</p>	<p>D3. Reason for Variation(s) :</p> <p>Refer to Section 1.2 of the ERR.</p>	<p>D4. Describe the environmental changes arising from the proposed variation(s) :</p> <p>Refer to Sections 3 to 9 of the ERR.</p>	<p>D5. Describe how the environment and the community might be affected by the proposed variation(s) :</p> <p>Refer to Sections 3 to 9 of the ERR.</p>	<p>D6. Describe how and to what extent the environmental performance requirements set out in the EIA report previously approved or project profile previously submitted for this project may be affected :</p> <p>As described in Sections 3 to 9 of the ERR, the environmental performance requirements set out in the previously approved EIA report will not be affected by the proposed variation.</p>	<p>D7. Describe any additional measures proposed to eliminate, reduce or control any adverse environmental impact arising from the proposed variation(s) and to meet the requirements in the Technical Memorandum on Environmental Impact Assessment Process :</p> <p>No additional mitigation measures will be required. As the proposed variations will not have implications on the validity of the findings of the approved EIA report, the proposed project still complies with the requirements in the Technical Memorandum on Environmental Impact Assessment Process.</p>
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PART E DECLARATION BY APPLICANT

E1. I hereby certify that the particulars given above are correct and true to the best of my knowledge and belief. I understand the environmental permit may be suspended, varied or cancelled if any information given above is false, misleading, wrong or incomplete.



Signature of Applicant



Full Name in Block Letters



Position



on behalf of Drainage Services Department
Company Name and Chop (as appropriate)

16 August 2021
Date

NOTES :

1. A person who constructs or operates a designated project in Part I of Schedule 2 of the Ordinance or decommissions a designated project listed in Part II of Schedule 2 of the Ordinance without an environmental permit or contrary to the permit conditions commits an offence under the Ordinance and is liable to a maximum fine of \$5,000,000 and to a maximum imprisonment for 2 years.
2. A person for whom a designated project is constructed, operated or decommissioned and who permits the carrying out of the designated project in contravention of the Ordinance commits an offence and is liable to a maximum fine of \$5,000,000 and to a maximum imprisonment for 2 years.





Environmental Review Report

Contract No. DPW 01/2020 Environmental Team for Drainage Improvement Works at Ngong Ping | VEP Application for Additional Jacking Pit

0118/20/ED/0311 00 | 18 August 2021

Formal Submission

Drainage Services Department

Document Control

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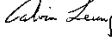
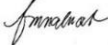


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Client Document No.	00JPZQ in DP R 8/4163CD

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Issue	Date	Status	Comments on Content	Prepared By	Checked By	Approved By
00	18 Aug 2021	For Review	Awaiting EPD comments	SMR	FN/CL	CY

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Executive Summary

Fugro Technical Services Limited was commissioned by Drainage Services Department to carry out an Environmental Review for Contract No. DPW 01/2020 Environmental Team for Drainage Improvement Works at Ngong Ping for the proposed additional Jacking Pit/Receiving Pit in Works Section 6.

The conducted Environmental Review showed that potential impacts and mitigation measures identified and recommended in the approved EIA (Register No. AEIAR-169/2013) report remained relevant and applicable even with the proposed additional Jacking Pit/Receiving Pit. With proper and strict implementation of the listed mitigation measures in the approved EIA Report, potential impacts that may arise from the proposed changes would be insignificant. Hence, no additional surveys are recommended, and no additional mitigation measures are required.

The proposed amendment would not constitute a material change to the environmental impact of the Project.

Summary of the Changes and Potential Environmental Impacts

Proposed Change/s	Sensitive Receiver	Potential Environmental Impacts	Severity of Impact from the Proposed Change
Construction of Additional JP/RP in WS6	Air Quality Impact	<ul style="list-style-type: none"> -No new ASRs will be added; horizontal distance of the proposed additional JP/RP is relatively farther to most of the ASRs -No significant increase of dust emissions with proper implementation of mitigation measures recommended in the EIA -No adverse residual impacts and cumulative impacts is anticipated. 	Insignificant
	Noise Impacts	<ul style="list-style-type: none"> -No new NSRs will be added; -No significant increase of noise emissions as the number and type of PME that will be used shall be the same as with what was initially stipulated in the EIA; mitigation measures will follow the recommended in the EIA. -No adverse residual impacts and cumulative impacts are anticipated. 	Insignificant
	Water Quality Impacts	<ul style="list-style-type: none"> -No additional WSRs -No direct potential impacts as the proposed location of the additional structure will 	Insignificant

Proposed Change/s	Sensitive Receiver	Potential Environmental Impacts	Severity of Impact from the Proposed Change
		not interface with any water course - Will not constitute additional construction activities that will affect water quality - No adverse residual impacts and cumulative impacts are anticipated.	
	Ecology	-Will not infringe the boundary of ecological sensitive receivers -Will not cause direct potential impacts to surrounding floral species of conservation interest; no vegetation clearing -Does not interface with the Ngong Ping Stream where aquatic fauna species of conservation interest were initially identified in the EIA -No adverse residual impacts and cumulative impacts are anticipated.	Insignificant
	Landscape and Visual	-No additional VSRs, LRs and LCAs will be affected -Will not result to permanent loss of landscape resources, loss of visual amenity -Will not lead to permanent visible above-ground structures	Insignificant
	Cultural Heritage	- Will not disturb areas of high archaeological potential -Will not affect sites of archaeological interest - Will not affect any Declared Monuments, proposed monuments, Graded Historic Sites/Buildings, and Government Historic Sites identified by the AMO or Historical villages - No adverse residual impacts and cumulative impacts is anticipated.	Insignificant
	Waste Management	- Additional volume (112 m ³) of C&D materials is	Insignificant

Proposed Change/s	Sensitive Receiver	Potential Environmental Impacts	Severity of Impact from the Proposed Change
		anticipated, however handling of these materials shall still follow the recommendations in the approved EIA report -Will not generate additional type of waste from the previously identified in the EIA	

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1. INTRODUCTION

1.1 Project Background

- 1.1.1 To enhance the capacity of the trunk drainage system and reduce the flood risk in Ngong Ping, long term drainage improvement works are proposed to be implemented under "PWP Item No. 4163CD – Drainage Improvement Works at Ngong Ping" (hereafter referred to as "the Project").
- 1.1.2 The Project is a designated project under Schedule 2 of the Environmental Impact Assessment Ordinance (EIAO) (Cap.499). An Environmental Impact Assessment (EIA) Report (hereafter referred to as the "approved EIA report") together with an Environmental Monitoring and Audit (EM&A) Manual (hereafter referred to as the "approved EM&A Manual") (Register No. AEIAR-169/2013) was prepared for the Project and approved by Environmental Protection Department (EPD) on 21 April 2013. An Environmental Permit (EP) was first issued on 7 August 2013 and its current version (EP No. EP-456/2013/A) as issued on 29 March 2019. These documents are available through the EIAO Register.

1.2 Scope and Purpose of this Document

- 1.2.1 The extraction of the tunnel boring machine (TBM) equipment from the receiving pit at the proposed Outfall B in Works Section 6 (WS6) is anticipated to encounter technical difficulties due to access problem. Given the estimated weight of over 20 tons, extraction of the equipment may require deployment of heavy lifting crane. However, transportation will be constrained by the limited width of the existing access and topographic difference between the receiving pit at the proposed outfall works in WS6. Moreover, temporary widening of the existing access may not be recommended as plant species of conservation interest were identified in the adjacent areas during the updated baseline vegetation survey.
- 1.2.2 Thus, an alternative design scheme was proposed which would require the construction of an additional pit (hereafter referred to as "additional JP/RP") that will serve as receiving pit for the TBM extraction and jacking pit for further pipe jacking to the proposed outfall by hand shield method. The proposed dimension of the additional JP/RP is approximately 7m x 5m with a depth of about 6.06 m. The associated temporary stockpiling area (SA5) of the additional JP/RP is around 3.5m x 5.5m and the works area (WA5) is around 7.5m x 5.5m.

- 1.2.3 This Environmental Review Report (ERR) was prepared by Fugro Technical Services Limited (FTS) for Drainage Services Department (DSD) to determine if the aforementioned alternative design scheme¹ would constitute a material change² to the environmental impact of the Project and to assess if the environmental performance requirements set out in the approved EIA report will be exceeded or violated, even with mitigation measures in place. The guidelines for material change considered in this ERR referred to Section 6 of the EIAO-TM for Material change to a Designated Project or to an Environmental Impact.
- 1.2.4 As the proposed additional JP/RP is located in WS6, the assessment of potential impacts and mitigation measures undertaken for this ERR is limited on this section of the Project only, particularly at a maximum of 500 m Study Area boundary from the proposed additional JP/RP. The proposed amendment is not expected to pose adverse potential impacts in the remaining work sections of the Project.
- 1.2.5 The general layout of the Project is shown in **Appendix A.1**.
- 1.2.6 The proposed location of additional JP/RP is presented in **Appendix A.2**.

1.3 Report Structure

- 1.3.1 Succeeding Section 1 Introduction, the remainder of this ERR is presented as follows:
- a. Section 2: review on the design and construction of the Project and other concurrent projects;
 - b. Section 3-9: review on the potential environmental impacts arising from the proposed change of the Project:
 - Section 3 Air Quality Impact
 - Section 4 Noise Quality Impact
 - Section 5 Water Quality Impact
 - Section 6 Ecological Impact
 - Section 7 Landscape and Visual Impact

¹ The alternative design scheme has been reviewed by the specialist subcontractor of the Contractor, i.e. Victory Trenchless Technology Co. Ltd., and were considered necessary by the professional of the Contractor.

² As defined in Schedule 1 of the EIAO, "material change" means a physical addition or alteration to a designated project which results to an adverse environmental impact as detailed in Section 6 of the EIAO-TM for Material change to a Designated Project or to an Environmental Impact.

- Section 8 Cultural Heritage Impact
 - Section 9 Waste Management
- c. Section 10: presents the conclusion of the Environmental Review.

2. PROJECT DESCRIPTION

2.1 Project Requirements and Programme

2.1.1 The scope of works under the Project includes:

- Construction and operation of a new underground DN 1500-1950 drain pipe of about 440 m long at the Northern side of the Po Lin Monastery (Interception Drain);
- Construction and operation of new underground box culvert of about 223 m long at Northwest of the Po Lin Monastery near Lin Ping Drive (Loop System); and
- Construction and operation of a new underground DN 1800 drain pipe of about 198m long at Northern side of the Ngong Ping 360 Terminal and columbarium (Flood Relief Drain).

2.2 The Study Area and Constraints

2.2.1 The Study Area for the Environmental Impact Assessment is generally defined within 500 m of the Project.

2.2.2 The main environmental constraints, reflected in Figure 6.1 of the EIA report and **Appendix A.3** of this document, include the following:

- Lantau North Country Park (LNCP) – the proposed new underground flood relief drain pipe at the western side of the Ngong Ping 360 Terminal is within the LNCP. However, it should be noted that, the Columbarium area as well as the proposed location of the additional JP/RP is not within the LNCP while part of the segment of the drain pipe immediately to the north of the Columbarium area is within the LNCP;
- Lantau South Country Park (LSCP) – none of the proposed works infringed into the LSCP. Nevertheless, the alignment section of the Project closest to the LSCP is about 400m away from the boundary;
- Ngong Ping Site of Special Scientific Interest (SSSI) – none of the proposed works infringed into the SSSI. However, the alignment section of the Project closest to the SSSI is about 220m apart. The proposed works is downstream of the SSSI;
- Ngong Ping Stream - The upper section of the Ngong Ping Stream (to the south east of the proposed alignment), located within the Ngong Ping SSSI, is natural and listed as an Ecologically Important Streams/Rivers (EIS) under the ETWB TC (W) No. 5/2005. The EIS specification requires enhanced protection and works to be restrained to minimise possible disturbance to the water course. The proposed works are downstream of the EIS section of the Ngong Ping Stream; and

- Conservation Area – A large portion of the areas between the country parks and the existing development are zoned as the Conservation Area under the Ngong Ping OZP (S/I-NP/6). A small part of works area falls within the conservation area.

2.2.3 Based on the current information, no changes have been made for the boundaries of the listed ecological constraints.

2.2.4 Meanwhile, not all of the listed ecological constraints are within the 500 m Study Area of the proposed additional JP/RP. Nevertheless, LCNP, Ngong Ping Stream and the Conservation Area is covered within the Study Area of the proposed additional structure.

2.3 Construction Methods and Sequence of Works

2.3.1 The scope of the selected drainage improvement works under the Project is presented in Figure 1.1 of the EIA (**Appendix A.1 of this ERR**) report and summarised in **Table 2.1**.

Table 2.1: Key Components of the Proposed Works

Location	Works	Approx. Length	Dimensions	Proposed Construction Method
Northern side of the Po Lin Monastery (Upstream Section)	New underground drainage pipe (Interception Drain)	440m	DN1500-1950 drain pipe	Cut-&-Cover excavation (250m) and trenchless method (190m)
Northwest of the Po Lin Monastery near Lin Ping Drive (Midstream Section)	New underground box culvert (Loop System)	223m	49m 2.5m x 2.5m box culvert + 174m 4m x 2.5m box culvert	Cut-&-Cover excavation
Northern side of the Ngong Ping 360 Terminal and Columbarium (Downstream Section)	New underground box drainage pipe (Flood Relief Drain)	198m	DN1800 drain pipe	Trenchless method

2.3.2 The aforementioned works are divided into six work sections (WS) where the interception drain is situated WS1, WS2, and WS3; the Loop System in WS4 and WS5 while the Flood Relief Drain is located in WS6. The types of construction works involved in six main WS are summarised in **Table 2.2** and shown in Figures 2.9a-2.9g of the approved EIA report and shown in **Appendix A.4**.

Table 2.2: Works Sections and Construction Works

Drainage System	Works Section (Chainage)	Location	Works Description
-	2 (A1+60 – A2+10)	Northwest of PLM, around between 法嚴精舍 and 覺淨	-Site clearance and construction of site office (SO). -The area will also be used for stocking of materials. -The size of the SO is about 1350 m ² . -Site hoarding/chain fence will be established around the perimeter.
Interception Drain	1 (A0+00 – A1+20)	Northeast of PLM, around between the water storage tank and 慧海淨舍	-C&C construction of DN 1500-1950mm drain pipe (120m long), manholes and Intake A. -About 120m excavation: 2.5m wide, depth range between 4-6m. -A temporary stockpiling area (SA1) of about 110 m ² at the eastern side of the PLM water storage tank.
Interception Drain	2 (A1+20 –A3+00)	Northwest of PLM, around between 法嚴精舍 and 常樂林	-Construction of DN 1500-1950mm drain pipe (180m long) by trenchless method, associated pits and manholes. -Jacking pit (JP1) at A1+70, about 10m deep. Receiving pit (RP1) at A1+20, about 8m deep. -Receiving pit (RP2) at A3+00, about 8m deep. -Temporary works areas (WA1 of about 130m ² , and WA2 of about 110 m ²) will be established around the two receiving pits.
Interception Drain	3 (A3+00 – A4+40)	Northwest of PLM, about between 常樂林 and north end of Lin Ping Drive	-C&C construction of DN 1500-1950mm drain pipe (150m long) and manholes. -About 150m excavation: 2.5m wide, depth range between 4-6m.
Loop System	4 (B0+00 – B0+45)	North end of Lin Ping Drive	-C&C construction of 2.5m (W) x 2.5m (H) box culvert (45m long) and Intake B. -About 45m excavation: 5.5m wide, depth range between 4-6m. -A temporary stockpiling area (SA2) of about 880 m ² along the alignment. -Intake B at existing open channel.
Loop System	5 (B0+45 –B2+22)	West of PLM, around between north end of Lin Ping Drive and north-east of Walking with Buddha (與佛同行)	- C&C construction of 4.0m (W) x 2.5m (H) box culvert (182m long) and Outfall A. - About 182m excavation: 6.0m wide, depth range between 4-7m.

Drainage System	Works Section (Chainage)	Location	Works Description
			<ul style="list-style-type: none"> -A temporary stockpiling area (SA3) of about 2440m² along the western half of the alignment. - Outfall A at existing gabion channel. -A temporary haul road may be required to allow crossing of the existing open channel.
Flood Relief Drain	6 (C0+00 – C1+96)	North of the Ngong Ping 360 Terminal, around between north of Ngong Ping Village and north of PLM Columbarium. Partly within the Lantau North Country Park.	<ul style="list-style-type: none"> - Construction of DN 1800mm drain pipe (198m) by trenchless method, associated pits, manholes, Intake C and Outfall B. -Jacking pit JP2 at C1+10, about 5m deep. -Receiving pit (RP3) at C0+00, about 5m deep. -Receiving pit (RP4) at C1+96, about 2m deep. -Temporary works areas (WA3 of about 180m², and WA4 of about 100 m²) will be established around the two receiving pits. -A temporary stockpiling area (SA4) of about 300m² at JP2. -Intake C at existing gabion channel. -Outfall B at existing natural stream.

2.3.3 The recommended construction programme is shown in **Table 2.3**.

Table 2.3: Summarised Construction Programme (Tentative)

Main ID	Major Task (1) (2)	Period
1	Site preparation and site office (SO) establishment	Month: 1 - 2.
2	Interception Drain (C&C at Works Sections 1 and 3)	Month: 3 - 15.
3	Loop System (C&C at Works Sections 4 and 5)	Month: 16 - 30.
4	Flood Relief Drain (Pipe jack at Works Section 6)	Month: 3 – 16.
5	Interception Drain (Pipe jack at Works Section 2)	Month: 16 - 28.
6	Demolition of site office, site reinstatement and landscaping work	Month: 29 - 30.

2.4 Current Proposed Change/Variation

- 2.4.1 As aforementioned, an additional pit is proposed to be constructed that will serve as receiving pit for the TBM extraction and jacking pit for further pipe jacking to the proposed outfall. The proposed dimension of the additional JP/RP is approximately 7m x 5m with a depth of about 6.06 m and its associated works area (WA5) is around 7.5m x 5.5m while the temporary stockpiling area (SA5) is around 3.5m x 5.5m. The proposed location of the additional JP/RP is on a concrete paved ground in the road going to the Columbarium of Po Lin Monastery (**Appendices A.2 and A.2b**).
- 2.4.2 Construction of the additional JP/RP shall be undertaken in two months. The construction method will still follow the methodology described in the approved EIA report where DN1800 drain between JP2 and the additional JP/RP will be constructed by TBM pipe jacking method, with JP2 serving as the launching pit for establishment of the TBM. Upon completion of the pipe jacking works, the TBM will then be retrieved from the additional JP/RP. The additional JP/RP will then be used to establish the hand shield tunnelling method for construction of the DN1800 drain between the additional JP/RP and RP4. The construction activities of the additional JP/RP will not overlap with the construction activities of RP4/ Outfall B.

2.5 Concurrent Projects

- 2.5.1 There were no concurrent projects identified in the Study Area that would be in parallel to the proposed drainage improvement works during the EIA.
- 2.5.2 However, based on the latest information for this ERR, potential interfacing project is the minor landscape works by Civil Engineering and Development Department Contract No. CV/2020/05 which includes erosion control, planting on slopes, amenity planting, horticultural maintenance, and other types of landscape works throughout Hong Kong including restricted areas and outlying islands. The landscape improvement works commenced in early 2018 and substantially completed in the same year. Establishment works are now in progress. The as-built Tree Survey Plan of the said contract is shown in **Appendix A.5**.

3. AIR QUALITY IMPACTS REVIEW

3.1 Introduction

3.1.1 The potential air quality impacts identified for both construction and operational phases have been reviewed for the purpose of this ERR. This section details the review on the air quality assessment in the approved EIA report and the potential impacts arising from the proposed additional JP/RP.

3.2 Environmental Legislation, Guidelines and Criteria

3.2.1 According to the approved EIA report, the establishment of the construction phase air quality impact assessment criteria had made reference to the Hong Kong Planning Standards and Guidelines (HKPSG), the Air Pollution Control Ordinance (APCO) (Cap 311), and Annex 4 and 12 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM). The Project works should uphold the Government's policy on air pollution which is to:

- Limit the contamination of the air in Hong Kong, through land use planning and through the enforcement of the APCO, to safeguard the health and well-being of the community; and
- Ensure that the Air Quality Objectives (AQOs) for seven common air pollutants are met as soon as possible

3.2.2 A set of Air Quality Objective (AQOs), stipulates the compliance concentrations for a range of pollutants (**Table 3.1**).

Table 3.1: Hong Kong Air Quality Objectives

Pollutant	Concentration ⁽ⁱ⁾ µg /m ³ Averaging Time				
	1 Hour ⁽ⁱⁱ⁾	8 Hours ⁽ⁱⁱⁱ⁾	24 Hours ⁽ⁱⁱⁱ⁾	3 Months ^(iv)	1 Year ^(iv)
Sulphur Dioxide (SO ₂)	800	-	350	-	80
Total Suspended Particulates (TSP)	-	-	260	-	80
Respirable Suspended Particulates (RSP) ^(v)	-	-	180	-	55
Nitrogen Dioxide (NO ₂)	300	-	150	-	80
Carbon Monoxide (CO)	30,000	10,000	-	-	-
Photochemical Oxidants (as ozone)	240	-	-	-	-

Pollutant	Concentration ⁽ⁱ⁾ µg /m ³ Averaging Time				
	1 Hour ⁽ⁱⁱ⁾	8 Hours ⁽ⁱⁱⁱ⁾	24 Hours ⁽ⁱⁱⁱ⁾	3 Months ^(iv)	1 Year ^(iv)
Lead (PB)	-	-	-	1.5	-
Notes:					
(i) Measured at 298K (25 °C) and 101.325 kPa (one atmosphere)					
(ii) Not to be exceeded more than 3 times per year					
(iii) Not to be exceeded more than once per year					
(iv) Arithmetic means					
(v) RSP means suspended particulates in air with a nominal aerodynamic diameter of 10µm and smaller					
(vi) Photochemical oxidants are determined by measurements of ozone only					

3.2.3 Likewise stipulated in the EIAO-TM, hourly total suspended particulates (TSP) level should not exceed 500 µg/m³ (measured at 25°C and one atmosphere) for construction dust impact assessment.

3.3 Air Sensitive Receivers

3.3.1 Based on the approved EIA report, a total of ten Air Sensitive Receivers (ASRs) are situated within the vicinity of the Project site. Five of these ASRs (Table 3.2) (Appendix B.1) are located within the 500 m boundary identified for the review of air quality impacts that may arise from the construction of the proposed additional JP/RP. Most of the ASRS identified within the assessment area are farther from the proposed additional structure except for ASR1, the Columbarium of Po Lin Monastery, which is situated approximately 20 m to its west. Based on the current information of the area, no ASRs will be added. Likewise, no known planned ASRs are identified.

Table 3.2: Representative Air Sensitive Receivers

ASR	Location	Land use ^[1]	No. of Storeys	Assessment Height (above ground level)	Horizontal Distance to the Proposed Drainage Works (m)	Horizontal Distance to the Proposed Additional JP/RP
ASR1	Columbarium of Po Lin Monastery	--	1	1.5 m	21	20
ASR2	Ngong Ping Village	OU	2	1.5 m	23	170
ASR3	Village House No. 68	GB	2	1.5 m	37	280
ASR4	Village House No. 65	GB	2	1.5 m	31	290
ASR5	Village House No. 49A	GB	2	1.5 m	8	355
Notes:						
Note: [1] -- -- No zoning, OU – Other Specified Uses (Cable Car Terminal), GB – Green Belt, V – Village Type Development, GIC – Government, Institution or Community.						

3.4 Review of Air Quality Impact Assessment in the Approved EIA Report

3.4.1 Identification of Potential Air Quality Impacts

3.4.1.1 The identified major sources of dust nuisance during the EIA were exposed site areas, including the excavation areas, movement of vehicles along unpaved roads, material handling, and wind erosion of the site. The major sources of dust would mainly come from the following construction activities:

- Heavy construction activities such as site clearance, excavation and backfilling activities as a result of the use of cut-and-cover method for open trenches for the construction of the underground drainage pipelines and box culvert;
- Heavy construction activities such as site clearance, excavation and backfilling activities for the construction and reinstatement of the jacking pits and receiving pits for the pipe-jacking process in Work Sections 2 and 6.
- Mucking-out activities at the jacking pits during the pipe-jacking process;
- Loading and unloading activities at the stockpile area;
- Wind erosion at construction sites and stockpile areas.

3.4.1.2 The dust generated during the construction works would not contain a significant proportion of fine particulates (<10 µm) which are deemed to be respirable. Therefore, only the 1-hr average and 24-hr average TSP concentrations, in addition to the annual average TSP concentrations were evaluated during the EIA to assess the short- and long-term dust impact from the Project to the ASRs, respectively.

3.4.2 Assessment Methodology

3.4.2.1 Quantitative assessment for short- and long-term dust impact from the Project was undertaken as detailed in Section 3.7 of the EIA report. The assessment approach was based on the requirements specified in the EIA Study Brief (ESB-227/2011) and in accordance with the criteria and guidelines for assessing air quality impacts as stated in Annex 4 and 12 of the EIAO-TM. The requirements as stipulated under the Air Pollution Control (Construction Dust) Regulation was also followed to ensure that construction dust impacts are controlled to within the relevant standards as stipulated in the EIAO-TM.

3.4.2.2 The emission factors for fugitive dust was determined with reference to the *Compilation of Air Pollution Emission Factors, USEPA AP-42, 5th Edition, January 1995 (AP-42)* and the key assumptions for the calculation of dust emission factors are summarised in Table 3.4 of the EIA report. The Fugitive Dust Model (FDM) was used for the simulation of the construction dust dispersion from the areas of emissions. FDM for modelling construction dust impact assessment is an accepted model for calculating the dust impact for the construction activities and reference was made to the *Guidelines on Choice of Models and Model Parameters* (https://www.epd.gov.hk/epd/english/environmentinhk/air/guide_ref/guide_aqa_model_g1.html).

3.4.2.3 The FDM was undertaken at heights 1.5 m above local ground level to determine maximum cumulative 1-hour, 24-hour, and annual averaged TSP concentrations. The modelling assumed that all construction activities were carried out at the same time to represent the worst-case situation where dust emission sources are distributed across the whole work site area and 100% of the works areas are active. This assumption has made the approach of the assessment more conservative although in actual situation all the construction works would not be carried out at the same time but in phases or in sequences. Moreover, the data at Nei Lak Shan Weather Station was adopted for the modelling as the meteorological data at Ngong Ping Weather Station is less than 90%. Because of the similar height and meteorological characteristics, it is considered that using the data of Nei Lak Shan is appropriate. Uncertainties in the assessment of impacts were considered when drawing conclusions from the assessment and worst-case scenario was adopted.

3.4.3 Assessment Results

3.4.3.1 The unmitigated results of the FDM showed that exceedances will occur for 1-hour in ASR1-ASR5; and 24-hour and annual average maximum cumulative unmitigated TSP Concentrations in ASR3-ASR5 as shown in **Table 3.3**. Therefore, mitigation measures are required to control dust impacts.

Table 3.3: 1-hour, 24-hour and Annual Average Maximum Cumulative Unmitigated TSP Concentrations ($\mu\text{g}/\text{m}^3$) at ASRs (Including Background Level)

Receiver Reference ¹	Predicted Maximum 1-hour Concentration	Predicted Maximum 24-hour Concentration	Predicted Maximum Annual Concentration
Criteria	$500\mu\text{g}/\text{m}^3$	$260\mu\text{g}/\text{m}^3$	$80\mu\text{g}/\text{m}^3$
ASR1	515	121	71.4
ASR2	646	161	72.0
ASR3	1670	377	94.0
ASR4	1514	356	89.4
ASR5	1879	338	107.5

Notes:

1. Representative ASRs within the 500 m boundary of the additional JP/RP
2. Highlighted cells mean exceedance in AQOs.

3.4.3.2 Specific mitigation measures (detailed **Section 3.6 of this ERR**) were assumed in the modelling to reduce the dust generation from the Project to within the 1-hour ($500\mu\text{g}/\text{m}^3$), 24-hour ($260\mu\text{g}/\text{m}^3$) and Annual ($80\mu\text{g}/\text{m}^3$) criteria at ASRs, and were applied for both the short-term Tier 1 and annual TSP predictions.

3.4.3.3 The mitigated results for short-term dust impacts are presented in **Table 3.4**. The results indicate that, for all ASRs, no exceedances of the 1-hour and 24-hour TSP criteria are predicted to occur, even assuming the absolute worst-case situation where 100% of every works site would be active and emitting dust.

Table 3.4: Tier 1 Screening Test: 1-hour and 24-hour Average Maximum Cumulative Mitigated TSP Concentrations (mg/m3) at ASRs (Including Background Level)

Receiver Reference ¹	Predicted Maximum 1-hour Concentration	Predicted Maximum 24-hour Concentration
Criteria	500µgm ⁻³	260µgm ⁻³
ASR1	102	70
ASR2	113	75
ASR3	189	95
ASR4	185	91
ASR5	209	89

Notes:
1. Representative ASRs within the 500 m boundary of the additional JP/RP

3.4.3.4 The mitigated results for maximum predicted annual average TSP concentrations are presented in **Table 3.5**. The predicted annual average maximum cumulative TSP concentrations at representative ASRs showed no exceedances of the annual average TSP criterion are predicted to occur, even assuming the absolute worst-case situation where 100% of every works site would be active and emitting dust, with all impacts being confined to the works area.

Table 3.5: Annual Average Maximum Cumulative Mitigated TSP Concentrations (mgm-3) at ASRs (Including Background Level)

Receiver Reference	Predicted Maximum Annual Concentration
Criteria	80µgm ⁻³
ASR1	65.6
ASR2	65.7
ASR3	67.9
ASR4	67.5
ASR5	69.1

Notes:
1. Representative ASRs within the 500 m boundary of the additional JP/RP

3.4.3.5 The results of the FDM presented the effectiveness of the mitigation measures to significantly reduce TSP concentrations well below its respective AQO during construction works even if 100% of the works areas are active. Furthermore, emission rate is significantly reduced in the mitigated scenario as detailed in the emission inventory detailed in Appendix B2 of the approved EIA report and **Appendix C.1 of this ERR**.

3.5 Review of Potential Air Quality Impacts Associated with the Proposed Additional JP/RP

- 3.5.1 Based on the proposed change, the construction of the additional JP/RP is likewise anticipated to generate dust emissions. Dust emissions will likewise come from construction activities such as excavation and backfilling activities for the construction and reinstatement of the additional JP/RP, mucking out activities during pipe-jacking process, loading and unloading activities at the stockpile area, and wind erosion at the works and stockpiling areas. However, in the assessment of potential air quality impacts that may arise from the proposed additional structure, it shall be noted that most of the ASRs (ASR2-ASR5) are relatively far from the proposed works of the additional JP/RP (approximately 170 m or more). With the localized and small excavation area (35 m²) of the additional JP/RP, adverse dust impacts to these ASRs due to the proposed additional JP/RP are not anticipated.
- 3.5.2 Meanwhile, the nearest ASR to the proposed JP/RP is ASR1 Columbarium of Po Lin Monastery (approximately 20 m). However, it can be presumed that the potential air quality impacts due to additional JP/RP will be relatively lesser comparing to other Work Areas in the Project given its smaller scale (the proposed WA5 of the additional JP/RP is only approximately 35 m² while WA1 is about 130 m², WA2: 110 m², WA3: 180 m², and WA4: 100 m²) and its nature of construction works which will only involve pit excavation, delivery of precast element, pipe jacking and back-filling. Moreover, the proposed additional JP/RP is located in a concrete paved ground.
- 3.5.3 Furthermore, it should be noted that on regular days, ASR1 has one or two maintenance staff and has few infrequent visitors that are transitory in nature. These receivers are concealed within the enclosed walls of the columbarium and will only be exposed to potential dust impacts from the additional JP/RP in the front entrance door and along their path when going to the columbarium. Possible increase in visitors to ASR1 is anticipated, though, during Ching Ming Festival and Chung Yeung Festival. However, construction of the additional JP/RP will be sequenced to not overlap with these festival periods. With the low number of receivers, occasional nature of visits, and wall enclosure, potential dust impacts to receivers in ASR1 would be considered minimal.
- 3.5.4 Based on the proposed change, the construction of the additional JP/RP is likewise anticipated to generate dust emissions. It should be noted however, that emissions from the construction of the proposed additional structure should be relatively lesser than the other Work Areas in the Project given its smaller scale (approximately 35 m²), its works nature and its proposed location, being situated in a hard-paved area. Hence, based on the local conditions of the site, scale of the structure, and the capacity of the proposed mitigation measures listed in the approved EIA Report to significantly reduce the TSP concentrations to well below its respective AQO, adverse air quality impacts from dust emissions is not anticipated to occur due to the proposed additional JP/RP.

3.6 Review on the Mitigation Measures

- 3.6.1 Mitigation measures have been laid out in Section 11 of the approved EIA report to reduce the dust generation from the works of the Project to below their respective 1-hour ($500\mu\text{g}\text{m}^{-3}$), 24-hour ($260\mu\text{g}\text{m}^{-3}$), and annual ($80\mu\text{g}\text{m}^{-3}$) criteria and mitigate potential dust impacts to the identified ASRs.
- 3.6.2 The specific mitigation measure to minimise dust impacts is watering once per hour for 12 hours a day at exposed soil in all active works areas and paved haul roads will reduce dust emissions by 91.7%. The amount of water to be applied would be $0.25\text{L}/\text{m}^2$ for the respective watering frequency. During construction of additional JP/RP, WA5 and haul roads, particularly the concrete paved road to the Columbarium, will be watered with the same frequency and amount to mitigate dust impacts to ASR1.
- 3.6.3 To further reduce dust impacts, dust suppression measures stipulated in the Air Pollution Control (Construction Dust) Regulation and good site practices such as below should likewise be followed:
- Use of regular watering to reduce dust emissions from exposed site surfaces and unpaved roads, particularly during dry weather;
 - Use of frequent watering for particularly dusty construction areas and areas close to ASRs;
 - Side enclosure and covering of any aggregate or dusty material storage piles to reduce emissions. Where this is not practicable owing to frequent usage, watering shall be applied to aggregate fines;
 - Open stockpiles shall be avoided or covered. Prevent placing dusty material storage piles near ASRs;
 - Tarpaulin covering of all dusty vehicle loads transported to, from and between site locations;
 - Establishment and use of vehicle wheel and body washing facilities at the exit points of the site;
 - Imposition of speed controls for vehicles on unpaved site roads, 8 km per hour is the recommended limit;
 - Routing of vehicles and position of construction plant should be at the maximum possible distance from ASRs;
 - Every stock of more than 20 bags of cement or dry pulverised fuel ash (PFA) should be covered entirely by impervious sheeting or placed in an area sheltered on the top and the 3 sides;

- Cement or dry PFA delivered in bulk should be stored in a closed silo fitted with an audible high-level alarm which is interlocked with the material filling line and no overfilling is allowed; and
- Loading, unloading, transfer, handling or storage of bulk cement or dry PFA should be carried out in a totally enclosed system or facility, and any vent or exhaust should be fitted with an effective fabric filter or equivalent air pollution control system.

3.6.4 It is noted, however, that possible increase in visitors to the ASR1 is anticipated during Ching Ming Festival and Chung Yeung Festival. As discussed in **Section 3.5.3 of this ERR**, construction of the additional JP/RP will be sequenced to not overlap with these festival periods. Moreover, during the construction period for pipe jack at WS6, most of these activities are underground and will have minimal impact to ASR1.

3.6.5 The recommended mitigation measures laid-out in the approved EIA report are likewise applicable and relevant to minimise the potential impacts on air quality that may arise from the construction of the additional JP/RP. Hence, no additional mitigation measure is recommended. Notwithstanding, the approved EM&A programme will be implemented to ensure all mitigation measures are effective.

3.6.6 Moreover, the effectiveness of these mitigation measures was exhibited by the results of the FDM which showed that with the application of these mitigation measures TSP concentrations will be reduced to well below its respective AQO during construction works even if 100% of the works areas are active. Furthermore, the said measures have been tried and tested techniques used extensively throughout Hong Kong construction projects, thus, the level of uncertainty of their effective implementation would be small.

3.7 Cumulative Impacts

3.7.1 Minor Landscape Works by CEDD

3.7.1.1 The minor landscaping works adjacent to the proposed of the additional JP/RP have potential cumulative impacts on air quality. The key sources of these impacts include dust emissions from drilling works, amenity planting and construction of water mains, as well as gaseous emissions from vehicles. However, considering the small scale of the works to be undertaken, no significant impacts is anticipated. With the implementation of dust suppression measures, unacceptable cumulative impact would not arise.

3.7.2 Other Construction Works in WS6 Concurrent with the Construction of Additional JP/RP

3.7.2.1 Construction of the additional JP/RP shall be undertaken in two months. No construction activities of the additional JP/RP will overlap with the construction activities of RP4/ Outfall B as described in **Section 2.4.2 of this ERR**. Nonetheless, there will be an overlap of schedule of about one month for construction of manhole at L305 and at L305A, which may have potential cumulative air quality impacts that may arise generally from the construction activities. However, considering the distance between these two structures (approximately 160 m) and with the implementation of mitigation measures recommended in the approved EIA report, unacceptable cumulative impact to nearby identified ASRs is unlikely.

3.8 Residual Impacts

3.8.1 With strict implementation of the recommended mitigation measures, no construction dust is predicted to affect the health and welfare of the local community. Moreover, no residual impacts will be anticipated in the construction of the proposed additional JP/RP.

3.9 Environmental Monitoring and Audit Requirements

3.9.1 To ascertain that the mitigation measures recommended are properly undertaken during the construction phase of the Project, site audits shall be undertaken. No changes of the EM&A requirements as recommended in Section 3.11 of the approved EIA report and Section 2 of the approved EM&A Manual is proposed.

3.10 Conclusion

3.10.1 A review of the potential air quality impacts has been conducted for the proposed additional JP/RP. Based on the review of the current information, the potential impacts on air quality anticipated to arise from the proposed additional JP/RP will result from dust emissions from various construction activities. However, there will be no increase in dust emissions that will likely violate the guidelines or criteria set in Annex 4 and 12 of the EIAO-TM. Furthermore, no additional potential impact is anticipated and no additional ASRs, existing or planned, are noted within the vicinity of the proposed additional structure. Hence, no additional mitigation measures and EM&A requirements will be recommended. Therefore, it can be deduced that the air quality impact assessment conducted during EIA are still relevant and recommendations are still applicable and valid and no additional assessments will be conducted.

3.11 Supplementary Reference

3.11.1 To further demonstrate that the dust impact to the ASRs would still meet the current AQO (effective on January 2014) and will not likely violate the guidelines or criteria set in Annex 4 of the EIAO-TM even with additional dust emissions from the proposed additional JP/RP, air quality impact assessment of this Project was compared to another project (with approved EIA report) with roughly similar scope of work and sources of emissions but in a larger scale. The reference AQOs and criteria set in Annex 4 of the EIAO-TM are shown in **Table 3.6**.

Table 3.6: Summary of Reference AQOs and the criteria for evaluating air quality impact (Annex 4 of the EIAO-TM)

Hong Kong Air Quality Objectives (January 2014)			
Pollutant	Averaging time	Concentration limit (Number of exceedances allowed
¹ Respirable suspended particulates (PM ₁₀)	24-hour	100	9
	Annual	50	Not applicable
² Fine suspended particulates (PM _{2.5})	24-hour	75	9
	Annual	35	Not applicable
Criteria set in Annex 4 of the EIAO-TM			
Hourly Total Suspended Particulate concentration of 500 µg/m ³ measured at 298K (25°C) and 101.325 kPa (one atmosphere)			
Notes:			
1. Respirable suspended particulates means suspended particles in air with a nominal aerodynamic diameter of 10 µm or less.			
2. Fine suspended particulates means suspended particles in air with a nominal aerodynamic diameter of 2.5 µm or less.			

To account for local conditions, project in Southern Lantau was selected. Based on the available approved EIA report, the most plausible project to compare with is the Outlying Islands Sewerage Stage 2 - Upgrading of Tai O Sewage Collection, Treatment and Disposal Facilities (AEIAR-209/2017). As presented in Table 3.7 of this ERR and Figure 3.11 of the approved EIA report (AEIAR-209/2017), the relevant scope of Upgrading of Tai O Sewage Collection, Treatment and Disposal Facilities that is comparable to the construction works for the additional JP/RP is the construction of approximately 100 m in length of twin sewer rising mains with size 100 mm diameter along Tai O Road underneath the section of Tai O Creek near Tai O Fire Station (TOFS) by trenchless method. The modelling results for the hypothetical unmitigated and mitigated scenarios for 1-hour TSP, daily averaged RSP, daily averaged FSP, annual averaged RSP and annual averaged FSP concentrations in TOFS were referred to in the assessment (**Appendix D**).

- 3.11.2 It should be noted that the nearest ASR to the relevant twin sewer rising mains is the Tai O Fire Station (TOFS) which is approximately 17 m from the trenchless construction works, which would involve excavation, pipe jacking and backfilling works for the construction and reinstatement of jacking and receiving pits at the riverbank of Tai O Creek in close proximity to TOFS. The estimated size of the jacking and receiving pit near the Tai O Fire Station should likewise be just about the size of the proposed additional JP/RP, which is the minimal size requirement for equipment deployment. Based on results of the Quantitative Construction Dust Impact Assessment (under Mitigated Scenario and assessment height of 1.5m) the highest predicted daily 1-hour average TSP concentration is 156.2 µg/m³ which is compliant with the EIAO-TM criteria (i.e. (500 µg/m³)). Meanwhile, the predicted highest daily averaged RSP and

FSP concentrations in TOFS are $120.1 \mu\text{g}/\text{m}^3$ [1]³ and $90.0 \mu\text{g}/\text{m}^3$ [1]³, respectively. These values have exceeded the maximum concentration but are still compliant with the number of exceedances allowed under the current AQOs (i.e. RSP: $(100 \mu\text{g}/\text{m}^3$ [9]⁴ and FSP: $75 \mu\text{g}/\text{m}^3$ [9]⁴). Additionally, the highest predicted annual averaged RSP and FSP concentrations are $39.46 \mu\text{g}/\text{m}^3$ and $29.56 \mu\text{g}/\text{m}^3$, respectively; both compliant to the current AQOs (i.e. annual averaged RSP: $50 \mu\text{g}/\text{m}^3$ and annual averaged FSP: $35 \mu\text{g}/\text{m}^3$). On the other hand, the nearest ASR that will be affected by potential dust emissions from the construction of the additional JP/RP is the Columbarium of Po Lin Monastery which is approximately 20 m. It should likewise be noted that even with the closer distance of TOFS to the trenchless construction works for the twin sewer rising mains, the dust emissions from the works are still within the AQO criteria. Additionally, the construction of the relevant twin sewer rising mains will utilise more PME with higher percentage on time compared to the proposed additional JP/RP. Meanwhile, the construction of both additional JP/RP and the relevant twin rising main will adopt the same trenchless construction method which will involve excavation, pipe jacking and backfilling works. The estimated size dimension for pipe jacking for the twin sewer rising mains should likewise be just about the size of the proposed additional JP/RP, which is the minimal size requirement for equipment deployment. Furthermore, dust emission from the construction of both structures will be mainly from localized excavation and backfilling activities as well as earth handling, loading, unloading and stockpiling, removal/unloading soil materials and wind erosion. Hence, based on the comparison, it is anticipated that the potential construction dust impacts to the ASRs associated with the current proposed additional JP/RP would still likely meet the requirements set out under the current AQO and EIAO-TM. Further information on the comparison of the relevant works for the two projects are summarized in **Table 3.7**.

³ Values in [] following the respective results for RSP and FSP mean the number of exceedances against the AQOs.

⁴ Values in [] mean the number of exceedances allowed for RSP and FSP as per current AQO (effective on January 2014) and relevant EIAO-TM criteria.

Table 3.7: Comparison of this Project’s Air Quality Impact Assessment with Similar Project

	This project, Drainage Improvement Works at Ngong Ping	AEIAR-209/2017 Outlying Islands Sewerage Stage 2 - Upgrading of Tai O Sewage Collection, Treatment and Disposal Facilities
Project Scope of Work	<p>1. Construction and operation of a new underground DN 1500-1950 drain pipe of about 440 m long at the Northern side of the Po Lin Monastery (Interception Drain) using Cut-&-Cover excavation 250m) and trenchless method (190m)</p> <p>2. Construction and operation of new underground box culvert of about 223 m long at Northwest of the Po Lin Monastery near Lin Ping Drive (Loop System) using Cut-&-Cover excavation; and</p> <p>3. Construction and operation of a new underground DN 1800 drain pipe of about 198m long at Northern side of the Ngong Ping 360 Terminal and columbarium (Flood Relief Drain) using Trenchless method</p>	<p>1. Sewers works (*Section 2.1.6):</p> <p>a) Construction of approximately 5,000 m in length of new gravity sewers / twin sewer rising mains with size ranging from 100 mm to 300 mm diameter in village areas by open cut method; and</p> <p>(b) Construction of approximately 100 m in length of twin sewer rising mains with size 100 mm diameter along Tai O Road underneath two sections of Tai O Creek by trenchless method</p> <p>2. Sewage Pumping Station (*Section 2.1.5): construction of two new sewage pumping stations (i.e. Fan Kwai Tong SPS and Hang Mei SPS)</p> <p>3. Sewage Treatment Works (*Section 2.1.2): expansion of Tai O STW capacity to 2,750 m³/day with secondary treatment level</p>
Air Quality Baseline Information	<p>Ngong Ping is a rural area which does not have heavy traffic flows. The major land uses located close to, or passes through the proposed Project site are residential village houses, temples and ancillary buildings in the Government, Institution or Community Zone, the Ngong Ping 360 cable car in the Other Specified Uses; and the Lantau North Country Park and the Lantau South Country Park.</p> <p>The sources of dust are mainly from burning activities during worship at the monasteries, the unpaved or non-vegetated open areas and emissions from the Hong Kong International Airport.</p> <p>There are no fixed air quality monitoring stations near the Project site. The nearest EPD Air Quality Monitoring Station (AQMS) is the Tung Chung AQMS which was made reference for historical air quality monitoring data.</p>	<p>The proposed sewage treatment upgrading works would be located at seashore of North of Tai O, Wang Hang Tsuen near Tai O Road and Nam Chung Tsuen, respectively.</p> <p>The major land uses in the vicinity of the Project area include residential villages, local retail, knoll and marine environs. Tai O Road is the only road with vehicle activities in the area. Tai O Village is generally car-free except the common used transportation within the area by village vehicles called “VV vehicle” and the emergency vehicles.</p> <p>There is currently no EPD-operated air quality monitoring station located in Tai O area. Historical air quality monitoring data was referred to the nearest station, Tung Chung AQMS.</p>
Total volume of Excavated Materials (e.g. soil, rock, concrete) (m ³)	14,500	25,250 (*Table 6.10)

	This project, Drainage Improvement Works at Ngong Ping	AEIAR-209/2017 Outlying Islands Sewerage Stage 2 - Upgrading of Tai O Sewage Collection, Treatment and Disposal Facilities
Comparison of relevant scope of the Projects		
Relevant scope of the Project reviewed for the Air Quality Assessment for the purpose of this ERR	Proposed additional JP/RP for the construction and operation of a new underground DN 1800 drain pipe of about 198m long at Northern side of the Ngong Ping 360 Terminal and columbarium (Flood Relief Drain)	Sewer Works: Construction of approximately 100 m in length of twin sewer rising mains with size 100 mm diameter by trenchless method along Tai O Road underneath the section of Tai O Creek near Tai O Fire Station (*Section 2.1.6 and Figure 3.11). Construction and reinstatement activities will involve, excavation, pipe jacking and backfilling works.
Construction method adopted for the Relevant Scope of the Project	Trenchless method	Trenchless method (*Section 2.1.6).
Dimension/ Size of Pipe Jacking and Receiving Pit	7m x 5m	Although not specified in AEIAR-209/2017, as a general practice, dimension for pipe jacking should likewise be just about the size of the proposed additional JP/RP, which is the minimal size requirement for equipment deployment. Meanwhile, the recommended standard dimensions for jacking and receiving pits are a length of 25 to 35 ft (7.6 to 10.7 m) and a width of 10 to 12 ft (3 to 3.6 m) with sufficient room for material storage (https://virginiadot.org/vtrc/main/online_reports/pdf/15-r16.pdf).
Powered Mechanical Equipment	Approximately 14 types of PME will be used during the construction activities of the additional JP/RP with only 1 PME having 100 % on time.	Approximately 17 types of PME will be used during the trenchless construction activities with 13 PME having 100 % on time (*Appendix 4.4).
Number of potentially affected ASRs	5 ASRs will be affected by the construction works for the proposed additional JP/RP	4 ASRs (i.e. Buddhist Cheung Mui Kwai Kindergarten, Buddhist Fat Ho Memorial College, Tai O Fire Station and Tin Hau Temple) will be affected by the proposed sewer works of the twin sewer rising mains along Tai O Road underneath two sections of Tai O Creek (*Table 3.3).
Nearest horizontal distance to proposed works	Horizontal distance of the nearest ASR, the Columbarium of Po Lin Monastery, to the proposed construction works of the additional JP/RP is 20 m.	Horizontal distance of the nearest ASR, the Tai O Fire Station, to the trenchless works for the proposed rising main including the excavation of jacking/receiving pit is 17 m (*Table 3.3).
Potential air quality impacts and sources	Potential air quality impacts will be from dust emission from localized heavy construction activities (i.e. excavation, and backfilling activities).	Potential air quality impacts will be from dust emission that will be generated mainly from localized excavation (*Section 3.5.7).

	This project, Drainage Improvement Works at Ngong Ping	AEIAR-209/2017 Outlying Islands Sewerage Stage 2 - Upgrading of Tai O Sewage Collection, Treatment and Disposal Facilities
	Other sources of dust emission include mucking-out activities, loading and unloading activities at the stockpile areas, and wind erosion at the construction sites and stockpile areas.	Other activities that could potentially generate fugitive dust include earth handling, loading, unloading and stockpiling, removal / unloading soil materials and wind erosion.
Quantitative Construction Dust Impact Assessment	Fugitive Dust Model ^{1,2,4}	Industrial Source Complex Short-Term 3 (ISCST3) model ^{3,4} (*Section 3.6.1)
Assessment Height	ASR 1-ASR 5: 1.5m	ASR TOFS: 1.5m
Results of the Quantitative Construction Dust Impact Assessment (Unmitigated Scenario)	In the air quality assessment during EIA, the predicted 1-hour average cumulative TSP concentrations at all ASRs and the predicted 24-hour average cumulative TSP concentrations at ASR3, ASR4, ASR5 and ASR8 show exceedances of the AQOs based upon the worst-case Tier 1 approach but with no dust mitigation measures applied. In addition, the predicted annual average cumulative TSP concentrations at ASR3, ASR4, ASR5, ASR8 and ASR9 have predicted exceedances of the relevant AQOs with no dust mitigation measures applied. It should be noted however, that emissions from the construction of the proposed additional JP/RP should be relatively lesser given its smaller scale (approximately 35 m ²) and its proposed location, being situated in a hard-paved area. Nevertheless, mitigation measures are required to control dust impacts.	Unmitigated 1-hour averaged TSP concentration in TOFS is 156.4 µg/m ³ (Concentration limit: 500 µg/m ³). Meanwhile predicted averaged daily RSP and FSP concentrations are 120.2 µg/m ³ [1] (Concentration limit: 100 µg/m ³ [9]) and 90.0 µg/m ³ [1] (Concentration limit: 75 µg/m ³ [9]) respectively. As for the annual RSP and FSP concentrations, predicted annual RSP and FSP concentrations are 39.5 µg/m ³ (Concentration limit: 50 µg/m ³) and 29.56 µg/m ³ (Concentration limit: 35 µg/m ³) respectively which are both compliant with the relevant EIAO-TM and AQO criteria. The unmitigated Daily Averaged RSP and Daily Averaged FSP levels with background due to construction of the Project Site would exceed the relevant AQO concentration limits once but are compliant with the number of exceedances allowed under the AQO. In order to minimize the air quality impact, the mitigation measures will be implemented during the construction phase (*Section 3.7.3).
Specific Mitigation Measures Applied	Watering of exposed soil areas in active works areas and paved haul roads once per hour for 12 hours a day to reduce dust emissions by 91.7%, with reference to the "Control of Open Fugitive Dust Sources" (USEPA AP-42). The amount of water to be applied would be 0.25L/m ² for the respective watering frequency.	Watering every hour on unpaved areas and stockpiles of dusty materials (if no tarpaulin is provided) to reduce dust emissions by 90% (e.g. watering intensity at 1.9 litre/m ² during the first hour, subsequent application at 0.2 litre/m ² (water loss from evaporation) to achieve the target dust removal efficiency. Actual application shall depend on the site condition and weather conditions (*Section 3.7.5).
Results of the Quantitative Construction Dust Impact Assessment (Mitigated Scenario)	The mitigated results in the EIA for the whole Project works indicate that, for all of ASRs, no exceedances of the 1-hour, 24-hour, and annual TSP criteria are predicted to occur, even assuming the absolute worst-case situation where 100% of every works site would be active and emitting dust.	The predicted impacts to the nearest ASR, Tai O Fire Station, are found to have reduced with the proposed mitigation measures incorporated with highest predicted 1-hour averaged TSP concentration of 156.2 µg/m ³ which is compliant with the EIAO-TM criteria (Concentration limit: 500 µg/m ³). Meanwhile, highest predicted averaged daily RSP and FSP concentrations are 120.1 µg/m ³ [1] (Concentration limit: 100 µg/m ³ [9]) and 90.0 µg/m ³ [1] (Concentration limit: 75 µg/m ³ [9]) respectively.

	This project, Drainage Improvement Works at Ngong Ping	AEIAR-209/2017 Outlying Islands Sewerage Stage 2 - Upgrading of Tai O Sewage Collection, Treatment and Disposal Facilities
		<p>Albeit these values have exceeded the criteria, the exceedance is still within the allowed number of exceedances. As for the annual RSP and FSP concentrations, highest predicted annual RSP and FSP concentrations are 39.46 µg/m³ (Concentration limit: 50 µg/m³) and 29.56 µg/m³ (Concentration limit: 35 µg/m³) respectively; both within acceptable levels (*Table 3.6).</p>
<p>Notes:</p> <p>* Relevant section/s of the AEIAR-209/2017 Outlying Islands Sewerage Stage 2 - Upgrading of Tai O Sewage Collection, Treatment and Disposal Facilities</p> <p>Values in [] mean the number of exceedances allowed.</p> <p>Values in [] after concentration limit mean the number of exceedances allowed.</p> <ol style="list-style-type: none"> 1. As the dust generated during the construction works will not contain a significant proportion of fine particulates (<10 µm) which are deemed to be respirable and therefore, the 1-hr average and 24-hr average TSP concentrations, in addition to the annual average TSP concentrations was evaluated to assess the short and long term dust impact from the Project to the ASRs, respectively and RSP was not assessed. 2. All the construction works areas have been assumed to be 100% active to present a worst-case scenario in this assessment. 3. A 100% active worksite at Tai O STW, Hang Mei SPS and Fan Kwai Tong SPS has been considered in this assessment. While emissions from the sewers works are expected to be relatively low when compare with the construction work for upgrading works of Tai O STW, construction of Hang Mei SPS and Fan Kwai Tong SPS, for conservative approach, the model has included the dust sources of sewers works located within the 500m of the upgrading works of Tai O STW, Hang Mei SPS and Fan Kwai Tong SPS study area for the evaluation of the potential construction dust impacts. 4. Developed and validated by the United States Environmental Protection Agency (USEPA) and accepted by EPD. 		

4. NOISE IMPACT REVIEW

4.1 Introduction

4.1.1 Section 4 of the approved EIA report was reviewed, and potential noise impacts were assessed for the purpose of this ERR. This section details the review on the noise impact assessment in the EIA report and the potential impacts arising from the proposed additional JP/RP.

4.2 Environmental Legislation, Standards and Guidelines

4.2.1 Noise Control Ordinance and Technical Memoranda

4.2.1.1 The potential noise impacts have been reviewed adopting the criteria set in the Noise Control Ordinance (NCO) (Cap. 400). Assessment procedures and relevant standards referred for the review of the noise impacts for the proposed additional JP/RP include:

- The TM on Environmental Impact Assessment Process (EIAO-TM);
- The TM on Noise from Construction Work other than Percussive Piling (GW-TM); and
- The TM on Noise from Construction Work in Designated Areas (DA-TM).

4.2.2 Noise Standards for Non-restricted Hours

4.2.2.1 Construction noise assessment limits shall refer to Annex 5 of the EIAO-TM as shown in **Table 4.1**.

Table 4.1: Daytime Construction Noise Limits

Uses	Noise Standard, Leq, 30 min dB(A)
Domestic premises, hotels and hostels	75
Educational institutions, kindergartens, nurseries and all others where voice communication is required	70 (65 during examination period)
Notes: The above criteria apply to noise sensitive uses which rely on open window for ventilation and should be viewed as the maximum permissible noise levels assessed at 1m from the external façade.	

4.2.3 Noise Standards for Non-restricted Hours

4.2.3.1 All the proposed construction works for the Project including the proposed additional JP/RP are expected to be carried out during non-restricted hours. Nevertheless, in the event that any construction activities will be undertaken during restricted hours, compliance with the NCO and the relevant TMs must be ascertained. Additionally, construction noise permit (CNP) must be obtained. Construction noise criteria for activities during restricted hours is presented in **Table 4.2**.

Table 4.2: Construction Noise Criteria for Activities other than Percussive Piling

	Basic Noise Levels (BNLs), dB(A)		
	ASR 'A'	ASR 'B'	ASR 'C'
Evening (1900 to 2300 hrs) ^[a]	60 (45)	65 (50)	70 (55)
Night-time (2300 to 0700 hrs)	45 (30)	50 (35)	55 (40)
Notes: a. Includes Sunday and Public Holidays during daytime and evening. Figures in brackets are BNLs for Specified Powered Mechanical Equipment (SPME) construction work in designated areas.			

4.3 Noise Sensitive Receivers

4.3.1 A total of nine Noise Sensitive Receivers (NSR) were identified during the EIA. Only one (**Table 4.3**) (**Appendix B.2**) however, is within the 300 m Study Area for the assessment of the noise impacts that may arise on the construction of the proposed additional JP/RP. Albeit NSR1 is situated approximately 20 m from the proposed additional structure, it shall be noted that the Columbarium of Po Lin Monastery has one or two maintenance staff and has infrequent visitors that are transitory in nature. Moreover, the construction of the proposed additional JP/RP will not fall on Ching Ming and Chung Yeung Festival when an increase of visitors to the columbarium is anticipated during these festival periods. Meanwhile, based on the current information of the area, no new NSR will be added from the initially identified during the EIA within the Study Area.

Table 4.3: Representative Noise Sensitive Receivers

NSR	Location	Type	No. of Storeys	Minimum Source-Receiver Slant Distance (m)*	Distance to WA of the Additional JP/RP
NSR1	Columbarium of Po Lin Monastery	Place of public worship	1	18.7	20
Notes: Slant distance is the distance from the SR to the location of the PMEs in the nearest works area in the EIA.					

4.4 Review of Potential Noise Impacts

- 4.4.1 The EIA identified the potential noise sources during the construction of the Project. Noise impacts may generate from site formation for all work areas within the Project area; construction of the Site Office (SO); construction of pipelines and box culverts using the cut and cover method with stockpiling activities at the stockpile areas; construction of jacking pits and mucking-out activities at jacking pits for the pipe-jacking process; construction of manholes; intakes and outfalls and demolition of Site Office (SO) with associated road reinstatement and landscaping works.
- 4.4.2 Groups of PME were identified and have been assigned to aforementioned construction activities of the Project. During the EIA, the on-time of each piece of equipment has been estimated with the reference of EIAO-GN 9/2004 to reflect the actual situation which was considered practicable. Moreover, the percentages of time have been considered when calculating the cumulative Sound Power Levels (SWL) for the construction activities. **Table 4.4** reflects the plant inventory that shall be utilised for various construction activities which represents a realistic worst-case scenario for assessment.
- 4.4.3 Activity 5 – Laying of Pipe by Pipe-jacking Method in Table 4.4 of the approved EIA report will be relevant to the proposed additional JP/RP. This was also adopted for the noise assessment during the EIA wherein these tasks were identified to be closest to identified NSR (in the case of the EIA and for this ERR is NSR1) with the highest SWL of 120 dB(A). Total SWL presented in below table referred the plant inventory-unmitigated scenario presented in Appendix C.4 of the approved EIA report (**Appendix C.2 of this ERR**).

Table 4.4: Specific Plant Inventory for Construction Works at additional JP/RP for the Unmitigated Scenario

ID	PME	CNP	No. of Item	SWL, dB(A)	% on time	Total SWL, dB(A)
5	Activity 5 – Laying of Pipe by Pipe-jacking Method					
5a	Construction of jacking pits					
	<i>Construction of jacking pits-Excavation</i>					
5a-1	Breaker, Excavator Mounted (Hydraulic)	CNP 028	1	122	70 %	120
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	105	30 %	
	<i>Construction of jacking pits - Delivery of Precast Elements</i>					
5a-2	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	105	30 %	100
	<i>Construction of jacking pits - Generators and Pumps</i>					
5a-3	Water Pump (Electric)	CNP 281	1	88	50 %	101

ID	PME	CNP	No. of Item	SWL, dB(A)	% on time	Total SWL, dB(A)
	Generator, Silenced, 75 dB(A) at 7m	CNP 102	1	100	100 %	
	Air blower (electric)	CNP 006	1	95	50 %	
5b	Pipe jacking					
	Crane, Mobile/Barge Mounted (diesel)	CNP 048	1	112	70 %	111
	Winch (Electric)	CNP 262	1	95	50 %	
	Grout mixer	CNP 105	1	90	80 %	
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	105	30 %	
	Pipe jacking machine*	No Noise Impact	1		--	
	Grout pump	CNP 106	1		--	
	Tunnel boring machine*	No Noise Impact	1		--	
5c	Construction of receiving pits					
5c-1	Construction of receiving pits - Excavation					
	Breaker, Excavator Mounted (Hydraulic)	CNP 028	1	122	70 %	120
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	105	30 %	
5c-2	Construction of receiving pits – Delivery of Precast Elements					
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	105	30 %	100
5c-2	Construction of receiving pits – Generators and Pumps					
	Water Pump (Electric)	CNP 281	1	88	50 %	101
	Generator, Silenced, 75 dB(A) at 7m	CNP 102	1	100	100 %	
	Air blower (electric)	CNP 006	1	95	50 %	
5d	Backfilling the pits					
5d-1	Backfilling the pits – Filling					
	Dump Truck, gross vehicle weight > 38 tonne	CNP 067	1	117	30 %	114
	Excavator/Loader, Wheeled/Tracked	CNP 081	1	112	70 %	
5d-2	Backfilling the pits – Compacting					
	Compactor, Vibratory	CNP 05	1	105	50 %	102

ID	PME	CNP	No. of Item	SWL, dB(A)	% on time	Total SWL, dB(A)
<p>Notes:</p> <p>* Pipe jacking system, grout pump and tunnel boring machine would be located at the bottom of the pit which is about 6m below ground level. The noise of the machines would be effectively shielded from the sensitive receivers and thus would not be considered as a potential noise source in the construction noise assessment.</p> <p>** For the construction of RP4 and Outfall B at WA4 (task ID 5 and 6), a mini excavator (CNP 082) with SWL in 94 dB(A) will be used instead of the normal excavator (CNP 081) due to lack of space near the works area and access constraints</p>						

- 4.4.4 The tasks presented in above table will likewise be carried out in the construction of additional JP/RP. No changes on the method as described in the approved EIA Report will be made for the proposed additional structure. Likewise, no additional tasks will be undertaken with respect to the existing condition of the proposed location of the additional JP/RP. Furthermore, it should be noted that there will be no any concurrent construction activities of the additional JP/RP with the construction of RP4 / Outfall B nearby. Thus, no cumulative noise impacts with construction activities at Outfall B is anticipated.
- 4.4.5 Considering the tasks in **Table 4.4** in an unmitigated scenario during the construction activities for the additional structure, it is predicted that noise level at NSR1 will be at 89 dB(A) which exceeds the day-time noise criteria of 70dB(A) for the places of public worship. The details of the calculation for the assessment of unmitigated noise impact conducted for this ERR for specific construction activities that will be carried out for the proposed additional JP/RP is presented in **Appendix C.4**. Without implementing any noise mitigation measures, the sound pressure level for most of the construction activities that will be carried out for the proposed additional structure (i.e. excavation for the construction of JP/RP, pipe-jacking, backfilling of the pits) will exceed the day-time noise criteria.
- 4.4.6 Nevertheless, the EIAO Guidance Note No. 9/2010 for the Preparation of Construction Noise Impact Assessment Under the Environmental Impact Assessment Ordinance listed some commonly used and quantifiable direct mitigation measures such as the use of quieter PME, use of quieter alternative construction method; and use of noise barriers/ enclosure. Thus, to reduce the noise impacts to within acceptable levels, these mitigation measures will be implemented. Section 4.8.2.3 of the approved EIA report recommended the use of quieter PME with lower SWL to reduce noise impacts for the Project. It shall likewise be noted that the columbarium itself is surrounded by two solid boundary walls of about 2.5 m high and about 200 mm thick which are sufficient to act as a fixed barrier. Furthermore, Section 4.8.2.5 of the approved EIA report recommended to cover the gaps facing the works in the wall, along the front edge of the columbarium with acoustic fabric or small barrier sections to increase the screening to NSR1 from the noise during the construction works. Consequently, a noise attenuation level of 10 dB(A) for the PME is assumed for the "special noise barrier" which is the upgraded columbarium boundary wall. Appendix C6 of the EIA report (**Appendix C.3 of this ERR**) details the specific plant inventory in a mitigated scenario for construction works in RP4/ Outfall B (includes Special Noise Barrier applicable to NSR 1) which is also applicable to the construction activities for the additional JP/RP (**Table 4.5**).

Table 4.5: Specific Plant Inventory for Construction Works at additional JP/RP (Include Special Noise Barrier applicable to NSR 1) Mitigated Scenario

ID	PME	CNP	No. of Item	% on time	SWL, dB(A)	Mitigation Measures	Attenuation	Total SWL, dB(A)
5	Activity 5 – Laying of Pipe by Pipe-jacking Method							

ID	PME	CNP	No. of Item	% on time	SWL, dB(A)	Mitigation Measures	Attenuation	Total SWL, dB(A)
5a	Construction of jacking pits							
	<i>Construction of jacking pits - Excavation</i>							
5a-1	Tracked excavator fitted with hydraulic rock breaker	BS D8/13	1	70 %	110	Special Noise barrier	-10	99
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30 %	105	Special Noise barrier	-10	
	<i>Construction of jacking pits – Delivery of Precast Elements</i>							
5a-2	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30 %	105	Special Noise barrier	-10	90
	<i>Construction of jacking pits – Generators and Pumps</i>							
5a-3	Water Pump, Submersible (Electric)	CNP 283	1	50 %	85	Special Noise barrier	-10	87
	Generator, Super Silenced, 70 dB(A) at 7m	CNP 103	1	100 %	95	Special Noise barrier	-10	
	Air blower (electric)	CNP 006	1	50 %	95	Special Noise barrier	-10	
	Pipe Jacking							
5b	Tracked mobile crane (132kW, 55t)	BS C3/29	1	70 %	98	Special Noise barrier	-10	92
	Winch (Electric)	CNP 262	1	50 %	95	Special Noise barrier	-10	
	Grout mixer	CNP 105	1	80 %	90	Special Noise barrier	-10	
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30 %	105	Special Noise barrier	-10	
	Pipe jacking machine*	No Noise Impact	1	--				
	Grout pump	CNP 106	1	--				
	Tunnel boring machine*	No Noise Impact	1	--				
5c	Construction of receiving pits							
	<i>Construction of receiving pits - Excavation</i>							
5c-1	Tracked excavator fitted with hydraulic rock breaker	BS D8/13	1	70 %	110	Special Noise barrier	-10	99

ID	PME	CNP	No. of Item	% on time	SWL, dB(A)	Mitigation Measures	Attenuation	Total SWL, dB(A)	
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30 %	105	Special Noise barrier	-10		
	<i>Construction of receiving pits – Delivery of Precast Elements</i>								
5c-2	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30 %	105	Special Noise barrier	-10	90	
	<i>Construction of receiving pits – Generators and Pumps</i>								
5c-3	Water Pump, Submersible (Electric)	CNP 283	1	50 %	85	Special Noise barrier	-10	87	
	Generator, Super Silenced, 70 dB(A) at 7m	CNP 103	1	100 %	95	Special Noise barrier	-10		
	Air blower (electric)	CNP 006	1	50 %	95	Special Noise barrier	-10		
5d	<i>Backfilling the pits</i>								
	<i>Backfilling the pits – Filling</i>								
5d-1	Dump Truck	BS D9/39	1	30 %	103	Special Noise barrier	-10	89	
	Excavator, mini-robot mounted	CNP 082	1	70 %	94	Special Noise barrier	-10		
	<i>Backfilling the pits – Compacting</i>								
	Compactor, Vibratory	CNP 050	1	50 %	105	Special Noise barrier	-10	92	

4.4.7 In the assessment of construction noise impacts in a mitigated scenario (**Appendix C.5**) where noise attenuation level of 10 dB(A) is attained using quieter PME and the updated Columbarium wall, the noise level at NSR1 is significantly reduced to acceptable level. Range of Predicted Construction Noise Level in a mitigated scenario is 56-70 dB(A). With the implementation of the aforementioned noise mitigation measures and other noise mitigation measures as described in Section 4.8.2 of the approved EIA report and in the succeeding section, the noise levels at NSR1 is unlikely to exceed the criteria. Meanwhile, **Table 4.6** summarizes the predicted noise level of various construction activities for the additional JP/RP in both unmitigated and mitigated scenarios.

Table 4.6: Predicted Unmitigated and Mitigated Construction Noise Levels for NSR 1.

ID	Description	Maximum Predicted Construction Noise Level, dB(A)-Unmitigated	Maximum Predicted Construction Noise Level, dB(A)-Mitigated
5a	<i>Construction of jacking pits</i>		

ID	Description	Maximum Predicted Construction Noise Level, dB(A)-Unmitigated	Maximum Predicted Construction Noise Level, dB(A)-Mitigated
5a-1	Construction of jacking pits-Excavation	89	68
5a-2	Construction of jacking pits - Delivery of Precast Elements	69	59
5a-3	Construction of jacking pits - Generators and Pumps	70	56
5b	<i>Pipe jacking</i>	80	61
5c	<i>Construction of receiving pits</i>		
5c-1	Construction of receiving pits-Excavation	89	68
5c-2	Construction of receiving pits – Delivery of Precast Elements	69	59
5c-3	Construction of receiving pits – Generators and Pumps	70	56
5d	<i>Backfilling the pits</i>		
5d-1	Backfilling the pits-Filling	81	58
5d-2	Backfilling the pits-Compacting	71	61
Note: Highlighted cells mean exceedance in noise criteria of 70 dB(A) for the places of public worship.			

4.4.8 Furthermore, it shall be noted that the columbarium is infrequently visited with relatively few estimated numbers of visitors which are transitory in nature on regular days. Additionally, the construction of the proposed additional JP/RP will not fall on Ching Ming and Chung Yeung Festival when an increase in vehicular and foot traffic to the columbarium is anticipated during these festival periods.

4.5 Review of Mitigation Measures

4.5.1 As aforementioned, potential noise impacts are anticipated to arise from the use of PME during construction works of the proposed additional structure. Albeit, the columbarium has its own fixed barrier and with recommended upgraded wall with attenuation level of 10dB(A) for PME, the proposed mitigation measures as indicated in Section 4.8.3 of the approved EIA Report, will be strictly implemented. With the implementation of these mitigation measures and inherent structure of the columbarium, potential noise levels at NSR1 are anticipated to be below its criteria, with predicted range of within 56-68 dB(A).

4.5.2 The following mitigation measures should be employed to reduce the noise impacts from specific PMEs which effectiveness is assumed to have attenuation level of 5-10 dB(A):

- Use of mobile temporary noise barriers at individual movable and stationary PMEs. The barriers should be about 2 m high which considering the low rise residential sensitive receivers would be considered sufficient for screening purposes. The barrier material shall have a surface density of at least 10kg/m² to effectively provide noise screening. With reference to EIAO Guidance Note No.9/2004, noise reductions of 5dB(A) and 10dB(A) can be achieved by direct application of the noise barriers to movable and stationary plant, respectively; and
- Use of enclosures with covers at the top and three sides and a surface density of at least 10kg/m² to screen noise from generally static noisy plant, such as air compressors.

4.5.3 Furthermore, good site practices are also recommended to reduce noise levels as far as possible:

- Only well-maintained plant should be operated on-site and PME should be serviced regularly during the construction programme;
- Silencers or mufflers on construction equipment should be utilised and properly maintained throughout the construction programme;
- Any mobile PME should be sited as far from NSRs as possible;
- Machines and PME that may be in intermittent use should be shut down between work periods to avoid idling;
- PME known to emit noise strongly in one direction should be orientated to direct away from line of the sight of the nearby NSRs;
- Material stockpiles and other structures should be effectively utilised, wherever practicable, in screening noise from on-site construction activities;
- Use of acoustic enclosure, in accordance with EPD's A Practical Guide for the Reduction of Noise from Construction Works; and
- Re-scheduling of works should be considered to ameliorate the residual impact.

4.5.4 The mitigation measures recommended in the approved EIA Report are still relevant and applicable to mitigate the potential noise impacts arising from the construction of additional JP/RP. Given that these recommended measures have been tried and tested and previously implemented on construction sites in Hong Kong, the level of uncertainty of the effective implementation of the mitigation measures would be small. Thus, no additional mitigation measures shall be implemented. Notwithstanding, the EM&A programme will be implemented to ensure all proposed mitigation measures are effective.

4.6 Cumulative Impacts

4.6.1 Minor Landscape Works by CEDD

4.6.1.1 The minor landscaping works adjacent to the proposed of the additional JP/RP have potential cumulative noise impacts. The key sources of these impacts include the use of PME for various landscaping works. However, considering the small scale of the works to be undertaken, no significant impacts is anticipated. Additionally, the landscaping works mostly use hand tool and the use of PME is infrequent. With the implementation of noise impact mitigation measures, and good site practices, unacceptable cumulative impact would not arise.

4.6.2 **Other Construction Works in WS6 Concurrent with the Construction of Additional JP/RP**

4.6.2.1 Construction of the additional JP/RP shall be undertaken in two months. Upon completion of the additional JP/RP and subsequent pipe jacking works, there will be an overlap of schedule of about one month for construction of manhole at L305 and at L305A, which may have potential cumulative noise impacts that may arise generally from the use of PME for various construction activities. Nevertheless, considering the distance between these two structures (approximately 160 m) and with the implementation of mitigation measures recommended in the EIA report, unacceptable cumulative impact to nearby identified NSR is unlikely.

4.7 **Residual Impacts**

4.7.1 With strict implementation of the recommended mitigation measures, no adverse residual potential noise impact is anticipated during the construction of the proposed additional JP/RP.

4.8 **Environmental Monitoring and Audit Requirements**

4.8.1 No changes of the EM&A requirements as recommended in Section 4.11 of the EIA Report and Section 3 of the EM&A Manual is proposed. It is noted in the EIA that during the construction process, episodes of noise higher levels may occur for some areas of the Project, albeit, not related to the works in the proposed additional JP/RP. During the EM&A process, these events will be identified and taken the necessary actions.

4.9 **Conclusion**

4.9.1 A review of the potential noise impacts has been conducted for the proposed additional JP/RP. Potential noise impacts are likely to arise from the use of PME, which was likewise assessed during the EIA; thus, no additional impact is anticipated. Based on the current information on the area, no new NSR existing or planned was identified in the vicinity of the proposed additional structure. With the implementation of the proposed mitigation measures listed in the approved EIA Report, it is unlikely that noise level will exceed its criteria in NSR1, the closest NSR to the proposed additional structure. Thus, no additional mitigation measures and EM&A requirements are recommended. Therefore, the noise impact assessment conducted during EIA remain relevant and recommendations are still applicable and valid. Consequently, no additional survey will be required.

5. WATER QUALITY IMPACT REVIEW

5.1 Introduction

5.1.1 Section 5 of the approved EIA Report was reviewed, and potential water quality impacts have been assessed for the purpose of this ERR. This section details the review on the water quality impact assessment in the approved EIA report and the potential impacts arising from the proposed additional JP/RP.

5.2 Environmental Legislation, Guidelines and Criteria

5.2.1 The legislation, guidelines and criteria applicable to the evaluation of water quality impacts associated with the construction and operation of the Project are as follows:

- Water Pollution Control Ordinance (WPCO) (Cap.358);
- Environmental Impact Assessment Ordinance (EIAO) (Cap.499), Technical Memorandum of Environmental Impact Assessment (EIAO-TM), Annexes 6 and 14
- Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-DSS);
- Practice Note for Professional Persons, Drainage Plan (ProPECC PN 5/93); and
- Practice Note for Professional Persons, Construction Site Drainage (ProPECC PN 1/94), which provides useful guidelines on the management of construction site drainage and prevention of water pollution associated with construction activities.

5.2.2 The majority part of the Project belongs to the catchment of the North Western WCZ while a small portion is in the Southern Supplementary WCZ (Figure 5.1 of the approved EIA report). The Water Quality Objectives (WQOs) of the North Western WCZ will be of particular relevance to the proposed location of the additional JP/RP. The WQOs are listed in **Table 5.1**.

Table 5.1: Water Quality Objectives for North Western Water Control Zone (NWWCZ)

Water Quality Objectives		Part or Parts of Zone
A	AESTHETIC APPEARANCE	
	(a) Waste discharges shall cause no objectionable odours or discolouration of the water.	Whole zone
	(b) Tarry residues, floating wood, articles made of glass, plastic, rubber or of any other substance should be absent.	Whole zone
	(c) Mineral oil should not be visible on the surface. Surfactants should not give rise to a lasting foam.	Whole zone
	(d) There should be no recognisable sewage-derived debris.	Whole zone

Water Quality Objectives	Part or Parts of Zone
(e) Floating, submerged and semi-submerged objects of a size likely to interfere with the free movement of vessels, or cause damage to vessels, should be absent.	Whole zone
(f) Waste discharges shall not cause the water to contain substances which settle to form objectionable deposits	Whole zone
B	
BACTERIA	
(a) The level of <i>Escherichia coli</i> should not exceed 610/100 mL, calculated as the geometric mean of all samples collected in a calendar year.	Secondary Contact Recreation Subzones
(b) The level of <i>Escherichia coli</i> should be less than 1/100 mL, calculated as the running median of the most recent 5 consecutive samples taken at intervals of between 7 and 21 days.	Tuen Mun (A) and Tuen Mun (B) Subzones and Water Gathering Ground Subzones
(c) The level of <i>Escherichia coli</i> should not exceed 1000/100 mL, calculated as the running median of the most recent 5 consecutive samples taken at intervals of between 7 and 21 days.	Tuen Mun (C) Subzone and other inland waters
(d) The level of <i>Escherichia coli</i> should not exceed 180/100 mL, calculated as the geometric mean of all samples collected from March to October inclusive. Samples should be taken at least 3 times in one calendar month at intervals of between 3 and 14 days.	Bathing Beach Subzones
C	
COLOUR	
(a) Waste discharges shall not cause the colour of water to exceed 30 Hazen units.	Tuen Mun (A) and Tuen Mun (B) Subzones and Water Gathering Ground Subzones
(b) Waste discharges shall not cause the colour of water to exceed 50 Hazen units.	Tuen Mun (C) Subzone and other inland waters
D	
DISSOLVED OXYGEN	
(a) Waste discharges shall not cause the level of dissolved oxygen to fall below 4 mg per litre for 90% of the sampling occasions during the whole year; values should be calculated as water column average (arithmetic mean of at least 3 measurements at 1 m below surface, mid-depth and 1 m above seabed). In addition, the concentration of dissolved oxygen should not be less than 2 mg/L within 2 m of the seabed for 90% of the sampling occasions during the whole year.	Marine waters
(b) Waste discharges shall not cause the level of dissolved oxygen to be less than 4 mg/L.	Tuen Mun (A), Tuen Mun (B) and Tuen Mun (C) Subzones, Water Gathering Ground Subzones and other inland waters
E	
pH	
(a) The pH of the water should be within the range of 6.5-8.5 units. In addition, waste discharges shall not cause the natural pH range to be extended by more than 0.2 unit.	Marine waters excepting Bathing Beach Subzones
(b) Waste discharges shall not cause the pH of the water to exceed the range of 6.5-8.5 units.	Tuen Mun (A), Tuen Mun (B) and Tuen Mun (C) Subzones and Water Gathering Ground Subzones

Water Quality Objectives		Part or Parts of Zone
	(c) The pH of the water should be within the range of 6.0-9.0 units.	Other inland waters
	(d) The pH of the water should be within the range of 6.0-9.0 units for 95% of samples collected during the whole year. In addition, waste discharges shall not cause the natural pH range to be extended by more than 0.5 unit.	Bathing Beach Subzones
F	TEMPERATURE	
	Waste discharges shall not cause the natural daily temperature range to change by more than 2.0 degrees Celsius.	Whole zone
G	SALINITY	
	Waste discharges shall not cause the natural ambient salinity level to change by more than 10%.	Whole zone
H	SUSPENDED SOLIDS (DO)	
	(a) Waste discharges shall neither cause the natural ambient level to be raised by more than 30% nor give rise to accumulation of suspended solids which may adversely affect aquatic communities.	Marine waters
	(b) Waste discharges shall not cause the annual median of suspended solids to exceed 20 mg/L.	Tuen Mun (A), Tuen Mun (B) and Tuen Mun (C) Subzones and Water Gathering Ground Subzones
	(c) Waste discharges shall not cause the annual median of suspended solids to exceed 25 mg/L.	Other inland waters
I	AMMONIA	
	The un-ionized ammoniacal nitrogen level should not be more than 0.021 mg/L, calculated as the annual average (arithmetic mean).	Whole zone
J	NUTRIENTS	
	(a) Nutrients shall not be present in quantities sufficient to cause excessive or nuisance growth of algae or other aquatic plants.	Marine waters
	(b) Without limiting the generality of objective (a) above, the level of inorganic nitrogen should not exceed 0.3 mg/L, expressed as annual water column average (arithmetic mean of at least 3 measurements at 1 m below surface, mid-depth and 1 m above seabed).	Castle Peak Bay Subzone
	(c) Without limiting the generality of objective (a) above, the level of inorganic nitrogen should not exceed 0.5 mg/L, expressed as annual water column average (arithmetic mean of at least 3 measurements at 1 m below surface, mid-depth and 1 m above seabed).	Marine waters excepting Castle Peak Bay Subzone
K	5-DAY BIOCHEMICAL OXYGEN DEMAND (BOD₅)	
	(a) Waste discharges shall not cause the 5-day biochemical oxygen demand to exceed 3 mg/L.	Tuen Mun (A), Tuen Mun (B) and Tuen Mun (C) Subzones and Water Gathering Ground Subzones

Water Quality Objectives		Part or Parts of Zone
	(b) Waste discharges shall not cause the 5-day biochemical oxygen demand to exceed 5 mg/L.	Other inland waters
L	CHEMICAL OXYGEN DEMAND (COD)	
	(a) Waste discharges shall not cause the chemical oxygen demand to exceed 15 mg/L.	Tuen Mun (A), Tuen Mun (B) and Tuen Mun (C) Subzones and Water Gathering Ground Subzones
	(b) Waste discharges shall not cause the chemical oxygen demand to exceed 30 mg/L.	Other inland waters
M	TOXINS	
	(a) Waste discharges shall not cause the toxins in water to attain such levels as to produce significant toxic, carcinogenic, mutagenic or teratogenic effects in humans, fish or any other aquatic organisms, with due regard to biologically cumulative effects in food chains and to toxicant interactions with each other.	Whole zone
	(b) Waste discharges shall not cause a risk to any beneficial use of the aquatic environment.	Whole zone
N	PHENOL	
	Phenols shall not be present in such quantities as to produce a specific odour, or in concentration greater than 0.05 mg/L as C ₆ H ₅ OH.	Bathing Beach Subzones
O	TURBIDITY	
	Waste discharges shall not reduce light transmission substantially from the normal level.	Bathing Beach Subzones
Notes: For WQOs with different criteria for different usage, the criterion that is more relevant to this study is highlighted.		

5.3 Baseline Water Quality and Water Quality Standards

5.3.1 In addition to the WQOs, the discharge of effluent is likewise subject to control under the WPCO. The Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-DSS) sets limits for effluent discharges.

5.3.2 As the majority of the inland water bodies in the Study Area are within Ngong Ping Gathering Grounds and in boundary of the NLCP, the standards for effluents discharged into Group A will be the relevant criteria for the effluent discharges (Table 5.2).

Table 5.2: Standards for Effluents Discharged into Group A Inland Waters

Flow rate (m ³ /day)	≤10	> 10 and ≤100	>100 and ≤500	> 500 and ≤1000	>1000 and ≤2000
Determinant					
pH (pH units)	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
Temperature (°C)	35	35	30	30	30

Flow rate (m ³ /day)	≤10	> 10 and ≤100	>100 and ≤500	> 500 and ≤1000	>1000 and ≤2000
Determinant					
Colour (lovibond units) (25mm cell length)	1	1	1	1	1
Conductivity (ms/cm at 20 °C)	1000	1000	1000	1000	1000
Suspended solids	10	10	5	5	5
Dissolved oxygen	≥4	≥4	≥4	≥4	≥4
BOD	10	10	5	5	5
COD	50	50	20	20	10
Oil & Grease	1	1	1	1	1
Boron	2	2	1	0.5	0.5
Barium	2	2	1	0.5	0.5
Iron	2	2	1	0.5	0.5
Arsenic	0.05	0.05	0.05	0.05	0.05
Total chromium	0.05	0.05	0.05	0.05	0.05
Mercury	0.001	0.001	0.001	0.001	0.001
Cadmium	0.001	0.001	0.001	0.001	0.001
Selenium	0.01	0.01	0.01	0.01	0.01
Copper	0.2	0.2	0.2	0.2	0.1
Lead	0.1	0.1	0.1	0.1	0.1
Manganese	0.5	0.5	0.5	0.5	0.5
Zinc	1	1	1	1	1
Other toxic metals individually	0.1	0.1	0.1	0.1	0.1
Total toxic metals	0.3	0.3	0.2	0.2	0.15
Cyanide	0.05	0.05	0.05	0.05	0.02
Phenols	0.1	0.1	0.1	0.1	0.1
Hydrogen sulphide	0.05	0.05	0.05	0.05	0.05
Sulphide	0.2	0.2	0.1	0.1	0.1
Fluoride	1	1	1	1	0.5
Sulphate	800	600	500	400	200

Flow rate (m ³ /day)	≤10	> 10 and ≤100	>100 and ≤500	> 500 and ≤1000	>1000 and ≤2000
Determinant					
Chloride	800	500	500	200	200
Total reactive phosphorus	1	0.7	0.7	0.5	0.5
Ammonia nitrogen	1	1	1	1	0.5
Nitrate + nitrite nitrogen	15	15	15	10	10
E. coli (count/100 ml)	< 1	< 1	< 1	< 1	< 1
Notes:					
1. All units in mg/L unless otherwise stated; all figures are upper limits unless otherwise indicated.					
2. The identified beneficial use of Group A inland waters is for abstraction for potable water supply.					

5.4 Water Sensitive Receivers

5.4.1 The main water body within the vicinity of the Project is the Ngong Ping Stream. As such, this is considered a water sensitive receiver (WSR) during the EIA (**Appendix B.3**). Areas of ecological or conservation value were likewise considered in the water quality impact assessment.

5.4.2 Within the Study Area for the assessment of water quality impacts that may arise from the construction and operation of the proposed additional JP/RP, the identified WSR is the lower section of the Ngong Ping Stream. Moreover, the identified areas of ecological or conservation value are the LNCP and a portion of the Conservation Area (CA) under the Ngong Ping OZP (S/I-NP/6) as likewise included in the EIA. Based on the current existing conditions of the proposed location of additional JP/RP, no WSR and areas of ecological or conservation value will be added from the previously listed sensitive receivers in the approved EIA Report. The findings of the EIA is still relevant and valid.

5.5 Review of Potential Water Quality Impacts

5.5.1 The potential impacts that are likely to arise from the Project and likewise anticipated in the construction of the proposed additional JP/RP were reviewed and assessed. The key sources of water quality impacts will be principally related to:

- construction site runoff containing elevated suspended solids, oils due to erosion of exposed surfaces, stockpiles and material storage areas, fuel and oil storage and maintenance areas and dust suppression sprays being washed out into adjacent watercourses as construction site runoff;
- run-off of bentonite contaminated slurry from pipe jacking operations;
- disturbance to water course banks and stream beds during intake and outfalls construction;
- litter from packaging materials and waste construction materials; and
- construction workforce sewage.

5.5.2 The construction of the proposed additional structure shall follow the methodology for pipe-jacking detailed in Section 2 of the approved EIA report. No changes in the methodology will be undertaken for the proposed additional RP/JP. Consequently, no additional potential impacts apart from what were previously identified during the EIA will be generated for the construction JP/RP. Hence, the findings of the EIA are still relevant and valid.

5.5.3 Construction Site Run-off

5.5.3.1 Site runoff may result from various construction works which may contain sediments, suspended solid and various contaminants which may cause physical, biological and chemical effects on nearby WSR.

5.5.3.2 For this Project, construction site run-off can be generated from the Site Office, which, also serves as the main storage site and pipe jacking pit JP1. It shall be noted that some of the excavated materials are also proposed to be delivered to the Site Office for temporary storage of materials for backfilling. However, as it enclosed with a site hoarding, construction site run-off can be easily contained.

5.5.3.3 Construction run-off may likewise generate from Stockpiling Areas (SA) as the earthed material can easily get into the watercourses due to wind erosion or may be washed away from rain or dust control spraying. The proposed SA for the additional JP/RP is located approximately 25 m from the nearest section of the Ngong Ping Stream. Additionally, the tentative schedule for the construction of the additional structure falls on the wet season which may increase the potential impacts from construction run-off. Nevertheless, the proposed location has inherent natural barriers such as boulders located east of the Columbarium. Furthermore, specific mitigation measures to minimise the risk site-runoff from polluting the existing watercourses to an acceptable level is presented in Section 5.8.8 of the EIA report as well as in succeeding sections.

5.5.4 **Bentonite Slurry**

5.5.4.1 Bentonite could be required as a lubricant during the pipe jacking operations which could potentially lead to frac-out. Albeit non-toxic, bentonite will become suspended solids if discharged to watercourse which can be harmful to aquatic life. The additional JP/RP is relatively close to the lower section of the Ngong Ping Stream (approximately 25 m). Hence, bentonite spillage has a higher potential to affect this WSR if not properly controlled. This potential impact however was anticipated and assessed during the EIA. Specific mitigation measures are recommended in Section 5.8.8 of the approved EIA report and also listed in subsequent sections to reduce impacts to acceptable levels.

5.5.5 **Disturbance to Water Courses**

5.5.5.1 No construction works relevant to the additional JP/RP shall be undertaken in the nearest section of the identified WSR. Construction works shall be within the proposed WA and SA boundary only. Moreover, additional JP/RP will be constructed at hard-paved area, in which the surface runoff within the proposed WA and SA are unlikely to disturb the WSR by underground seepage. Thus, disturbance to the Ngong Ping Stream caused by the additional JP/RP is unlikely to arise. Nevertheless, adoption of the relevant guidelines and good site practices for the construction runoff should be still be observed.

5.5.6 **Waste Construction Materials**

5.5.6.1 The use of mechanical plant during construction will unavoidably require refuelling, as well as fuel and oil storage and maintenance areas. Potential water quality impacts may arise from spillages of chemical waste, fuels and oils and be discharged to the nearest watercourse and NLCP as run-off. Nevertheless, the effects of litter and waste construction material can likewise be limited by the use of good site management practices. As indicated in the Section 5.8.6.3 of the approved EIA report, all chemical waste, fuels and oils shall be stored at the Site Office (SO), to reduce the risk of any spillage entering the water gathering grounds or Country Park. Moreover, all maintenance activities which could give rise to chemical waste shall also be undertaken at the Site Office site, as far as possible.

5.5.7 **Sewage Effluent**

5.5.7.1 Sewage effluents will arise from the sanitary facilities provided for the on-site construction workforce. However, temporary toilets shall be installed for the general workforce particularly located in the temporary site office at Work Section 2. As such, adverse water quality impacts from sewage effluent would not be anticipated on the nearby WSR.

5.5.8 The identified potential water quality impacts that are anticipated to arise from the construction of the additional JP/RP were also assessed during the EIA. No additional impacts are anticipated for the proposed additional structure.

5.6 Review of Mitigation Measures

5.6.1 As previously mentioned, the potential water quality impacts that are likely to arise from the proposed additional JP/RP were already assessed during the EIA. Therefore, the mitigation measures recommended in Section 5.8.8 of the approved EIA report should still be applicable and valid to the proposed additional structure. By adopting the mitigation measures with best management practices, it is anticipated that the aforementioned potential water quality impacts will be reduced to within acceptable levels. No additional mitigation measures will be recommended.

5.6.2 Construction Site Run-off

5.6.2.1 In accordance with the Practice Note for Professional Persons on Construction Site Drainage, Environmental Protection Department, 1994 (ProPECC PN 1/94), construction phase mitigation measures shall include the following:

- At the establishment of the WA and SA for the construction of additional JP/RP, perimeter cut-off drains to direct off-site water around the site should be constructed with internal drainage works and erosion and sedimentation control facilities implemented. Channels (both temporary and permanent drainage pipes and culverts), earth bunds or sand bag barriers should be provided to divert the stormwater to silt removal facilities. The design of the temporary on-site drainage system will be undertaken by the Contractor prior to the commencement of construction.
- Dikes or embankments for flood protection should be implemented around the boundaries of earthwork areas. Temporary ditches should be provided to facilitate the runoff discharge into an appropriate watercourse, through a site/sediment trap. Sediment/silt traps should be incorporated in the permanent drainage channels to enhance deposition rates.
- While ProPECC PN 1/94 requires construction works should be programmed to minimise surface excavation works during rainy seasons (April to September). By the nature of the pipe laying works, it is considered not practicable to avoid excavation works in the wet season as this would substantially affect the overall construction programme. However, for works at areas that directly interface with the existing watercourses, excavation works shall avoid the rainy season as far as possible.
- Exposed slope surfaces should be covered by tarpaulin or other means during the rainy season.

- The design of efficient silt removal facilities should be based on the guidelines in Appendix A1 of ProPECC PN 1/94, which states that the retention time for silt/sand traps should be 5 minutes under maximum flow conditions. The sizes may vary depending upon the flow rate, but for a flow rate of $0.1\text{m}^3/\text{s}$, a sedimentation basin of 30m^3 would be required and for a flow rate of $0.5\text{m}^3/\text{s}$ the basin would be 150m^3 . The detailed design of the sand/silt traps should be undertaken by the contractor prior to the commencement of construction.
- The overall slope of works sites should be kept to a minimum to reduce the erosive potential of surface water flows, and all trafficked areas and access roads should be protected by coarse stone ballast. An additional advantage accruing from the use of crushed stone is the positive traction gained during the prolonged periods of inclement weather and the reduction of surface sheet flows.
- All drainage facilities and erosion and sediment control structures should be regularly inspected and maintained to ensure their proper and efficient operation at all times particularly following rainstorms. Deposited silts and grits should be removed regularly and disposed of proper waste receiving facilities. As the area is within the water gathering grounds, on-site disposal of silts/grits shall not be allowed.
- Measures should be taken to minimise the ingress of site drainage into excavations. If the excavation of trenches in wet season is inevitable, they should be dug and backfilled in short sections wherever practicable. The water pumped out from trenches or foundation excavations should be discharged into storm drains via silt removal facilities.
- Manholes (including newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris being washed into the drainage system and storm runoff being directed into foul sewers;
- Precautions to be taken at any time of the year when rainstorms are likely, actions to be taken when a rainstorm is imminent or forecasted and during or after rainstorms, are summarised in Appendix A2 of ProPECC PN 1/94. Particular attention should be paid to the control of silty surface runoff during storm events, especially for areas located near steep slopes;
- All vehicles and plant should be cleaned before leaving a construction site to ensure no earth, mud, debris and the like is deposited by them on roads. An adequately designed and sited wheel washing facility should be provided at the exit of every construction site where practicable. Wash-water should have sand and silt settled out and removed at least on a weekly basis to ensure the continued efficiency of the process. The section of access road leading to, and exiting from, the wheel-washing bay to public roads should be paved with sufficient backfall toward the wheel-washing bay to prevent vehicle tracking of soil and silty water to public roads and drains.

- Oil interceptors should be provided in the drainage system downstream of any oil/fuel pollution sources. Oil interceptors should be emptied and cleaned regularly to prevent the release of oil and grease into the storm water drainage system after accidental spillage. A bypass should be provided for oil interceptors to prevent flushing during heavy rain.
- Stockpiled material shall be covered by tarpaulin and /or watered as appropriate to prevent windblown dust and surface run off. Measures should be taken to prevent the washing away of construction materials, soil, silt or debris into any drainage system.
- Major stockpiled areas shall be sited outside of the country parks area and away from stream courses as far as practicable. Stockpiling of earthed material shall be minimised and excavated soil shall be delivered to the Site Office as soon as possible. Similarly, overnight stockpiling of earthed material along the exposed trench shall be minimised as far as possible and the excavated soil shall be transferred to the designated stockpiling area as soon as possible.
- The Contractor shall comply with WSD's General Conditions for Working within Water Gathering Grounds as applicable.
- The construction solid waste, debris and rubbish on-site should be collected, handled and disposed of properly to avoid causing any water quality impacts.
- All fuel tanks and chemical and bentonite storage areas should be provided with locks and sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank to prevent spilled fuel oils from reaching the nearby WSRs.

5.6.2.2 A discharge licence must be applied to EPD for discharge of effluent from the construction site under the WPCO. The discharge quality must meet the requirements specified in the discharge licence. All the runoff and wastewater generated from the works areas should be treated so that it satisfies all the standards listed in the TM-DSS. Moreover, the discharge of site effluents shall be either at existing storm drains or artificial channels. No effluent or treated surface runoff shall be allowed to discharge at natural stream course.

5.6.3 **Bentonite Slurry**

5.6.3.1 The use of bentonite slurries shall be minimised as far as possible. However, where the bentonite slurries will be used, the following specific control measures shall be followed to reduce the risk and impacts of accidental spillage:

- All bentonite slurry should be stored in a container that resistant to corrosion, maintained in good conditions and securely closed;
- The container should be labelled in English and Chinese and note that the container is for storage of bentonite slurry only;

- The storage container should be placed on an area of impermeable flooring and bunded with capacity to accommodate 110% of the volume of the container size or 20% by volume stored in the area and enclosed with at least 3 sides; and
- Sufficiently covered to prevent rainfall entering the container or bunded area (water collected within the bund must be tested and disposed of as chemical waste, if necessary).

5.6.3.2 A staff shall be appointed to closely monitor the ground surface above the pipe jacking head for any frac-outs release. The pipe jacking works and application of bentonite shall immediately stop if frac-outs are observed. Any frac-out shall be immediately cleaned or bunded to prevent spreading of the bentonite slurry. The Contractor shall immediately notify the Engineer and propose rectification measures to prevent further frac-out to the satisfaction of the Engineer before pipe jacking works resume. An emergency clean-up kit shall be readily available at where pipe jacking will be undertaken.

5.6.3.3 The handling and disposal of bentonite slurries should be undertaken in accordance within ProPECC PN 1/94. Surplus bentonite slurries used in construction works shall be reconditioned and reused wherever practicable. Residual bentonite slurry shall be disposed of from the site as soon as possible as stipulated in Clause 8.56 of the General Specification for Civil Engineering Works.

5.6.4 Accidental Spillage of Chemicals

5.6.4.1 The Waste Disposal Ordinance (Cap 354) and its subsidiary regulations in particular the Waste Disposal (Chemical Waste) (General) Regulation should be observed and complied for control of chemical wastes. The general requirements stipulated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes published under the Waste Disposal Ordinance shall be followed in handling chemical wastes.

5.6.4.2 In order to minimise the risk of accidental spillage, the use and storage of oils/chemicals/waste should be limited to absolute minimum volume and are to be removed from sites at the earliest opportunity. However, all chemical waste, fuels and oils shall be stored at the Site Office (SO), to minimise impact to the Lantau North Country Park and water gathering grounds.

5.6.5 Sewage Water

5.6.5.1 Portable chemical toilets and sewage holding tanks are recommended for the handling of the construction sewage generated by the workforce at other works area. A temporary toilet located in the temporary site office at Work Section 2 shall be provided for the general workforce. A licensed contractor should be employed to provide appropriate and adequate portable toilets and be responsible for appropriate disposal and maintenance.

5.7 Review of Potential Impacts and Mitigation Measures during Operational Phase

- 5.7.1 The additional JP/RP will only potentially affect the nearby WSR during construction phase, no operational phase impact is anticipated. As mentioned in Section 5.9 of the approved EIA report, the proposed drainage system will *have no operational wastewater discharges or discharge points within the existing watercourse and would not affect the overall amount of water available to Ngong Ping Stream*. However, the anticipated potential water quality impacts during operational phase would be during the maintenance desilting works, if required. These maintenance works will be limited to the intakes only and are anticipated to be minimal.
- 5.7.2 Nevertheless, to minimise potential impacts it is recommended that desilting or maintenance works shall also be undertaken during the dry season when flow in the watercourse is low. Additionally, to avoid wastewater being discharged in the existing watercourses during maintenance works, desilting by hydraulic jetting shall be avoided and mechanical scooping / scraping methods are recommended. The disposal of the removed silt material shall be properly handled in accordance with the recommendations in Section 9 of the approved EIA report.

5.8 Cumulative Impacts

5.8.1 Minor Landscape Works by CEDD

- 5.8.1.1 The minor landscaping works adjacent to the proposed of the additional JP/RP have potential cumulative water quality impacts. The key sources of these impacts include construction site run-off and drainage; wastewater from various landscaping works activities and sewage effluent from construction and maintenance workforce. However, considering the small scale of the works to be undertaken, no significant impacts is anticipated. With the implementation of water quality impact mitigation measures, and good site practices, unacceptable cumulative impact would not arise.

5.8.2 Other Construction Works in WS6 Concurrent with the Construction of Additional JP/RP

- 5.8.2.1 Construction of the additional JP/RP shall be undertaken in two months. Upon completion of the additional JP/RP and subsequent pipe jacking works, there will be an overlap of schedule of about one month for construction of manhole at L305 and at L305A, which may have potential cumulative water quality impacts that may arise generally from run-off during construction activities. Nevertheless, with the strict implementation of mitigation measures recommended in the EIA report, unacceptable cumulative impact to nearby identified WSR is unlikely.

5.9 Residual Impacts

- 5.9.1 With strict implementation of the recommended mitigation measures, no adverse residual potential water quality impacts is anticipated during the construction and operation of the proposed additional JP/RP.

5.10 Environmental Monitoring and Audit Requirements

5.10.1 No changes of the EM&A requirements as recommended in Section 5.12 of the approved EIA report and Section 4 of the approved EM&A Manual is proposed. The recommended water quality monitoring and a routine audit programme of the construction activities throughout the construction period should be still be implemented. On the other hand, no operational phase EM&A for water quality is required.

5.11 Conclusion

5.11.1 A review of the potential water quality impacts has been conducted for the additional JP/RP of the Project. The potential impacts on water quality that are anticipated to arise from the proposed additional JP/RP are the same with the potential impacts previously anticipated during the EIA. Based on the current information, no new WSR shall be added. Likewise, no additional impact to water quality is anticipated other than what were previously identified in the EIA. Furthermore, no additional mitigation measures and EM&A requirements will be recommended. Therefore, it can be deduced that the water quality impact assessment conducted during EIA are still relevant and recommendations are still applicable and valid. Consequently, no additional survey will be undertaken.

6. ECOLOGICAL IMPACT ASSESSMENT

6.1 Introduction

6.1.1 This section details the review on the ecological impact assessment in the EIA for the construction and operation of the Project and the potential impacts arising from the proposed additional JP/RP.

6.2 Environmental Legislation, Standards and Guidelines

6.2.1 The local regulations, legislation, and guidelines relevant for the protection of species and habitats of ecological importance include:

- *Country Parks Ordinance* (Cap. 208) which provides for the designation and management of country parks and special areas;
- *Forests and Countryside Ordinance* (Cap. 96) which prohibits felling, cutting, burning or destroying of trees and growing plants in forests and plantations on Government land. Related subsidiary Regulations prohibit the selling or possession of listed restricted and protected plant species;
- *Wild Animals Protection Ordinance* (Cap. 170) which protects wild animals from being hunted, whilst their nests and eggs are protected from injury, destruction and removal. All birds and most mammals are protected under this Ordinance;
- *Protection of Endangered Species of Animals and Plants Ordinance* (Cap. 586) which gives effect to CITES in Hong Kong. The Ordinance requires a licence to be obtained in advance from the Agriculture, Fisheries and Conservation Department (AFCD) for the import, export, re-export, and possession of specimens of scheduled species;
- *Town Planning Ordinance* (Cap. 131) which provides for the designation of coastal protection areas, Sites of Special Scientific Interest (SSSIs), Conservation Area, Country Park, Green Belt or other specified uses that promote conservation or protection of the environment;
- *Hong Kong Planning Standards and Guidelines* Chapter 10 (HKPSG) which covers planning considerations relevant to conservation. This chapter details the principles of conservation, the conservation of natural landscape and habitats, historic buildings, archaeological sites and other antiquities. It also addresses the issue of enforcement. The appendices list the legislation and administrative controls for conservation, other conservation related measures in Hong Kong and government departments involved in conservation;
- *Technical Memorandum for the Environmental Impact Assessment Ordinance* (EIAO-TM). Annexes 8 and 16 of the Technical Memorandum EIAO (Cap. 499) 1997 which sets out

general criteria for evaluating the ecological importance of and hence the significance of potential ecological impacts and guidance for ecological assessment, respectively;

- *EIAO Guidance Notes (GN)*. The EIAO GN No. 3/2010 provides general guidelines for assessing the recommended environmental mitigation measures in Environmental Impact Assessment reports.
- *Environment, Transport and Works Bureau (ETWB) Technical Circular (Works) No. 5/2005 "Protection of natural streams/ivers from adverse impacts arising from construction works"*, which protects Hong Kong's natural streams/ivers from adverse impacts arising from construction works;
- *Convention on the International Trade in Endangered Species of Flora and Fauna (CITES)*. The import, export and possession of the listed species are regulated by Cap 586;
- *United Nations Convention on Biodiversity (1992)* which requires signatories to make active efforts to protect and manage their biodiversity resources;
- *World Conservation Union (IUCN) Data Books (and Red List)* is an inventory of the global conservation status of plants and animals; and
- *The Key Protected Wildlife Species List* details Category I and Category II protected animal species under the PRC's Wild Animal Protection Law.

6.3 Key Ecological Sensitive Receivers

6.3.1 Within the Study Area (500 m boundary from the proposed additional JP/RP), the recognised terrestrial sites of conservation importance (as outlined in Appendix A of Annex 16 of EIAO-TM) include the following:

- Lantau North Country Park (LNCP) –the proposed location of the additional JP/RP is not within but immediately adjacent to the LNCP.
- Conservation Area – Approximately 250 m south of the proposed location of the additional JP/RP is a conservation area.

6.4 Habitat Types

- 6.4.1 As required in Section 5.5.2.7 of the approved EM&A Manual and in accordance with EP Condition 2.8, an “Updated Baseline Vegetation Survey” was undertaken in October 2020 on WS6 where the proposed additional JP/RP is likewise located. During the survey, existing habitats were identified and detailed in succeeding sections.
- 6.4.2 A total of eight habitat types (i.e. secondary woodland, mixed shrubland/woodland, shrubland, shrubby grassland, stream, channelized watercourse, landscape plantation, and developed area) were identified in the Survey Area (**Appendix B.4**). All of these habitat types were also identified in the approved EIA Report except for mixed shrubland/woodland.
- 6.4.3 **Secondary Woodland.** Secondary woodland is a type of woodland that resulted from natural succession or from planting of previously unwooded land. The largest secondary woodland within the Survey area is at the western side of Outfall B, across the natural stream. Commonly recorded tree species in this habitat type are Red Machilus *Machilus thunbergii* and Woolly Machilus *Machilus velutina*. Dominant shrub and groundcover species were Common Melastoma *Melastoma malabathricum* and Twelve-stamened Melastoma *Melastoma dodecandrum*, respectively.
- 6.4.4 **Shrubland.** Shrubland habitats are dominantly covered with thickets of shrubs and young trees with presence of scattered grasses or herbs. Primary shrublands within the Survey area were observed adjacent (northern section) to the alignment of the drainage pipe. Commonly recorded shrubs within this habitat type are Mrs. Farrer's Rhododendron *Rhododendron farrerae* and Vietnam Leaf-flower *Phyllanthus cochinchinensis*. Groundcover species, on the other hand, were generally composed of Ambrosia Orchid *Bulbophyllum ambrosia* and Brown Rock-orchid *Coelogyne fimbriata*. Tree species that were present in this habitat type were Chekiang Machilus *Machilus chekiangensis*, Short-flowered Machilus *Machilus breviflora*, and Hong Kong Gordonia *Polyspora axillaris*.
- 6.4.5 **Mixed shrubland/woodland.** Mixed shrubland/woodland is characterized of having tree species mixed with shrubland species together with scattered groundcover species such as grasses or herbs. This type of habitat covers the south section of the alignment of the drainage pipes. In the approved EIA Report, this section was classified as plantation, but possible natural succession could have allowed growth of shrubs and young trees in this habitat. Common tree species recorded in this area were *M. chekiangensis*, *M. velutina*, Turn-in-the-wind *Mallotus paniculatus*, and Rough-leaved Holly *Ilex asprella*; dominant shrubs were *M. malabathricum*; and groundcover species were Carpet Grass *Axonopus compressus*. Species of conservation interest such as Heliotrope Ehretia *Ehretia acuminata*, Small-fruited Honeylocust *Gleditsia australis*, and Walking-stick Orchid *Geodorum densiflorum* were also recorded in this area.

- 6.4.6 **Shrubby grassland.** Shrubby grassland refers to areas with mixture of short or tall grass and shrubs with less than 50% of woody plant (AFCD, undated). This type of habitat was observed at the fringes of the channelized channel, where Intake C is proposed to be located. The dominant species found in this area were *A. compressus* and West-India Chickweed *Drymaria cordata*. *G. densiflorum* was also recorded near the road, east side of Intake C.
- 6.4.7 **Stream.** Streams refer to body of flowing water in a channel or bed. The natural stream found within the Survey area is Ngong Ping stream, which parallelly traverses the southern section of the alignment of the drainage pipe, passes behind the columbarium, and eventually discharges downstream at the cliff adjacent to the location of Outfall B. A number of Eurya-leaved Camellia *Camellia euryoides* were found along the stream in Outfall B. This species is listed as of conservation interest.
- 6.4.8 **Channelized Watercourse.** Channelization of streams or rivers is usually done for the purposes of flood control, drainage, navigation, and to prevent erosion. Intake C is proposed to be located in channelized watercourse which connects to the natural stream. Common species found in this area were Glabrous Knotweed *Polygonum glabrum*, Giant Alocasia *Alocasia macrorrhizos*, and Alligator-weed *Alternanthera philoxeroides*.
- 6.4.9 **Plantation.** This generally refers to man-made habitats with planted trees for landscape and forestation purposes. Plantations have simple structure due to the similarities of species present which results to little vegetation stratification and lower heterogeneity. Landscape plantation areas were along the road going to the columbarium and within the vicinity of the alignment of the drainage pipe. Common species that were planted in these areas were Oshima Cherry *Prunus speciosa* and Yunnan Cherry *Prunus yunnanensis*.
- 6.4.10 **Developed Area.** Developed areas within the Survey area are comprised of the village areas, roads, tourist attractions, and public utilities. *Terminalia mantaly*, Sasanqua Camellia *Camellia sasanqua*, Mock Lime *Aglaia odorata*, and Caribbean Copper Plant *Euphorbia cotinifolia* are some species observed in this area.

6.5 Vegetation and Floral Species of Conservation Interest

- 6.5.1 The updated baseline vegetation survey recorded 89 species in WS6, 9 of which are identified as floral species of conservation interest. A total of 99 individuals or clusters of the floral species of conservation interest were identified during the updated baseline vegetation survey. The potential impacts on these species of conservation interest were anticipated for the construction works in WS6, thus, transplantation activities and installation of floral protection measures were carried out during pre-construction phase. Summary of the transplantation and in-situ preservation measures are presented in succeeding sections.

- 6.5.2 Seven individuals of *Camellia euryoides* and five individuals of *Rhododendron farrerae* will be directly affected by the construction works in Outfall B and were therefore transplanted. The transplanted *C. euryoides* individuals were transplanted in the fringe area of the adjacent secondary woodland opposite to Outfall B; and currently support several individuals of the species along the riparian area of the nearby stream. Meanwhile, the transplanted *R. farrerae* are situated in northeast of the Ngong Ping Columbarium which currently support several individuals of the species.
- 6.5.3 Species of conservation interest that will not be directly affected by the construction works were preserved in-situ with provided protection measures. Warning signposts or labels were installed denoting the presence of floral species of conservation interest such as *Ehretia acuminata*, *Gleditsia australis*, *Geodorum densiflorum* located along road towards Ngong Ping Columbarium. Meanwhile, for *R. farrerae* located east of the columbarium and immediately south of the proposed additional JP/RP as well as *C. euryoides* adjacent to Outfall B, posts indicating prohibition of access were installed. Solid fencing at access entrance were likewise installed for clusters of *Coelogyne fimbriata* and *Bulbophyllum ambrosia* located north of Outfall B and for *R. farrerae* northeast of the columbarium to refrain encroachment to these areas. Moreover, for individuals of *G. densiflorum* adjacent to Intake C and *R. farrerae* immediately adjacent to the works in Outfall B where potential minimal impacts are anticipated, solid fencing around these individuals were erected. On the other hand, no protection measures were installed for the clusters of *Enkianthus quinqueflorus* and *Camellia sinensis* along Ngong Ping Trail as these individuals are relatively far from any construction works and no direct impact is expected provided that the construction activities.
- 6.5.4 The proposed additional JP/RP is located in a developed area and will not pose direct impacts to the surrounding floral species of conservation interest in WS6. Moreover, the construction works of additional JP/RP will not involve vegetation clearing. Hence, no transplantation works shall be conducted and no additional protection measures shall be installed. However, floral protection measures summarised in previous section and detailed in the Floral Protection Plan should be strictly observed. Consequently, the findings of the vegetation survey during the EIA and the updated baseline vegetation survey should be still relevant and valid.

6.6 Fauna Species of Conservation Interest

- 6.6.1 The baseline surveys during the EIA identified four fauna species of conservation importance in WS6 where the location of the additional JP/RP is likewise proposed. These species of conservation interest include Eastern Cattle Egret *Bubulcus coromandus*, Reeves' Terrapin *Mauremys reevesii* and Stream Crab *Somanniathelphusa zanklon*. The Eastern Cattle Egret listed as of Local Concern (Fellowes et al. 2002) and is uncommon to common all year round, although numbers are generally low away from Deep Bay (Carey et al. 2001) was recorded adjacent to the channelised watercourse near Intake C. Meanwhile, a single Reeves' Terrapin listed as Endangered by IUCN (2011), considered to be of Global Concern (Fellowes et al. 2002) and protected locally under the Wild Animals Protection Ordinance (Cap. 170) was recorded at the downstream survey point of W8 southeast of the proposed additional structure. The Stream Crab considered as being of Global Concern by Fellowes et al. (2002) and listed as Endangered on the IUCN Red List (IUCN 2011) was also recorded at the survey points W8 (Figure 6.5b of the approved EIA Report).
- 6.6.2 As required in Section 5.5.2.17 of the approved EM&A Manual and in accordance with EP Condition 2.11, an "Aquatic Fauna Translocation Survey" was undertaken in January 2021 at the affected section of the stream course WS6. The survey conducted did not however record aquatic fauna species of conservation interest such as the Reeves' Terrapin *Mauremys reevesii* and Stream Crab in the location where both were observed during EIA. These species if present and aquatic ecology in the nearest watercourse will be indirectly affected by construction run-off through sedimentation and contamination. However, it shall be noted the proposed works of the additional JP/RP will not interface with the nearest watercourse, hence, impacts from construction run-off to aquatic species is considered minor. Additionally, the proposed location has inherent natural barriers such as boulders located east of the Columbarium. Consequently, the proposed additional structure will not generate adverse impacts on the adjacent stream. The findings of the EIA are still applicable and valid.

6.7 Review of Impact Identification

- 6.7.1 According to Section 6.10 of the approved EIA report, the construction phase ecological impacts include habitat and vegetation loss, disturbance, and construction run-off. Likewise, is anticipated in the construction of additional JP/RP albeit impacts on habitat and vegetation loss is nil to minimal as the proposed works is located in a developed area. No additional ecological impacts are anticipated. Therefore, the findings of the EIA and recommendations should still be valid and applicable.

6.8 Review of Impact Evaluation: Construction Phase

- 6.8.1 **Habitat and vegetation loss.** As aforementioned no vegetation clearing will be carried out in the construction of the proposed JP/RP. However, temporary loss on developed area which will consequently affect associated wildlife is anticipated during excavation works of the proposed structure. Nevertheless, direct impacts to this area will be minimised by the adoption of a trenchless construction method. Severity of the impacts is considered minor.
- 6.8.2 **Disturbance.** One of the major construction ecological impacts on additional JP/RP is disturbance to fauna and flora present in the surrounding area. Disturbance is likely to be associated with noise and movement from construction traffic and the greater presence of human activities on-site which may lead to wildlife injury. Meanwhile, disturbance to nearby vegetation and flora species of conservation interest may result from dust deposition. However, no direct impact is anticipated for flora and fauna is anticipated with the proposed, hence, severity of this impact however is considered minor.
- 6.8.3 **Construction Run-off.** Construction site surface run-off, if it enters into the watercourses, can indirectly affect the aquatic ecology due primarily to sedimentation and contamination. The nearest watercourse will be a section of the Ngong Ping Stream approximately 25 m south of the proposed additional JP/RP. Surface runoff from the site is likely to carry sediment eroded from the excavated area and stockpiled earthed material. The elevated suspended solids can directly affect aquatic fauna by clogging their respiratory system (e.g., gill structures) or can potentially physically asphyxiate smaller individual and larval stage of aquatic species. Moreover, high suspended solids can likewise decrease dissolved oxygen levels rendering the water bodies hostile to intolerant species. Furthermore, contaminants such as fuel, oil, solvents and lubricants from maintenance of construction machinery and equipment, in the surface runoff can be toxic to the aquatic biota and may cut-off the oxygen supplies. Spillage of bentonite from the pipe jacking works could also affect the aquatic environment. Nevertheless, proposed works will not interface with the nearest watercourse, hence, severity of this impact however is still considered minor.

6.9 Review of Mitigation Measures

- 6.9.1 As aforementioned, no additional ecological impacts are anticipated from the construction and operation of the additional JP/RP. Consequently, the type and extent of potential ecological impacts arising from the additional structure will have no changes from previously identified in the EIA. Therefore, the recommended mitigation measures listed in Section 6.12 of the approved EIA report are still relevant and applicable. No additional mitigation measures is required for the proposed additional structure. Below are the recommended mitigation measures:

- avoid damage and disturbance to the remaining and surrounding natural habitat;
- placement of equipment in designated areas within the existing disturbed land;

- restricting the works activities to within designated works area by mean of fencing, railing or temporary barrier; and
- disturbed areas to be reinstated immediately after completion of the works.
- controlling the discharge of site runoff;
- All fuel tanks and storage areas should be provided with locks and sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank to prevent spilled fuel oils;
- oil interceptors should be provided in the drainage system downstream of any oil/fuel pollution sources;
- stockpiled material shall be covered by tarpaulin and /or watered as appropriate to prevent windblown dust and surface run off;
- Overnight stockpiling of earthed material along the exposed trench shall be minimised as far as possible and excavated soil shall be transferred to the designated stockpiling area as soon as possible;
- All bentonite slurry shall be suitably stored in accordance with Section 5.8.8 of the approved EIA report to minimise the chance of spillage;
- Pipe jacking areas shall be closely monitored for frac-outs release of bentonite and frac-out area immediately cleaned if they occur;
- Implementation of Floral Protection Plan;
- Implementation of dust suppression measures as described in Section 2.3.1.2 of the approved EM&A Manual minimize the potential adverse dust impacts on vegetation.

6.9.2 The particular measures to protect the ecology of the Lantau North Country Park are summarised below:

- Major stockpiled areas shall be sited outside of the country parks area WS6 and away from stream courses as far as practicable;
- All backfilling material and cement required for WS6 shall be delivered only in the quantities required;
- No storage of chemical waste in WS6; and
- No construction plant maintenance facilities in WS6.

6.9.3 Meanwhile, the additional JP/RP is not anticipated to induce any adverse ecological impacts during the operational phase. Therefore, operational phase mitigation measures are not necessary.

6.10 Cumulative Impacts

6.10.1 Minor Landscape Works by CEDD

6.10.1.1 The minor landscaping works adjacent to the proposed of the additional JP/RP have potential cumulative ecological impacts. The key sources of these impacts include site run-off, and minor habitat disturbance. However, considering the small scale of the works to be undertaken, no significant impacts is anticipated. With the implementation of impact mitigation measures, and good site practices, unacceptable cumulative impact would not arise.

6.10.2 Other Construction Works in WS6 Concurrent with the Construction of Additional JP/RP

6.10.2.1 Construction of the additional JP/RP shall be undertaken in two months. Upon completion of the additional JP/RP and subsequent pipe jacking works, there will be an overlap of schedule of about one month for construction of manhole at L305 and at L305A, which may have potential cumulative ecological impacts that may arise generally from site run-off and distance from the construction activities. Nevertheless, considering the distance between these two structures (approximately 160 m) and with the implementation of mitigation measures recommended in the EIA Report, unacceptable cumulative impact is unlikely.

6.11 Residual Impacts

6.11.1 With strict implementation of the recommended mitigation measures, no adverse residual potential ecological impacts is anticipated during the construction and operation of the proposed additional JP/RP.

6.12 Environmental Monitoring and Audit Requirements

6.12.1 No changes of the EM&A requirements as recommended in Section 6.17 of the approved EIA report and Section 5 of the approved EM&A Manual is proposed. Weekly audit shall be conducted to ascertain that construction run-off and habitat protection mitigation measures are implemented. Moreover, monthly audit will be carried out for the implementation of Floral Protection Plan until construction works completed and the site is reinstated. Likewise, audit of the transplanted species shall be conducted in terms of number, health and survival rate of the transplanted individual (monthly for the first 12 months after the transplantation and quarterly between months 12 to 24 after the transplantation).

6.13 Conclusion

6.13.1 A review of the potential ecological impacts has been conducted for the additional JP/RP of the Project. It is noted that the type and extent of potential ecological impacts arising from the additional structure will have no changes from the previously identified in the EIA. Likewise, no additional mitigations and EM&A requirements will be recommended. Therefore, it can be deduced that the ecological impact assessment conducted during EIA are still relevant and recommendations are still applicable and valid. Consequently, no additional surveys shall be conducted.

7. LANDSCAPE AND VISUAL IMPACT REVIEW

7.1 Introduction

7.1.1 Landscape Resources (LRs) and Landscape Character Area (LCAs) within the Study Area the additional JP/RP of the Project and Visually Sensitive Receivers (VSRs) within the Primary Zone of Visual Influence were assessed. Likewise, details of the assessment described in Section 7 of the EIA report have been reviewed for the purpose of the ERR. This section details the review on the landscape and visual impact assessment (LVIA) in the approved EIA report and the potential impacts arising from the proposed additional JP/RP.

7.2 Environmental Legislation, Standards and Guidelines

7.2.1 The legislation, standards, guidelines and criteria applicable to the evaluation of landscape and visual impacts associated with the construction and operation of the Project are as follows:

- Environmental Impact Assessment Ordinance (EIAO) (Cap. 499) Section 16 and Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM), particularly Annexes 3, 10, 11, 18, 20 and 21;
- EIAO Guidance Note 8/2010;
- EIA Study Brief No. ESB-227/2011;
- Ngong Ping Outline Zoning Plan. S/I-NP/6;
- Planning Department - Landscape Value Mapping of Hong Kong;
- Hong Kong Planning Standards and Guidelines, particularly Chapter 4 : Recreation, Open Space and Greening, Chapter 10 Conservation and Chapter 11: Urban Design Guidelines;
- Forests and Countryside Ordinance (Cap. 96);
- Town Planning Ordinance (Cap. 131);
- Country Parks Ordinance (Cap. 208);
- Plant Varieties Protection Ordinance (Cap 490).
- Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586);
- Agriculture, Fisheries and Conservation Department Nature Conservation Practice Note No. 01, 02 (Rev. Jun 2006) and 03;
- Agriculture, Fisheries and Conservation Department Publication "Checklist of Hong Kong Plants 2012";

- Agriculture, Fisheries and Conservation Department Publication “Rare and Precious Plants of Hong Kong 2003”;
- All relevant guidelines on “Tree Maintenance and Management” and “Greening works” issued by the Greening, Landscape and Tree Management (GLTM) Section of the Development Bureau;
- Civil Engineering and Development Department “Project Administration Handbook for Civil Engineering Works 2020”
- DEVB TCW No. 4/2020 – Tree Preservation;
- ETWB TCW No. 5/2005 – Protection of natural streams/ivers from adverse impacts arising from construction works;
- DEVB TCW No. 5/2020 – Registration and Preservation of Old and Valuable Trees;
- ETWB TCW No. 2/2004 – Maintenance of Vegetation and Hard Landscape Features;
- ETWB TCW No. 13/2003A – Guidelines and Procedures for Environmental Impact Assessment of Government Projects and Proposals Planning for Provision of Noise Barriers;
- HyDTC No. 2/2010 – Control in the Use of Shotcrete (Sprayed Concrete) in Slope Works;
- WBTC No. 7/2002 – Tree Planting in Public Works;
- WBTC No. 17/2000 – Improvement to the Appearance of slopes in connection with WBTC 25/93;
- WBTC No. 25/93 – Control of Visual Impact of Slopes;
- Land Administration Office Instruction (LAOI) Section D-12 – Tree Preservation;
- GEO Publication No. 1/2011 “ Technical Guidelines on Landscape Treatment for Slopes”;; and
- GEO Publication (1999) – Use of Vegetation as Surface Protection on Slopes

7.3 Review of Planning and Development Framework

- 7.3.1 Based on the current record on the Outline Zone Plan (OZP), the majority of the Project is covered by the Ngong Ping Outline Zoning Plan S/I-NP/6. No Departmental Plans have been developed for the Study Area since the EIA was undertaken up to present. However, the WS6 is outside of the scope of the OZP and lies within the Lantau North Country Park.

7.3.2 Albeit the proposed location of the additional JP/RP is in WS6, it is however situated in Lantau North Country Park excluded area (Figure 7.2 of the approved EIA report). Nonetheless, it should be ascertained that the construction works programmed for the additional JP/RP shall not encroach in the Country Park area. Country Parks and Special Areas are designated under the Country Parks Ordinance (Cap 208) and managed by the Agriculture, Fisheries and Conservation Department (AFCD) on the advice of the Country and Marine Parks Board (CMPB).

7.4 Review on the Landscape and Visual Baseline Conditions of the Proposed Additional JP/RP

7.4.1 Landscape Resources

7.4.1.1 The physical and cultural landscape resources identified in the EIA (Figure 7.3 of the EIA report) that are covered within 500 m from the proposed location of the additional JP/RP were reviewed. Moreover, the sensitivity of each landscape resource (LR) to the proposed development were reviewed and assessed. Details of the landscape resources surrounding the additional JP/RP are presented in subsequent sections and the sensitivity of each resource is summarised in **Table 7.1**.

7.4.1.2 **Natural Stream Courses.** Natural stream courses which include seasonal hillside ravines and water courses through Ngong Ping Valley are identified adjacent to the proposed location of the additional RP/JP particularly (west near Outfall B and south near Ngong Ping Columbarium respectively). Hillside ravines within the area are generally seasonal. However, ravines are sensitive to environmental change and given that these are located in protected Lantau North Country Park areas, sensitivity is considered *High*. Meanwhile, the section of the Ngong Ping stream which stretches to the drainage channel near Intake C is classified to have *Medium* sensitivity. This stretch is also seasonal and likewise sensitive to environmental change.

7.4.1.3 **Natural Topographic Features.** The rocky outcrops surrounding the Ngong Ping Columbarium and are situated immediately north and west of the proposed location of the additional JP/RP display a strong and unique appearance and may provide potential niches and crevices for ecological habitat and development. Hence, its sensitivity is considered to be *High*.

7.4.1.4 **Open Hillside Vegetation.** The proposed location of the additional JP/RP is surrounded with hillside grass and shrub which provided natural cover for mountain slopes which may develop in moist niches or on thicker localised soil deposits. As the grass and shrub habitat is the typical cover for much of the upland landscape of the area, the sensitivity is considered *Medium*.

7.4.1.5 **Religious Features.** The Ngong Ping Columbarium, located at the far end of the road, can accommodate change relatively easily and its cultural importance is not as that for other religious features in the district. Sensitivity is therefore, considered *Low*.

Table 7.1: Summary of Assessment of Sensitivity of Landscape Resources

Ref	Landscape Resource	Quality and Maturity (High, Medium, Low)	Rarity (High, Medium, Low)	Local / District / Regional Importance	Statutory Limitations/ Requirements*	Ability to Accommodate Change (High, Medium, Low)	Sensitivity (High, Medium, Low)
<i>LDR-1 Natural Stream Course</i>							
LDR 1.1	Seasonal Hillside Ravines	High	Medium	District	Country Park	Low	High
LDR 1.2	Water Courses through Ngong Ping Valley	Low	Medium	District	Country Park	Medium	Medium
<i>LDR-2 Constructed Water Courses</i>							
LDR-2.1	Open Drainage Channels	Low	Low	Local	-	High	Low
<i>LDR-3 – Natural Topographic Features</i>							
LDR-3.1	Rocky Outcrops Surrounding Ngong Ping Columbarium	High	Medium	District	Country Park	Low	High
<i>LDR-5 – Upland Vegetation</i>							
LDR-5.1	Hillside Grass and Shrub	Medium	Low	District	Country Park	Low	High
<i>LDR-8 – Religious Institutions / Features</i>							
LDR-8.3	Ngong Ping Columbarium	Low	Low	District	-	High	Low

7.4.2 Landscape Character Areas

7.4.2.1 The Landscape Character Areas (LCAs) as identified in the Section 7.5.3 and presented in Figure 7.4 of the approved EIA report which are covered within 500 m boundary of the proposed additional JP/RP are listed below and summarised in **Table 7.2**.

7.4.2.2 ***Inhabited Land around Ngong Ping Village.*** This area contains the typical features such as rural settlement with land under, or previously under, agriculture, local woods and streams enclosed within the surrounding mountains. These areas have undergone changes and continues to accommodate such slow changes. Sensitivity is considered as *Medium*.

7.4.2.3 ***Natural Hills Surrounding Ngong Ping.*** The general 'Peak Landscape' to the west of Ngong Ping exhibits typical character traits. This area is generally covered in grass and shrub vegetation with rocky outcrops. Designated as Country Park, the area is considered to have *High* sensitivity.

7.4.2.4 ***Upper Reaches of Sham Wat Valley.*** This area forms the visual ridge of the large character area formed from the valley floor at Shum Wat. In physical terms it more resembles the characteristics of LCA4 as a 'Peak Landscape' but is not visible from the plateau, making it singularly distinct. Sensitivity is considered *High*.

Table 7.2: Summary of Assessment of Sensitivity of Landscape Character Areas

Ref	Landscape Character Area	Landscape Character Type	Quality and Maturity (High, Medium, Low)	Rarity (High, Medium, Low)	Local / District / Regional Importance	Statutory Limitations/ Requirements*	Ability to Accommodate Change (High, Medium, Low)	Sensitivity (High, Medium, Low)
LCA1	Inhabited Land Around Ngong Ping Village	Upland Plateau Landscape	Medium	Medium	Regional	-	Medium	Medium
LCA4	Natural Hills Surrounding Ngong Ping	Peak Landscape	High	Medium	Regional	Country Park	Low	High
LCA5	Upper Reaches of Sham Wat Valley	Settled Valley Landscape	High	Medium	Regional	Country Park	Low	High

7.4.3 Visually Sensitive Receivers

- 7.4.3.1 A number of Visually Sensitive Receivers (VSRs) will be affected by the construction of the additional JP/RP (Table 7.3). The Zone of Visual Influence (Visual Envelope) which refers to area from which any part of the proposed Project will be seen, is set at a distance of 500 m. Beyond this, the effects of distance and the extensive visual context are already insignificant.
- 7.4.3.2 Six VSRs (Figure 7.5 of the approved EIA report) were identified within the 500 m Study Area of the proposed additional JP/RP. These are classified into Occupational, Leisure and Control, and Transportation VSRs. Details of each are presented in subsequent sections.
- 7.4.3.3 Staff at Ngong Ping Cable Car Terminal (O-01) and Monastery Visitors to Ngong Ping Columbarium (O-02) are identified as occupational VSRs. The staff at Ngong Ping Cable Car Terminal may circulate the building and have selected aspects on various sides into the surrounding countryside. However, given that the view to the additional JP/RP is somehow restricted with the presence of trees and other visual obstructions, the staff with few window opportunities available, relatively low staff numbers and infrequent durations of view, the receiver sensitivity is considered as *Low*. Meanwhile, the visitors to the Ngong Ping Columbarium will be directly affected by the construction works of the proposed additional JP/RP. As the proposed structure will be located directly adjacent to the Columbarium, this will generate visual potential impacts to monastery visitors as they pass through the WA and SA of the additional structure within the access road towards the columbarium. Nevertheless, inside the columbarium, receivers are concealed within the enclosed walls and will only be aware of outside views from the front entrance door and from the slit windows in the walls. Notwithstanding, the receiver sensitivity is considered *Medium* given that number of receivers are only few and nature of visits are not frequent.
- 7.4.3.4 Users of Ngong Ping 360 Cable Car (L-01) and hikers on footpaths in Lantau North Country Park and on Nei Lak Trail (L-04) are identified as leisure and culture VSRs. The potentially large number of users of the Ngong Ping 360 Cable Car may take specific interest in viewing the surroundings especially that the elevate view provides better opportunity in taking photos of the countryside. Although the views for the receivers are transitory, the high quality of panoramic views and the huge numbers of receivers mean that sensitivity is considered *High*. Meanwhile, the hikers on footpaths in Lantau North Country Park and on Nei Lak Trail may likewise potentially see the construction works as they pass through the road to the trail. Nevertheless, the access point to the trail is relatively distant from the additional JP/RP. Moreover, the only limited numbers are anticipated daily which are transient or occasional visitors, therefore, sensitivity is *Medium*.

7.4.3.5 Users of Columbarium access road and road users on Po Ngong Drive are identified as transportation VSRs. The proposed location of the additional JP/RP is in a roundabout which can be used as backing out area for visitors in Ngong Ping and parking area for the users of the columbarium. Albeit, this road is very infrequently travelled and restricted to Columbarium users, the WA and SA of the proposed additional structure will occupy the space of the roundabout and the limited remaining space may not be ideal for parking and backing out. Nevertheless, with low user numbers and short view duration, receiver sensitivity is considered to be *Medium*. Meanwhile, the road users on Po Ngong Drive experiences extremely limited traffic, where receiver's views are constantly changing. Thus, receiver sensitivity is considered *Low*.

Table 7.3: Summary of Assessment of Sensitivity of Visually Sensitive Receivers (VSRs)

Ref	Landscape Resource	Estimated number of Receivers (Few / Typical / Many)	Value and Quality of Existing View (Good / Fair / Poor)	Availability and Amenity of Alternative views	Duration and Frequency of Existing view (Stationary / Transitory / Glimpse Frequent / Regular / Occasional)	Degree of Visibility (Wide / Restricted / Narrow Distant / Near / Adjacent)	Sensitivity (High, Medium, Low)
Occupational							
O-01	Staff at Ngong Ping Cable Car Terminal	Few	Good	Yes / Good alternatives	Stationary / Frequent	Restricted / Adjacent	Low
O-02	Monastery visitors to Ngong Ping Columbarium	Few	Good	Yes / Good alternatives	Stationary / Frequent	Wide / Adjacent	Medium
Leisure & Cultural							
L-01	Users of Ngong Ping 360 Cable Car with Elevated Views Is	Many	Good	Yes / Good alternatives	Transitory / Occasional	Wide / Distant	High
L-04	Hikers on Footpaths in Lantau North Country Park and on Nei Lak Trail	Few	Good	Yes / Good alternatives	Transitory / Occasional	Wide / Distant	Medium
Transportation							

Ref	Landscape Resource	Estimated number of Receivers (Few / Typical / Many)	Value and Quality of Existing View (Good / Fair / Poor)	Availability and Amenity of Alternative views	Duration and Frequency of Existing view (Stationary / Transitory / Glimpse Frequent / Regular / Occasional)	Degree of Visibility (Wide / Restricted / Narrow Distant / Near / Adjacent)	Sensitivity (High, Medium, Low)
T-01	Users of Ngong Ping Columbarium Access Road	Few	Good	Yes / Good alternatives	Transitory / Regular	Wide / Near	High
T-02	Road Users on Po Ngong Drive	Few	Good	Yes / Good alternatives	Transitory / Regular	Restricted / Adjacent	Low

7.4.4 The baseline coverage defined in the LVIA during the EIA still covers the area of the proposed additional JP/RP. All the identified receivers which include LRs, LCAs, and VSRs that may be potentially affected by the proposed change have been reviewed through recent aerial orthophotographs and site inspections. No significant changes were observed on the identified landscape and visual sensitive receivers, albeit sensitivity of some may differ from the assessment of the EIA with respect to the distance and degree of impact that may arise from the proposed change. Nevertheless, no additional LRs, LCAs and VSRs within the visual envelope of the proposed additional structure.

7.5 Potential Sources of Landscape and Visual Impacts

7.5.1 Section 7.7 of the approved EIA report lists the potential impacts that are likely to arise from the construction and operation of the Project. These potential impacts are likewise anticipated and relevant in the proposed additional structure though no additional potential impacts will likely to arise from the proposed works.

7.5.2 During the Construction Stage of the proposed additional structure, potential Landscape and Visual Impacts would arise from:

- Excavation and construction works of the JP/RP;
- Stockpiling of excavated and building materials and storage of construction equipment and plant in stockpile areas;
- Off-site construction traffic involving haulage of excavated materials;
- Temporary traffic / road diversions;

- Night-time lighting;
- Temporary works hoardings, noise barriers and enclosures; and
- Contractor's temporary works areas, including parking areas.

7.5.3 Magnitude of these impacts are assessed to be small to negligible on LRs and LCAs. Meanwhile, magnitude of these potential impacts before mitigation on the identified VSRs ranges from small to large.

7.5.4 On the other hand, during the operational phase of the additional JP/RP, no potential landscape and visual impacts is anticipated.

7.6 Mitigation Measures

7.6.1 As no additional potential impacts are anticipated with the construction and operation of the additional JP/RP, the mitigation measures recommended in Section 7.11 of the approved EIA report should still be relevant and applicable.

7.6.2 The mitigation measures that shall be employed in the construction and operation of the additional structure shall be as follows:

- No-intrusion Zone- To maximize protection of existing resources including watercourses, existing trees, ground vegetation and the associated understory habitats a "No-intrusion Zone" will be designated to various areas within and along the site boundary with rigid and durable fencing for each individual no-intrusion zone. Regular checks will be carried out to ensure that the work site boundaries are not exceeded, hoarding is properly maintained and that no damage is being caused to these protected areas.
- Erection of Screen Hoardings- A temporary screen hoarding will be erected around the WA and SA of the additional JP/RP area to screen activities from local receivers. It shall be designed to be compatible with the existing rural context, with visually unobtrusive design and colours where appropriate.
- Control of night-time lighting- No night time work shall be programmed avoiding light pollution to visual receivers.

7.6.3 The mitigation measures that shall be employed in the construction and operation of the additional structure shall be as follows:

- Horizontal Greening- Following installation of underground culverts, pit excavation or utilization of land for works or stockpiling, the ground shall be backfilled, levelled and soiled as necessary for reinstatement.
- Reinstatement of Natural Water Courses- Where water courses have been affected by the works new, naturalised stream paths shall be provided as far as applicable, using

excavated local rocks and stones, in order to create a pleasing visual impression and potential enhanced ecological habitat.

7.7 Cumulative Impacts

7.7.1 Minor Landscape Works by CEDD

7.7.1.1 The minor landscaping works adjacent to the proposed of the additional JP/RP have potential cumulative landscape and visual impacts. The key sources of these impacts include the amenity planting and installation of water mains. However, considering the small scale of the works to be undertaken, no significant impacts is anticipated. With the implementation of impact mitigation measures, and good site practices, unacceptable cumulative impact would not arise.

7.7.2 Other Construction Works in WS6 Concurrent with the Construction of Additional JP/RP

7.7.2.1 Construction of the additional JP/RP shall be undertaken in two months. Upon completion of the additional JP/RP and subsequent pipe jacking works, there will be an overlap of schedule of about one month for construction of manhole at L305 and at L305A, which may have potential cumulative landscape and visual impacts that may arise generally from the construction activities.

7.7.2.2 Albeit, construction of the additional JPRP shall be carried out and completed in two months, backfilling of the excavated area will not be undertaken yet until the pipe-jacking operations is complete. It is assumed that the barriers/hoardings will be installed and maintained around the excavated area until pipe-jacking in WS6 is completed by November 2021. It shall be noted however, that Chung Yueng Festival falls on October. Increase in vehicular and foot traffic to the Columbarium and Po Ngong Drive is anticipated during the festival period. Consequently, population of the identified VSR will increase. Nevertheless, with the strict implementation of mitigation measures recommended in the EIA report, unacceptable cumulative impact is unlikely.

7.8 Residual Impacts

7.8.1 No adverse residual impacts is anticipated during the construction and operation of the proposed additional JP/RP on the identified LRs and LCAs. Likewise, adverse residual impacts to identified VSRs are nil to insignificant.

7.9 Environmental Monitoring and Audit Requirements

7.9.1 No changes of the EM&A requirements as recommended in Section 7.14 of the approved EIA report and Section 6 of the approved EM&A Manual is proposed. The design, implementation and maintenance of mitigation measures shall be checked regularly by the Environmental Team (ET) during the EM&A to ensure that these are fully realised and compliant with the intended aims of the measures. The extent of the agreed WA of the proposed additional JP/RP shall be likewise regularly checked during the construction phase by the Environmental Team (ET). Any trespass by the Contractor outside the limit of the works leading to damage to existing trees shall be reported to the Independent Environmental Checker and Engineer's Representative.

7.10 Conclusion

7.10.1 A review of the landscape and visual impact has been conducted for the additional JP/RP of the Project. It has been noted that no additional LRs, LCAs and VSRs will be likely affected with the additional structure. Likewise, no additional impacts and consequently, no additional mitigations and EM&A requirements will be recommended. Therefore, it can be deduced that the landscape and visual impact assessment conducted during EIA are still relevant and recommendations are still applicable and valid. Consequently, no additional surveys shall be required.

8. CULTURAL HERITAGE IMPACT REVIEW

8.1 Introduction

8.1.1 This section details the review on the cultural heritage impact assessment in the EIA Report and the potential impacts arising from the proposed additional JP/RP.

8.2 Environmental Legislation, Standards and Guidelines

8.2.1 The legislation, standards, guidelines and criteria relevant to the consideration of Cultural Heritage impacts under this study include the following:

- Environmental Impact Assessment Ordinance and Technical Memorandum;
- Antiquities and Monuments Ordinance;
- Hong Kong Planning Standards and Guidelines;
- Guidelines for Cultural Heritage Impact Assessment; and
- Development Bureau Technical Circular (DEVB TC) (Works) No. 6/2009.

8.3 Sites of Cultural Heritage within Study Area

8.3.1 Section 8.5.4.1 and Table 8.1 of the approved EIA report stipulated that WS6 is deemed very low in terms of archaeological potential given that the area has generally rocky surface. Likewise, the no adverse archaeological impacts were predicted during the EIA given the scale and the limited number of PME that will be used for the Project. Additionally, based on the current information, there is no identified site of archaeological interest in the area. As such, the additional JP/RP will not likely affect any sites of archaeological interest within the Study Area, which is defined as 50 m from the relevant proposed works area boundary. However, it is recommended that if any antiquities or supposed antiquities are discovered during the course of excavation works, *the Project proponent must arrange a temporary suspension of works in the affected area and notify AMO immediately after the discovery and any further action should be agreed with AMO prior to continuation of the works.*

8.3.2 Furthermore, the built heritage impact assessment during the EIA did not record any Declared Monuments, proposed monuments, Graded Historic Site/Buildings, and Government Historic Sites identified by the AMO or Historical villages within 100 m Study Area from the works area boundary of the proposed additional JP/RP.

- 8.3.3 One built heritage resource was identified, a grave, which is located approximately 20 m from the works area boundary (Table 8.4 and Appendix G1 of the EIA report). Albeit, it may not be directly in contact with the machinery and equipment during construction phase, given the distance of the grave to the proposed works, it is anticipated to have indirect potential impacts by ground borne vibrations. Ground borne vibration may be caused by the powered mechanical equipment (PME) that will be utilised during excavation and backfilling works such as handheld breaker, mini backhoe, handheld vibratory hammer/poker, compactor, excavator, dump truck/lorry. However, with small scale of the additional JP/RP and only a limited number of PMEs will be used, the extent of potential impacts arising from the proposed works is expected to be highly localised.
- 8.3.4 The EIA did not identify any significant adverse impacts on cultural heritage within the area during operational phase. As aforementioned, the purpose of the Project is to reduce the flooding risk in the area. As such, it should provide beneficial impacts to the identified built heritage structure within proximity to the additional JP/RP. Furthermore, the additional JP/RP will not have any adverse impact during the operational phase of the Project.

8.4 Recommended Mitigation Measures

- 8.4.1 As no archaeological impact is predicted during the proposed works of the additional JP/RP, no mitigation measures are required during both the construction and operational phase. Nevertheless, as aforementioned, if any antiquities or supposed antiquities are discovered during the course of excavation works, the Project proponent must arrange a temporary suspension of works in the affected area and notify AMO immediately after the discovery and any further action should be agreed with AMO prior to continuation of the works. Likewise, as no adverse impacts are anticipated during the operation of the drainage system, therefore no mitigation measures will be required.
- 8.4.2 However, one built resource has been identified in proximity with the proposed additional JP/RP and may be potentially affected by ground borne vibrations. Mitigation measure is recommended as likewise presented in Section 8.6.5.2 of the approved EIA report:
- Temporary fencing shall be installed around the identified built heritage with a buffer zone of 5 m. This shall be carried out two weeks before commencement of works and shall be retained until the completion of the pipe-jacking operations in WS6.
- 8.4.3 No changes to the recommended mitigation measures is proposed.

8.5 Cumulative Impacts

8.5.1 Minor Landscape Works by CEDD

- 8.5.1.1 The minor landscaping works adjacent to the proposed of the additional JP/RP have potential cumulative impacts. It shall be noted that the identified built heritage is immediately adjacent to the landscape works and may be disturbed during landscaping and maintenance activities. However, considering the small scale of the works to be undertaken, no significant impacts is

anticipated. With the implementation of impact mitigation measures, and good site practices, unacceptable cumulative impact would not arise.

8.5.2 Other Construction Works in WS6 Concurrent with the Construction of Additional JP/RP

8.5.2.1 Construction of the additional JP/RP shall be undertaken in two months. Upon completion of the additional JP/RP and subsequent pipe jacking works, there will be an overlap of schedule of about one month for construction of manhole at L305 and at L305A, which may have potential cumulative cultural heritage impacts that may arise generally from the construction activities. Nevertheless, considering the distance between these two structures (approximately 160 m) and distance from the nearest identified built heritage resource and with the implementation of mitigation measures recommended in the EIA report, unacceptable cumulative impact is unlikely.

8.6 Residual Impacts

8.6.1 No unacceptable cultural heritage impact is anticipated for the additional JP/RP considering the background environmental conditions and the latest site conditions. With the strict implementation of the recommended mitigation measures, adverse residual impact on built heritage is not anticipated.

8.7 Environmental Monitoring and Audit Requirements

8.7.1 No changes of the EM&A requirements as recommended in **Section 10.8 of the approved EIA Report and Section 7 of the approved EM&A Manual** is proposed. However, if any antiquities or supposed antiquities are discovered during the course of excavation works, the Project proponent must arrange a temporary suspension of works in the affected area and notify AMO immediately after the discovery and any further action should be agreed with AMO prior to continuation of the works. EM&A shall be undertaken during the construction phase of the Project. Implementation of the mitigation measures recommended by the EIA will be monitored through the site audit programme.

8.7.2 In the operation phase, adverse impacts would not be anticipated and the EM&A for cultural heritage during the operation phase of this Project is not considered necessary.

8.8 Conclusion

8.8.1 A review of the cultural heritage impact has been conducted for the additional JP/RP of the Project. It has been noted that no additional structures of cultural heritage will be likely affected with the additional structure. Likewise, no additional mitigations and EM&A requirements will be recommended. However, if any antiquities or supposed antiquities are discovered during the course of excavation works, the Project proponent must arrange a temporary suspension of works in the affected area and notify AMO immediately after the discovery and any further action should be agreed with AMO prior to continuation of the works. It can be deduced that cultural heritage impact assessment conducted during EIA are still relevant and recommendations are still applicable and valid.

9. WASTE MANAGEMENT REVIEW

9.1 Introduction

9.1.1 This section details the review on waste management in the EIA Report and the potential impacts arising from the proposed additional JP/RP during construction and operational phases.

9.2 Environmental Legislation, Standards and Guidelines

9.2.1 The relevant legislations and guidelines in handling, treatment and disposal of waste in Hong Kong are listed as follows:

- Environmental Impact Assessment Ordinance (Cap 499);
- Waste Disposal (Amendment) Ordinance (Cap 354);
- Land (Miscellaneous Provisions) Ordinance (Cap 28); and
- Public Health and Municipal Service Ordinance (Cap 132) - Public Cleansing and Prevention of Nuisances By-laws.

9.2.2 Under the Waste Disposal (Amendment) Ordinance, some of the regulations are relevant to the EIA, including:

- Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap 354); and
- Waste Disposal (Chemical Waste) (General) Regulation (Cap 354).

9.3 Waste Management Impact Assessment and Evaluation: Construction Phase

9.3.1 **Section 9 of the approved EIA Report** details and quantifies the potential wastes that may arise during the construction and operational phases of the Project. The types of wastes that shall be generated are as follows:

- Excavated construction and demolition (C&D) materials suitable for public fill (no excavation of sediment would occur in this project);
- C&D waste, including cleared vegetation, which is not suitable for public fill;
- Chemical waste;
- General refuse; and
- Sewage.

- 9.3.2 Options of reuse, minimization, recycling, treatment, storage, collection, transport and disposal of these wastes have been examined in the EIA report.
- 9.3.3 The C&D materials that are anticipated to arise from the Project as presented in Table 9.1 of the approved EIA report include excavated soil (12,200 m³) from the excavation of underground trenches and receiving pits by open-cut-and-cover and installation of underground pipes by pipe-jacking; concrete debris and aggregate (300 m³) from the in-situ casting of underground box culverts by concreting works; and excavated rock (2,300 m³) which would mainly come from the excavation of underground trenches and receiving pits by open-cut-and-cover. In view of the amendment of the design, it is anticipated that additional volume of soil/rock (73.6m³) and concrete (38.5m³) will be excavated. The proposed additional JP/RP is located in the roundabout immediately adjacent to the Po Lin Columbarium, which is currently paved. Consequently, construction of this structure will require concrete road breaking and excavation of materials. Albeit additional C&D materials is anticipated, handling of these materials shall still follow the recommendations in the approved EIA report. Any excavated soil from WS6 shall be removed and delivered to the Site Office area to avoid potential contamination of the Ngong Ping Stream and consequently avoid major stockpiling of earthed material within the Lantau North Country Park, as far as practicable. Some of the excavated soil would be reused on-site for backfilling of trenches and pits while the rest of C&D materials will be carefully stockpiled if it cannot be reused or removed to avoid dust and other nuisance impacts and will eventually be delivered to the Tseung Kwan O Area 137 Fill Bank via the Public Fill Reception Facility in Mui Wo.
- 9.3.4 C&D waste refers to waste that may be generated through vegetation clearing, wood from formwork, plastics, glass, unusable cement mixes, bentonite slurry (approximately 15 m³) arising from the pipe-jacking method and damaged or contaminated materials. However, the proposed location of the additional JP/RP will not require vegetation clearing. Nevertheless, the rest of the C&D waste that may arise from the construction of additional JP/RP will be reused prior to disposal and will be sorted to avoid contamination of the materials suitable for public fill, as also the recommended handling in the approved EIA report.
- 9.3.5 Meanwhile, chemical wastes that are likely to arise from the construction activities include scrap batteries or acid/alkali from maintenance activities; used paints, engine oils, hydraulic fluids and waste fuel; spent mineral oils/cleansing fluids from machinery; and spent solvents/solutions, some of which may be halogenated, from equipment cleansing activities. However, if handled, stored, transported and disposed appropriately, impacts would not be anticipated. Moreover, these wastes shall be appropriately sorted and disposed of according to the guidelines presented in the Waste Disposal (Chemical Waste) (General) Regulation and the Code of Practice on the Packing, Labelling and Storage of Chemical Waste.

- 9.3.6 The construction workforce will likewise generate general refuse (approximately 16 tonnes for the entire construction period) which consist mainly of food waste, aluminium cans, waste paper, etc. which will require proper disposal. The impacts from this type of waste is anticipated in the storage of general refuse which may potentially cause adverse environmental impacts as listed in Section 9.4.3.22 of the approved EIA report which include *odour nuisance if the waste is not collected frequently, windblown litter, water quality impacts if the waste enters water bodies, visual impacts, etc.* As estimated in the EIA, the maximum daily arising of general refuse would be approximately 20kg. Likewise, it is anticipated for the construction of additional JP/RP based on a generation rate of 0.65 kg per worker per day. Meanwhile, the sewerage from the site office will be connected to the existing sewer networks and treated at the Ngong Ping STW. Moreover, chemical temporary toilets will be installed at the various works areas with no foul sewers such as in WS6 where the proposed additional JP/RP is proposed. To safeguard the health of the workers and to ascertain no displeasing odour will be generated, nightsoil must be removed and disposed of off-site frequently.
- 9.3.7 The construction methodology and activities of additional JP/RP shall remain the same as with the other JP or RP in the Project. Consequently, no significant waste implications are predicted during the operation of the additional JP/RP. Furthermore, no additional type of wastes from the previously identified in the EIA is more likely to be generated. Thus, it is anticipated that no significant impacts will be generated from the generation of wastes during construction even with the construction of additional JP/RP. However, it should be ascertained that proper handling, storage, transportation and disposal of wastes is implemented to minimise potential impacts.

9.4 Waste Management Impact Assessment and Evaluation: Operational Phase

- 9.4.1 It is likewise anticipated that no adverse potential impacts will be generated during the operational phase of the additional JP/RP. Albeit, as stipulated in Section 9.5.1.2 of the approved EIA report, both inert materials (e.g. soil, sand, boulder, etc) and non-inert materials (e.g. refuse, tree debris, etc) will be generated from the maintenance of the proposed drainage system. The quantity of these wastes however, will be limited. Consequently, no adverse impacts are most likely to arise.

9.5 Waste Management Practice

- 9.5.1 Section 9.6 of the approved EIA report listed the recommended mitigation measures to minimise potential impacts that may possibly arise during construction and operation phases of the Project. As the additional JP/RP will not generate waste other than what were initially listed in the EIA report, the mitigation measures presented in the EIA are still valid and applicable even with the construction and operation of the proposed additional structure. With strict implementation on the proper handling (including stockpiling, labelling, packaging & storage), collection, transportation and re-use/disposal of wastes, adverse impacts from generated wastes, adverse potential impacts are less likely to arise. Below are the recommended mitigation measures.

- The Contractor should prepare a Waste Management Plan (WMP) which should meet the requirements as stipulated in the ETWB TC(W) No.19/2005 Environmental Management on Construction Sites;
- A trip-ticket system should be established in accordance with DevB TC(W) No. 6/2010 and Waste Disposal (Charges for Disposal of Construction Waste) Regulation to monitor the disposal of public fill and solid wastes at public filling facilities and landfills, and to control fly-tipping. A trip-ticket system would be included as one of the contractual requirements for the Contractor to strictly implement. The Engineer would also regularly audit the effectiveness of the system;
- A recording system for the amount of waste generated, recycled and disposed (locations) should be established. The Contractor should also provide proper training to workers regarding the appropriate concepts of site cleanliness and waste management procedures, e.g. waste reduction, reuse and recycling all the time;
- The CEDD should be timely notified of the estimated volumes of excavated materials to be generated and the Public Fill Committee should be notified and agreement sort on the disposal of surplus inert C&D materials. Wherever practicable, C&D materials should be segregated from other wastes to avoid contamination and to ensure acceptability at public filling areas or reclamation sites;
- The site and surroundings shall be kept tidy and litter free;
- No waste shall be burnt on-site;
- Make provisions in contract documents to allow and promote the use of recycled aggregates where appropriate;
- The Contractor will be prohibited to dispose of C&D materials within the proposed site and at any sensitive locations including Lantau North Country Park, the Lantau South Country Park, the Ngong Ping Site of Special Scientific Interest, the Lantau Peak Special Area and Site of Special Scientific Interest and the Conservation Area, etc. The Contractor should propose the final disposal sites in the EMP and WMP for approval before implementation;
- Stockpiled material shall be covered by tarpaulin and /or watered as appropriate to prevent windblown dust and surface run off;
- Major stockpiled areas shall be sited outside of the country parks area (Works Section 6) and away from stream courses as far as practicable. For the stockpiling area SA4 and proposed SA for the additional JP/RP within and adjacent to the country park area respectively, stockpiling of earthed material shall be minimised and excavated soil from Works Section 6 shall be delivered to the Site Office as soon as possible. Similarly, overnight stockpiling of earthed material along the exposed trench shall be minimised

as far as possible and the excavated soil shall be transferred to the designated stockpiling area as soon as possible;

- Excavated material in trucks shall be covered by tarpaulins to reduce the potential for spillage and dust generation;
- Wheel washing facilities shall be used by all trucks leaving the site to prevent transfer of mud onto public roads;
- Standard formwork or pre-fabrication should be used as far as practicable so as to minimise the C&D materials arising. The use of more durable formwork or plastic facing for construction works should also be considered. The use of wooden hoardings should be avoided and metal hoarding should be used to facilitate recycling. Purchasing of construction materials should be carefully planned in order to avoid over-ordering and wastage;
- The Contractor should recycle as many C&D materials as possible on-site. The public fill and C&D waste should be segregated and stored in separate containers or skips to facilitate the reuse or recycling of materials and proper disposal. Where practicable, the concrete and masonry should be crushed and used as fill materials. Steel reinforcement bar should be collected for use by scrap steel mills. Different areas of the sites should be considered for segregation and storage activities.
- Chemical waste producers should register with the EPD. Chemical waste should be handled in accordance with the Code of Practice on the Packaging, Handling and Storage of Chemical Wastes;
- All chemical waste, fuels and oils shall be stored at the Site Office area, to minimise impacts to the Country Park and water gathering grounds;
- All maintenance activities which may generate chemical waste shall be undertaken in Site Office area, as far as possible;
- The Contractor shall comply with WSD's General Conditions for Working within Water Gathering Grounds if applicable;
- Waste oils, chemicals or solvents shall not be disposed of to drain;
- Subject to agreement with Water Service Department, adequate numbers of portable toilets should be provided for on-site workers. Portable toilets should be maintained in reasonable states, which will not deter the workers from utilising them. Night soil should be regularly collected by licensed collectors;

- General refuse arising on-site should be stored in enclosed bins or compaction units separately from C&D and chemical wastes. General refuse shall be removed from Works Section 6 within the country park on the regular basis. Sufficient dustbins shall be provided for storage of waste as required under the Public Cleansing and Prevention of Nuisances By-laws. In addition, general refuse shall be cleared regularly and shall be disposed of to the nearest licensed landfill or refuse transfer station. Burning of refuse on construction sites is prohibited;
- All waste containers shall be in a secure area on hardstanding;
- Aluminium cans are usually collected and recovered from the waste stream by individual collectors if they are segregated and easily accessible. Separately labelled bins for their deposition should be provided as far as practicable;
- Office wastes can be reduced by recycling of paper if such volume is sufficiently large to warrant collection. Participation in a local collection scheme by the Contractor should be advocated. Waste separation facilities for paper, aluminium cans, plastic bottles, etc should be provided on-site; and
- Training shall be provided to workers about the concepts of site cleanliness and appropriate waste management procedure, including waste reduction, reuse and recycling.

9.5.2 Meanwhile, the mitigation measures for operational phase of the Project shall be as follows:

- Non-inert materials such as garbage and possibly vegetation will be disposed to WENT Landfill via the OITF in Mui Wo;
- Inert material, such as excess soil, sand and boulders, should be delivered from the project site to the Tseung Kwan O Area 137 Fill Bank via the Public Fill Reception Facility in Mui Wo or to WENT Landfill if the amount is negligible; and
- No marine disposal of dredged/excavated sediment would be involved in this project.

9.6 Cumulative Impacts

9.6.1 Minor Landscape Works by CEDD

9.6.1.1 The minor landscaping works adjacent to the proposed of the additional JP/RP would generate wastes such as C&D materials, chemical waste and general refuse. However, considering the small scale of the works to be undertaken, no significant cumulative impacts is anticipated. With the implementation of impact mitigation measures, and good site practices, unacceptable cumulative impact would not arise.

9.6.2 Other Construction Works in WS6 Concurrent with the Construction of Additional JP/RP

- 9.6.2.1 Construction of the additional JP/RP shall be undertaken in two months. Upon completion of the additional JP/RP and subsequent pipe jacking works, there will be an overlap of schedule of about one month for construction of manhole at L305 and at L305A, which may have potential cumulative impacts that may arise generally from the construction wastes and general refuse. Nevertheless, with the implementation of mitigation measures recommended in the EIA report, unacceptable cumulative impact is unlikely.

9.7 Residual Impacts

- 9.7.1 No unacceptable impact is anticipated for the additional JP/RP considering the background environmental conditions and the latest site conditions. Assuming all the mitigation measures are implemented and the overall short term and temporary nature of the construction works, adverse residual impacts associated with the handling, storage, transportation or disposal of the waste generated by the Project with the proposed additional structure is unlikely and is not expected to affect the health and welfare of the local community.

9.8 Environmental Monitoring and Audit Requirements

- 9.8.1 No changes of the EM&A requirements as stipulated in Section 9.11 of the EIA report and Section 8 of the EM&A Manual is proposed. EM&A shall be undertaken during the construction phase only to ascertain the waste arising from the works are handled, stored, collected, transferred and disposed of in an environmentally acceptable manner; verify the implementation status and evaluate the effectiveness of the mitigation measures; and to encourage the reuse and recycling of material. Moreover, documents including licenses, permits, disposal and recycling records should be reviewed and audited for the compliance with the legislation and contract requirements to ensure proper records are being maintained and procedures undertaken in accordance with the Waste Management Plan.

9.9 Conclusion

- 9.9.1 A review waste impact and management assessment has been conducted for the additional JP/RP of the Project. It has been noted that construction of additional JP/RP will not generate other wastes other than what were identified during the EIA. Albeit, additional volume of wastes is anticipated for the additional structure, the recommended mitigation measures in the EIA are still applicable and valid. Likewise, no additional EM&A requirements will be recommended. Therefore, it can be deduced that waste impact evaluation conducted during EIA are still relevant and recommendations are still applicable and valid.

10. SUMMARY and CONCLUSION

- 10.1.1 An Environmental Review for Contract No. DPW 01/2020 - Drainage Improvement Works at Ngong Ping has been conducted to determine if the construction of an additional JP/RP in Works Section 6 would constitute a material change to the Project with reference to the guidelines laid out in Section 6 of the EIAO-TM for Material Change to a Designated Project or to an Environmental Impact.
- 10.1.2 The landscaping works under CEDD Contract No. CV/2020/05 that are concurrent with the Project are minimal in nature and scale. Thus, the cumulative impacts from these minor landscape works have been reviewed to be insignificant.
- 10.1.3 Based on the latest information of the existing conditions of the proposed location of the additional JP/RP, no new sensitive receivers will be affected by the proposed works of the additional JP/RP. The potential impacts and the proposed mitigation measures identified and recommended in the approved EIA Report remained relevant and applicable even with the new additional structure.
- 10.1.4 The potential environmental impacts that may arise from the proposed additional JP/RP is summarized in **Table 10.1**. The potential impacts that are anticipated from the construction of the proposed additional structure are the same with the anticipated impacts detailed and assessed in the EIA. Consequently, the mitigation measures shall be the recommended measures in the EIA. With proper and strict implementation of the proposed mitigation measures listed in the approved EIA Report, potential impacts that may arise from the construction and operation of the proposed additional structure would still be below their respective criteria.

Table 10.1: Summary of the Changes and Potential Environmental Impacts

Change of the Proposed Layout	Sensitive Receiver	Potential Environmental Impacts	Severity of Impact From the Proposed Change
Construction of Additional JP/RP in WS6	Air Quality Impact	<ul style="list-style-type: none"> -No new ASRs will be added; horizontal distance of the proposed additional JP/RP is relatively farther to most of the ASRs -No significant increase of dust emissions with proper implementation of mitigation measures recommended in the EIA -No adverse residual impacts and cumulative impacts is anticipated. 	Insignificant

Change of the Proposed Layout	Sensitive Receiver	Potential Environmental Impacts	Severity of Impact From the Proposed Change
	Noise Impacts	<ul style="list-style-type: none"> -No new NSRs will be added; -No significant increase of noise emissions as the number and type of PME that will be used shall be the same as with what was initially stipulated in the EIA; mitigation measures will follow the recommended in the EIA. -No adverse residual impacts and cumulative impacts is anticipated. 	Insignificant
	Water Quality Impacts	<ul style="list-style-type: none"> -No additional WSRs -No direct potential impacts as the proposed location of the additional structure will not interface with any water course - Will not constitute additional construction activities that will affect water quality - No adverse residual impacts and cumulative impacts is anticipated. 	Insignificant
	Ecology	<ul style="list-style-type: none"> -Will not infringe with the boundary of ecological sensitive receivers -Will not cause direct potential impacts to surrounding floral species of conservation interest; no vegetation clearing -Does not interface with the Ngong Ping Stream where aquatic fauna species of conservation interest were initially identified in the EIA. -No adverse residual impacts and cumulative impacts is anticipated. 	Insignificant
	Landscape and Visual	<ul style="list-style-type: none"> -No additional VSRs, LRs and LCAs will be affected. -Will not result to permanent loss of 	Insignificant



Change of the Proposed Layout	Sensitive Receiver	Potential Environmental Impacts	Severity of Impact From the Proposed Change
		landscape resources, loss of visual amenity -Will not lead to permanent visible above-ground structures	
	Cultural Heritage	- Will not disturb areas of high archaeological potential -Will not affect sites of archaeological interest - Will not affect any Declared Monuments, proposed monuments, Graded Historic Sites/Buildings, and Government Historic Sites identified by the AMO or Historical villages - No adverse residual impacts and cumulative impacts is anticipated.	Insignificant
	Waste Management	- Additional volume (112 m ³) of C&D materials is anticipated, however handling of these materials shall still follow the recommendations in the approved EIA report -Will not generate additional type of waste from the previously identified in the EIA	Insignificant

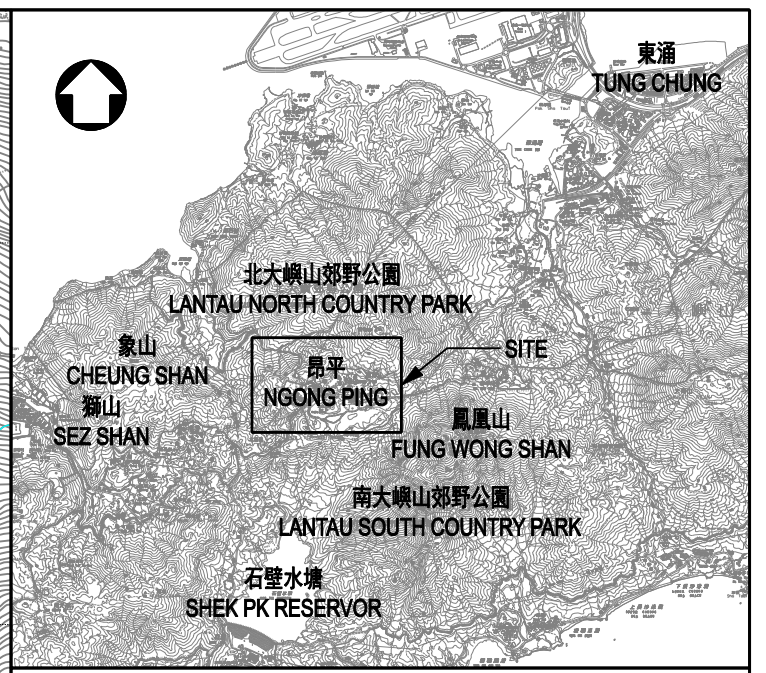
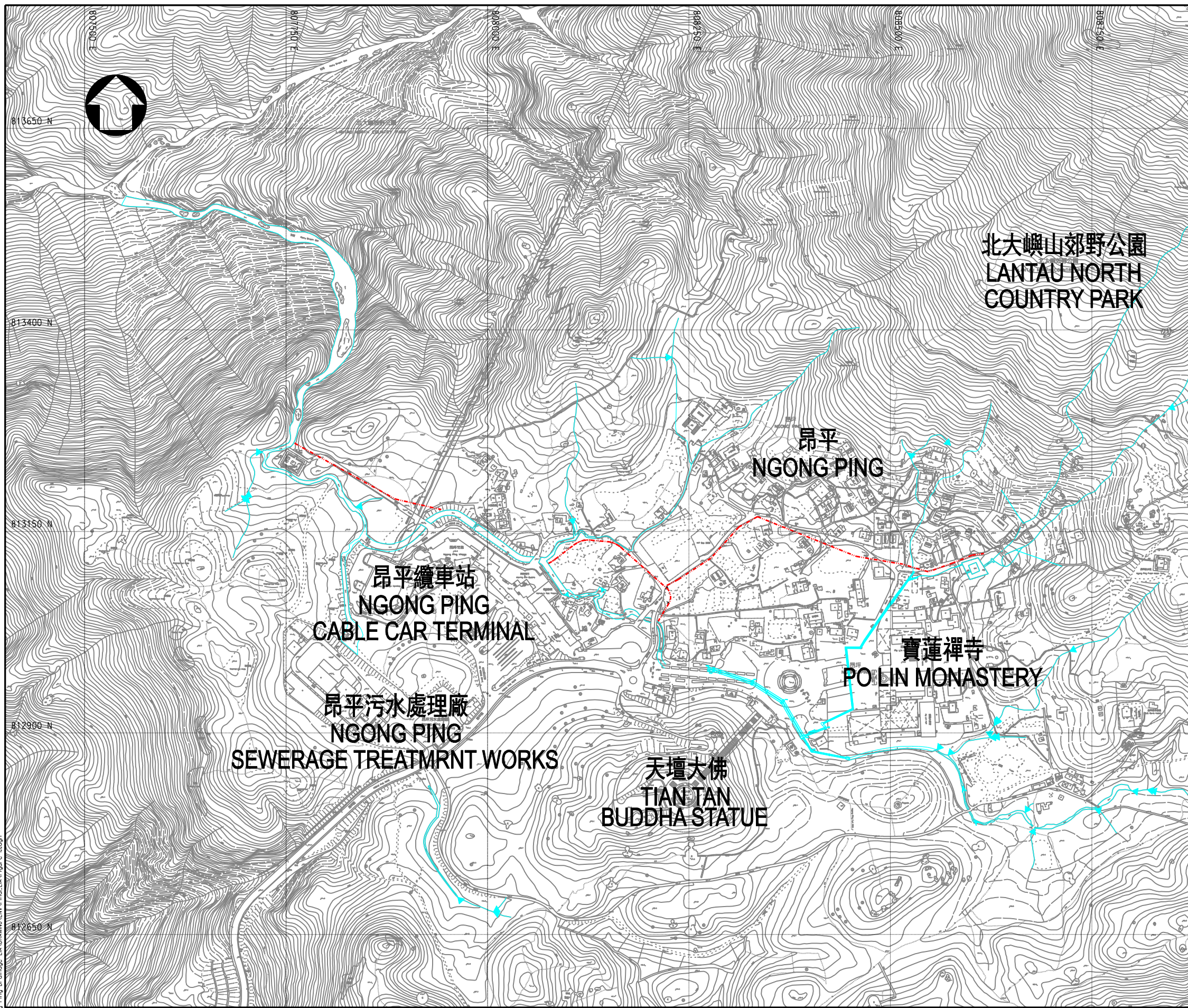
10.15 No additional surveys are recommended, and no additional mitigation measures are required.

10.16 Therefore, referring to the guidelines for material change specified in Section 6 of the EIAO-TM, with strict implementation of the laid-out mitigation measures, the proposed revision in the layout due to the aforementioned change would not constitute a material change to the environmental impact of the Project.

Appendix A

Project Layout

- A.1 General Layout of the Project**
- A.2 Location of Additional Jacking Pit/Receiving Pit**
- A.2b Overall Layout Plan**
- A.3 Environmental Constraints**
- A.4 Works Sections**
 - A.4.1 Works Sections-1**
 - A.4.2 Works Sections-2**
 - A.4.3 Works Sections-3**
 - A.4.4 Works Sections-4**
 - A.4.5 Works Sections-5**
 - A.4.6 Works Sections-6**
- A.5 As-built Tree Survey Plan**



LOCATION PLAN

圖例:
LEGENDS:

- 現有排水結構 / 水道
EXISTING DRAINAGE STRUCTURE / WATERCOURSE
- - - 擬建排水系統
PROPOSED DRAINAGE SYSTEM

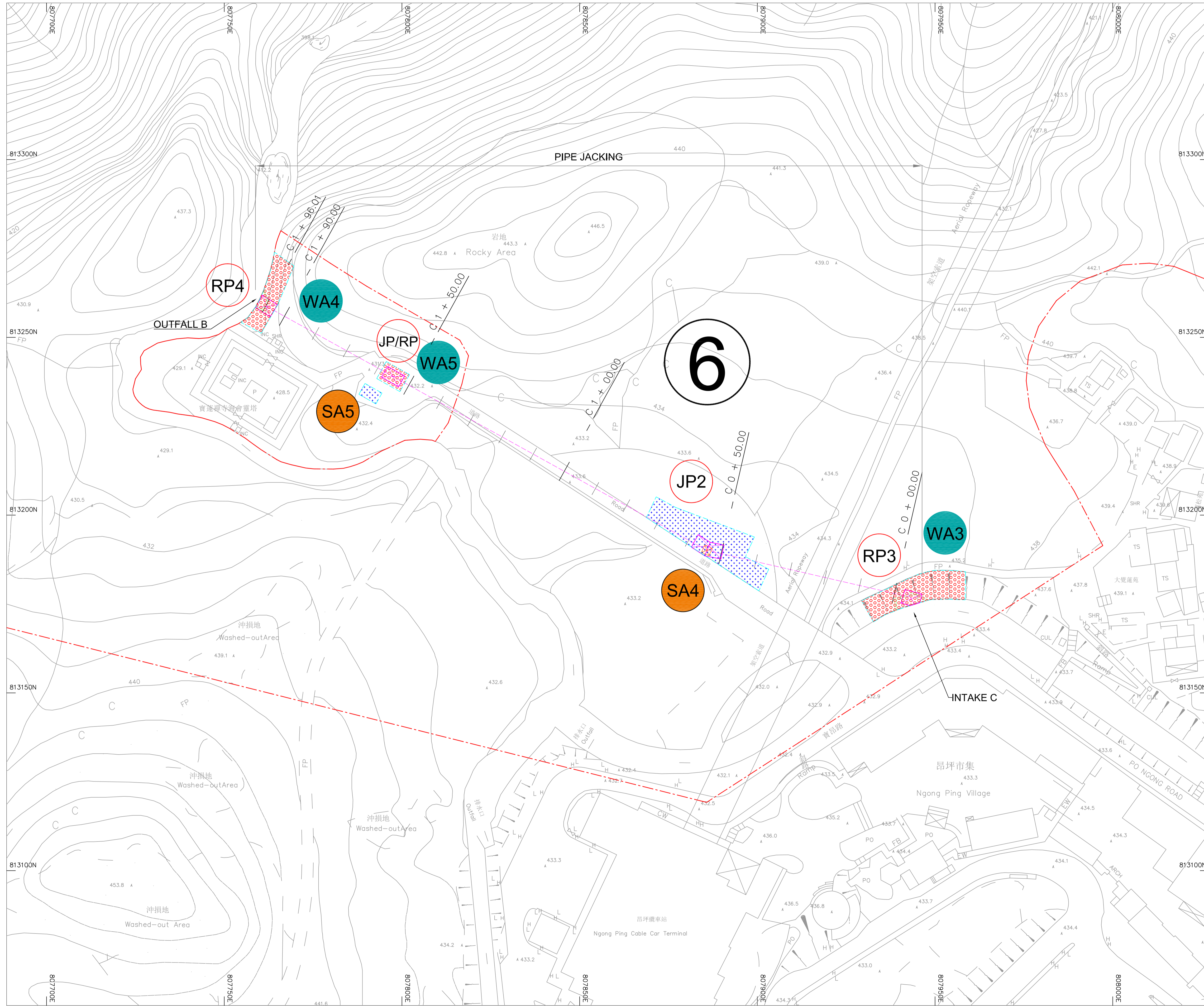
14/8/2012 09:43 K:\3254 Ngong Ping Drainage EIA\DRAWING\ENV\Final EIA\Figure 11.dgn



DRAINAGE SERVICES
DEPARTMENT
HONG KONG

GENERAL LAYOUT OF THE PROJECT

Figure:	A.1	Rev:	-
Scale:	1 : 5000 (A3)		



- LEGEND:**
- Country Park Boundary
 - Proposed 1800mm Flood Relief Drain
 - Proposed Stockpiling Area
 - Proposed Works Area
 - Stockpiling Area
 - Works Area
 - Jacking Pit
 - Receiving Pit
 - Jacking Pit/Receiving Pit
 - Proposed Manhole

Notes:
 This figure was prepared with reference to Figure 2.9g of the approved EIA Report and the approved Floral Protection Plan.

PROJECT :
 INDICATIVE LOCATION OF ADDITIONAL JACKING PIT/RECEIVING PIT

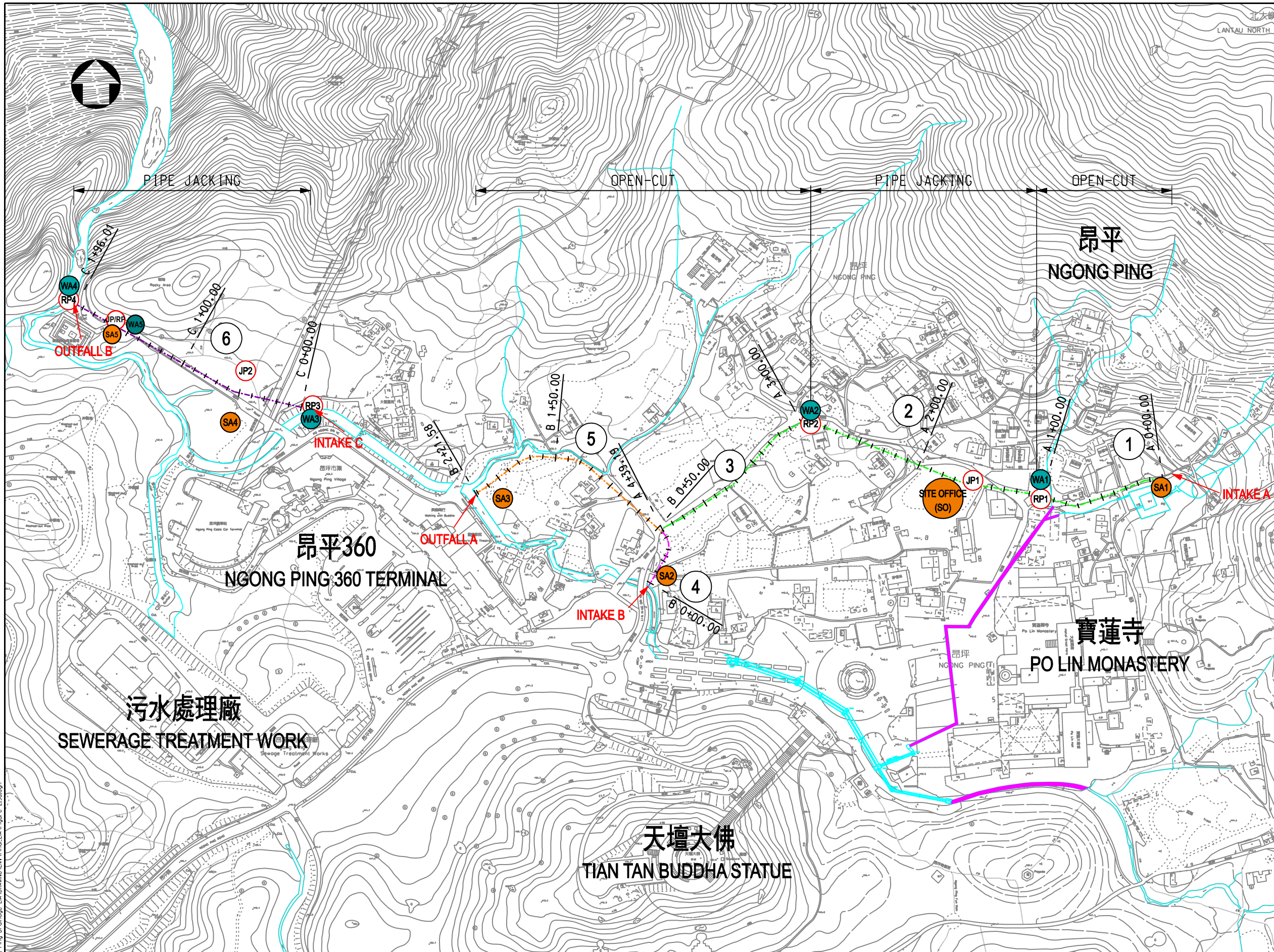
SCALE AT A1
 1: 500

FIGURE NUMBER	REVISION
A.2	0

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MEINHARDT

FUGRO



- LEGENDS:**
- PROPOSED 1500-1950mm INTERCEPTION PIPE IN 3 SECTIONS:
 - ① A0+00 - A1+20,
 - ② A1+20 - A3+00,
 - ③ A3+00 - A4+40
(TRENCH 2.5M WIDE)
 - PROPOSED 2.5m(W) x 2.5m(H) BOX CULVERT:
 - ④ B0+00 - B0+45
(TRENCH 5.5M WIDE),
 - PROPOSED 4.0m(W) x 2.5m(H) BOX CULVERT:
 - ⑤ B0+45 - B2+22
(TRENCH 6.0M WIDE)
 - PROPOSED 1800mm FLOOD RELIEF DRAIN:
 - ⑥ C0+00 - C1+96
 - RP RECEIVING PIT
 - JP JACKING PIT
 - SA STOCKPILING AREA
 - WA WORKS AREA

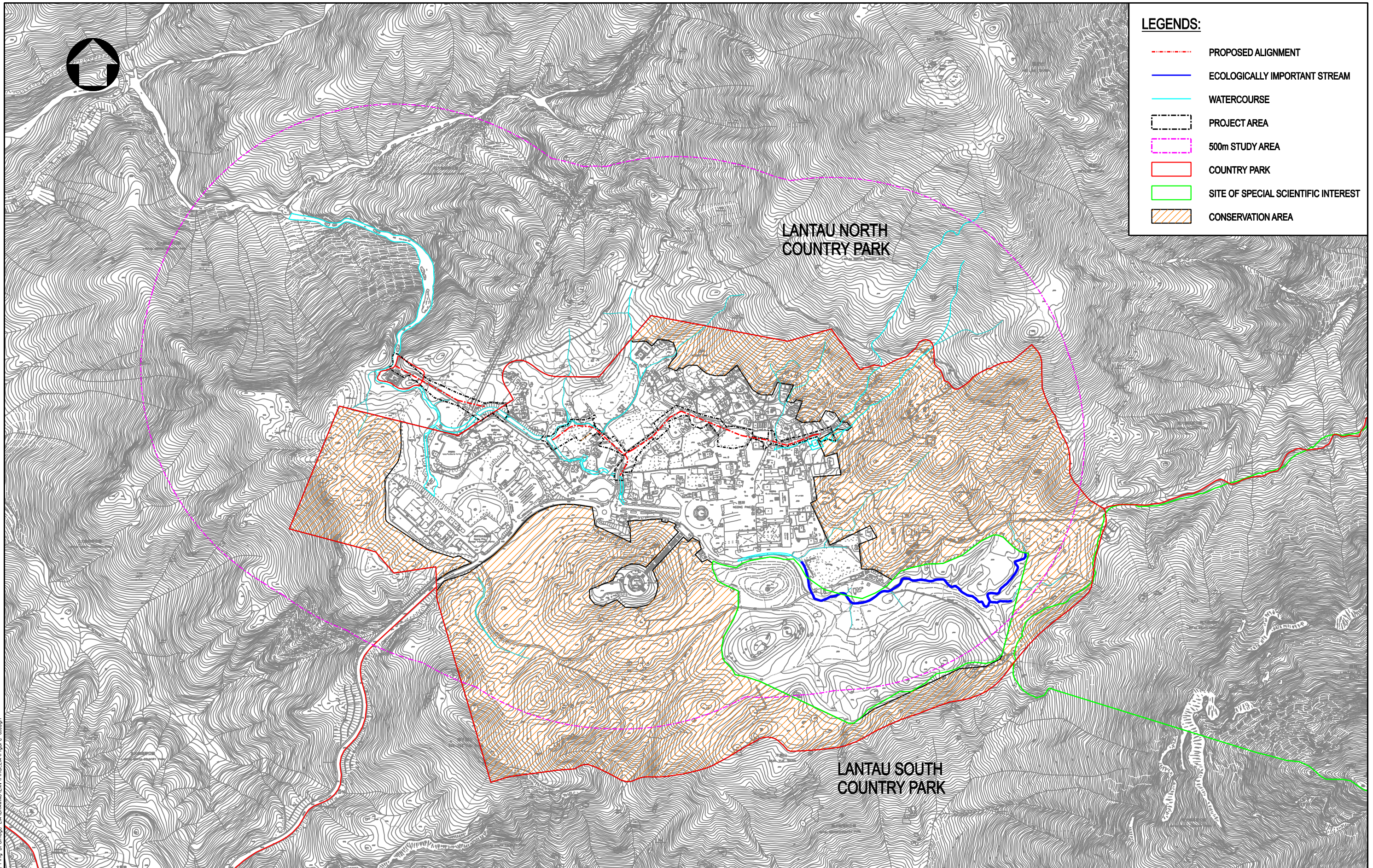
16/8/202 02:55:48 KA19254 Ngong Ping Drainage EIA/DRM/ENV/Final EIA Figure 2.30.dgn



DRAINAGE SERVICES DEPARTMENT HONG KONG

OVERALL LAYOUT PLAN OF THE PROJECT WITH PROPOSED ADDITIONAL JP/RP

Figure:	A.2b	Rev:	1
Scale:	1 : 3000 (A3)		



- LEGENDS:**
- - - PROPOSED ALIGNMENT
 - ECOLOGICALLY IMPORTANT STREAM
 - WATERCOURSE
 - PROJECT AREA
 - 500m STUDY AREA
 - COUNTRY PARK
 - SITE OF SPECIAL SCIENTIFIC INTEREST
 - CONSERVATION AREA

LANTAU NORTH
COUNTRY PARK

LANTAU SOUTH
COUNTRY PARK

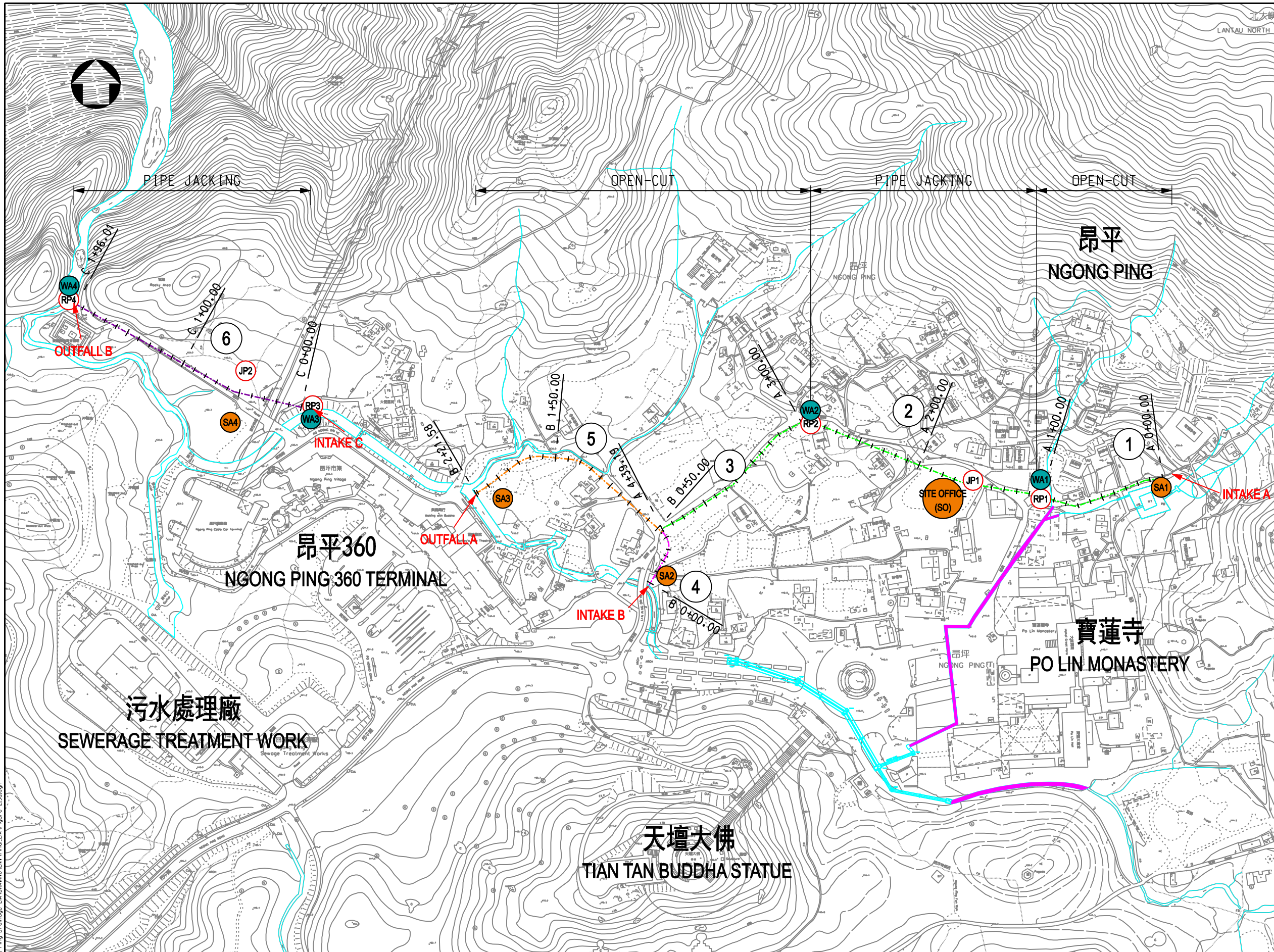
10/10/2022 14:35 KA 9254 Ngong Ping Drainage EIA/DRM/NC/ENV/Final EIA Figure 6.Ldgn



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ENVIRONMENTAL CONSTRAINTS

Figure:	A.3	Rev:	2
Scale:	1 : 7000 (A3)		



LEGENDS:

- PROPOSED 1500mm INTERCEPTION PIPE IN 3 SECTIONS:
 - ① A0+00 - A1+20,
 - ② A1+20 - A3+00,
 - ③ A3+00 - A4+40
(TRENCH 2.5M WIDE)
- PROPOSED 2.5m(W) x 2.5m(H) BOX CULVERT:
 - ④ B0+00 - B0+45
(TRENCH 5.5M WIDE),
- PROPOSED 3.5m(W) x 2.5m(H) BOX CULVERT:
 - ⑤ B0+45 - B2+22
(TRENCH 6.0M WIDE)
- PROPOSED 1800mm FLOOD RELIEF DRAIN:
 - ⑥ C0+00 - C1+96
- RP RECEIVING PIT
- JP JACKING PIT
- SA STOCKPILING AREA
- WA WORKS AREA

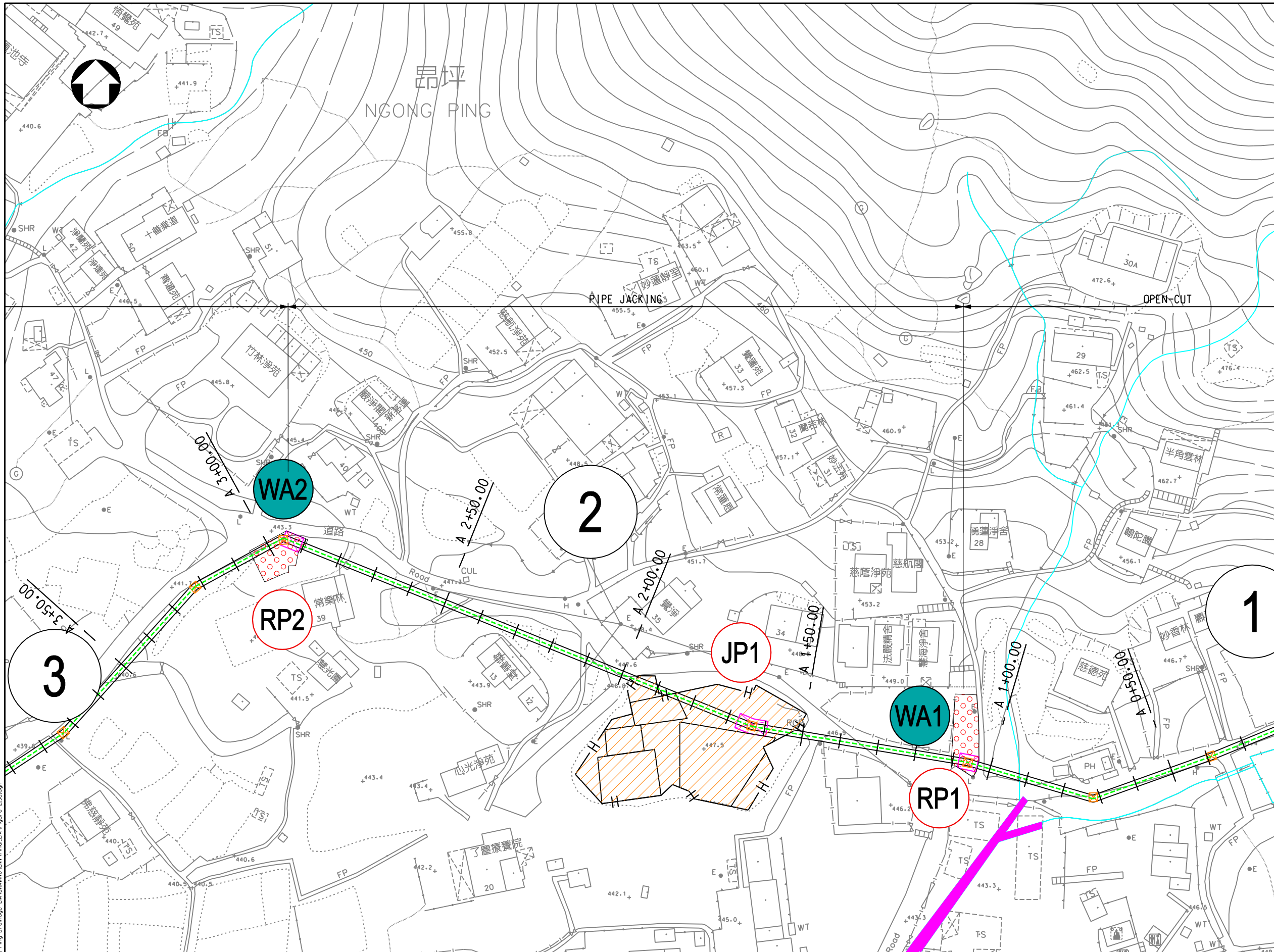
16/8/202 02:55:48 KA19254 Ngong Ping Drainage EIA/DRM/ENV/Final EIA Figure 2.30.dgn



DRAINAGE SERVICES DEPARTMENT
 HONG KONG

WORKS SECTIONS

Figure:	A.4	Rev:	1
Scale:	1 : 3000 (A3)		



- LEGENDS:**
- PROPOSED 1500mm INTERCEPTION PIPE IN 3 SECTIONS:
 - ① A0+00 - A1+20,
 - ② A1+20 - A3+00,
 - ③ A3+00 - A4+40 (TRENCH 2.5M WIDE)
 - PROPOSED 2.5m(W) x 2.5m(H) BOX CULVERT:
 - ④ B0+00 - B0+45 (TRENCH 5.5M WIDE).
 - PROPOSED 3.5m(W) x 2.5m(H) BOX CULVERT:
 - ⑤ B0+45 - B2+22 (TRENCH 6.0M WIDE)
 - PROPOSED 1800mm FLOOD RELIEF DRAIN:
 - ⑥ C0+00 - C1+96
 - RP RECEIVING PIT
 - JP JACKING PIT
 - SA STOCKPILING AREA
 - WA WORKS AREA
 - - - COUNTRY PARK BOUNDARY
 - ▨ PROPOSED WORKS AREA
 - ▨ PROPOSED STOCKPILING AREA
 - ▨ JACKING PIT / RECEIVING PIT
 - ▨ PROPOSED MANHOLE
 - ▨ SITE OFFICE

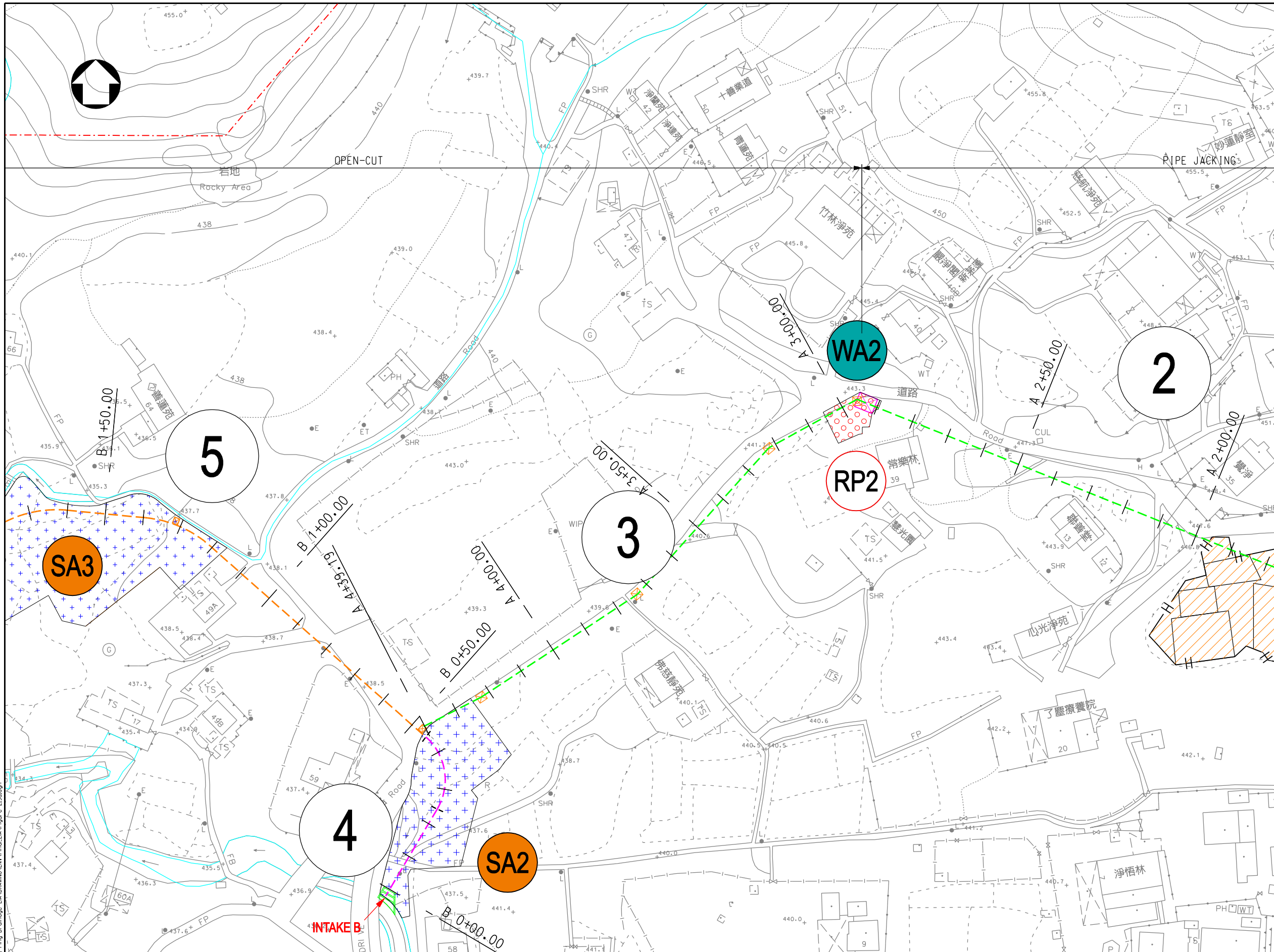
10/1/2013 14:48:07 KA:9254 Ngong Ping Drainage EIA/DRM/ENV/Final EIA Figure 2.9c.dgn



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WORKS SECTION - 2

Figure:	A.4.2	Rev:	
Scale:	1 : 1000 (A3)		2



LEGENDS:

- PROPOSED 1500mm INTERCEPTION PIPE IN 3 SECTIONS:
 - ① A0+00 - A1+20,
 - ② A1+20 - A3+00,
 - ③ A3+00 - A4+40 (TRENCH 2.5M WIDE)
- PROPOSED 2.5m(W) x 2.5m(H) BOX CULVERT:
 - ④ B0+00 - B0+45 (TRENCH 5.5M WIDE).
- PROPOSED 3.5m(W) x 2.5m(H) BOX CULVERT:
 - ⑤ B0+45 - B2+22 (TRENCH 6.0M WIDE)
- PROPOSED 1800mm FLOOD RELIEF DRAIN:
 - ⑥ C0+00 - C1+96
- RP RECEIVING PIT
- JP JACKING PIT
- SA STOCKPILING AREA
- WA WORKS AREA
- COUNTRY PARK BOUNDARY
- PROPOSED WORKS AREA
- PROPOSED STOCKPILING AREA
- JACKING PIT / RECEIVING PIT
- PROPOSED MANHOLE
- SITE OFFICE

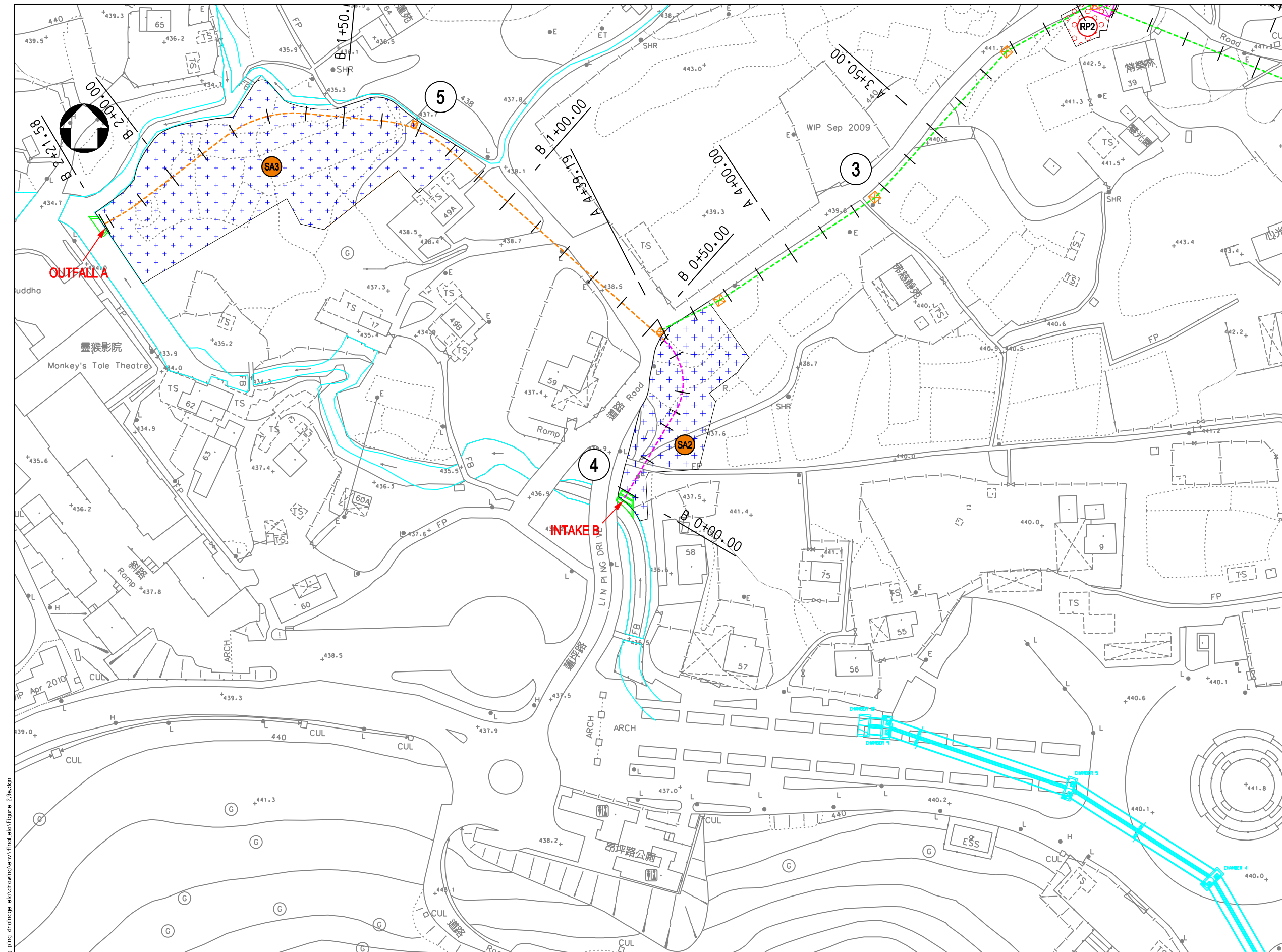
8/1/2013 10:09:17 K:\9254 Ngong Ping Drainage EIA\DRAWING\ENV\Final EIA\Figure 2.9c.dgn



DRAINAGE SERVICES DEPARTMENT HONG KONG

WORKS SECTION - 3

Figure:	A.4.3	Rev:	2
Scale:	1 : 1000 (A3)		



- LEGENDS:**
- PROPOSED 1500mm INTERCEPTION PIPE IN 3 SECTIONS:
 - ① A0+00 - A1+20,
 - ② A1+20 - A3+00,
 - ③ A3+00 - A4+40
(TRENCH 2.5M WIDE)
 - PROPOSED 2.5m(W) x 2.5m(H) BOX CULVERT:
 - ④ B0+00 - B0+45
(TRENCH 5.5M WIDE).
 - PROPOSED 3.5m(W) x 2.5m(H) BOX CULVERT:
 - ⑤ B0+45 - B2+22
(TRENCH 6.0M WIDE)
 - PROPOSED 1800mm FLOOD RELIEF DRAIN:
 - ⑥ C0+00 - C1+96
 - RP RECEIVING PIT
 - JP JACKING PIT
 - SA STOCKPILING AREA
 - WA WORKS AREA
 - COUNTRY PARK BOUNDARY
 - ▨ PROPOSED WORKS AREA
 - ▨ PROPOSED STOCKPILING AREA
 - ⊠ JACKING PIT / RECEIVING PIT
 - ⊠ PROPOSED MANHOLE

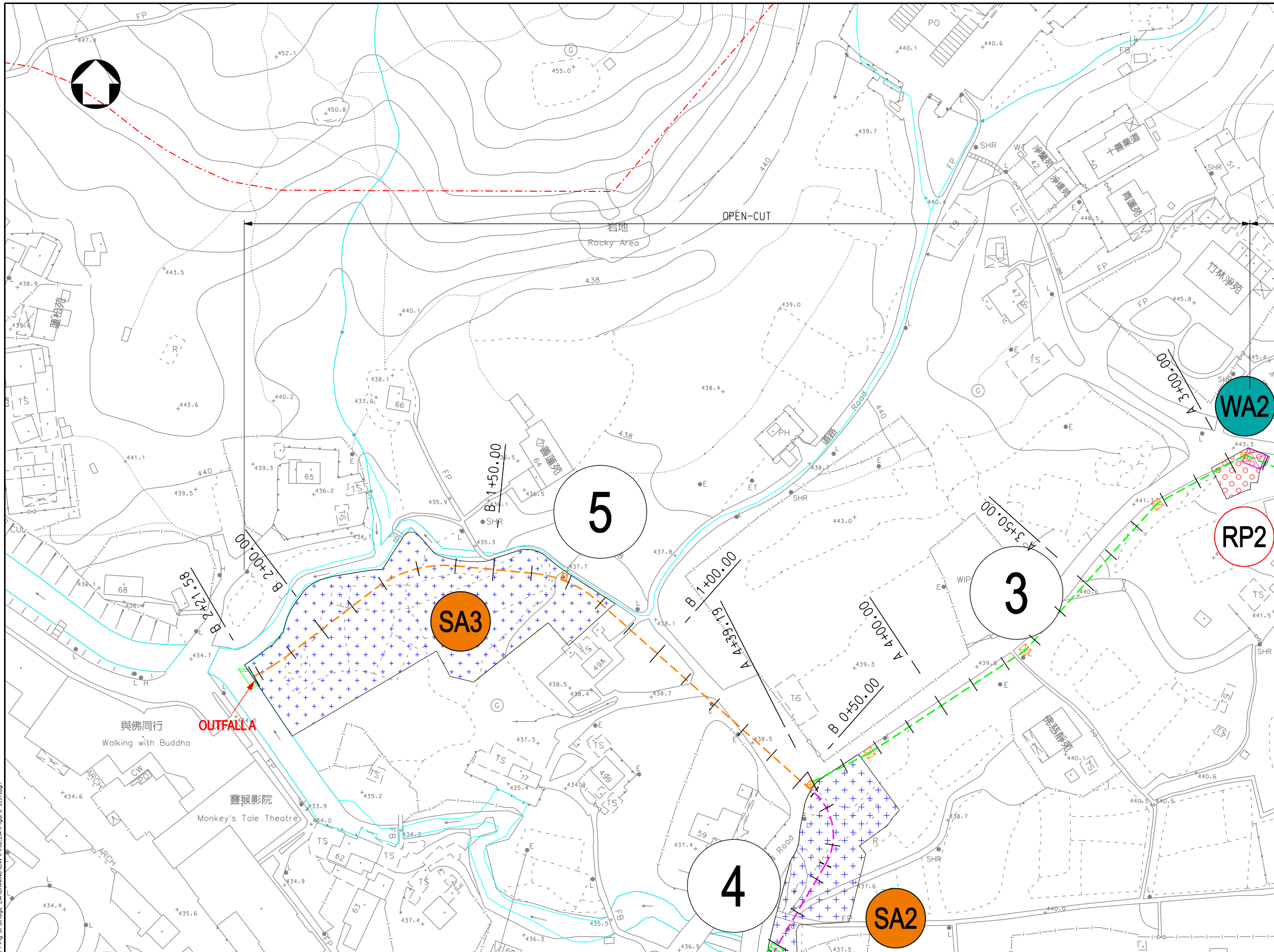
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**DRAINAGE SERVICES
DEPARTMENT
HONG KONG**

WORKS SECTION - 4

Figure:	A.4.4	Rev:	1
Scale:	1 : 1000 (A3)		



- LEGENDS:**
- PROPOSED 1500mm INTERCEPTION PIPE IN 3 SECTIONS:
 - ① A0+00 - A1+20,
 - ② A1+20 - A3+00,
 - ③ A3+00 - A4+40
(TRENCH 2.5M WIDE)
 - PROPOSED 2.5m(W) x 2.5m(H) BOX CULVERT:
 - ④ B0+00 - B0+45
(TRENCH 5.5M WIDE).
 - ⑤ B0+45 - B2+22
(TRENCH 6.0M WIDE)
 - PROPOSED 1800mm FLOOD RELIEF DRAIN:
 - ⑥ C0+00 - C1+96
 - RP RECEIVING PIT
 - JP JACKING PIT
 - SA STOCKPILING AREA
 - WA WORKS AREA
 - COUNTRY PARK BOUNDARY
 - PROPOSED WORKS AREA
 - PROPOSED STOCKPILING AREA
 - JACKING PIT / RECEIVING PIT
 - PROPOSED MANHOLE

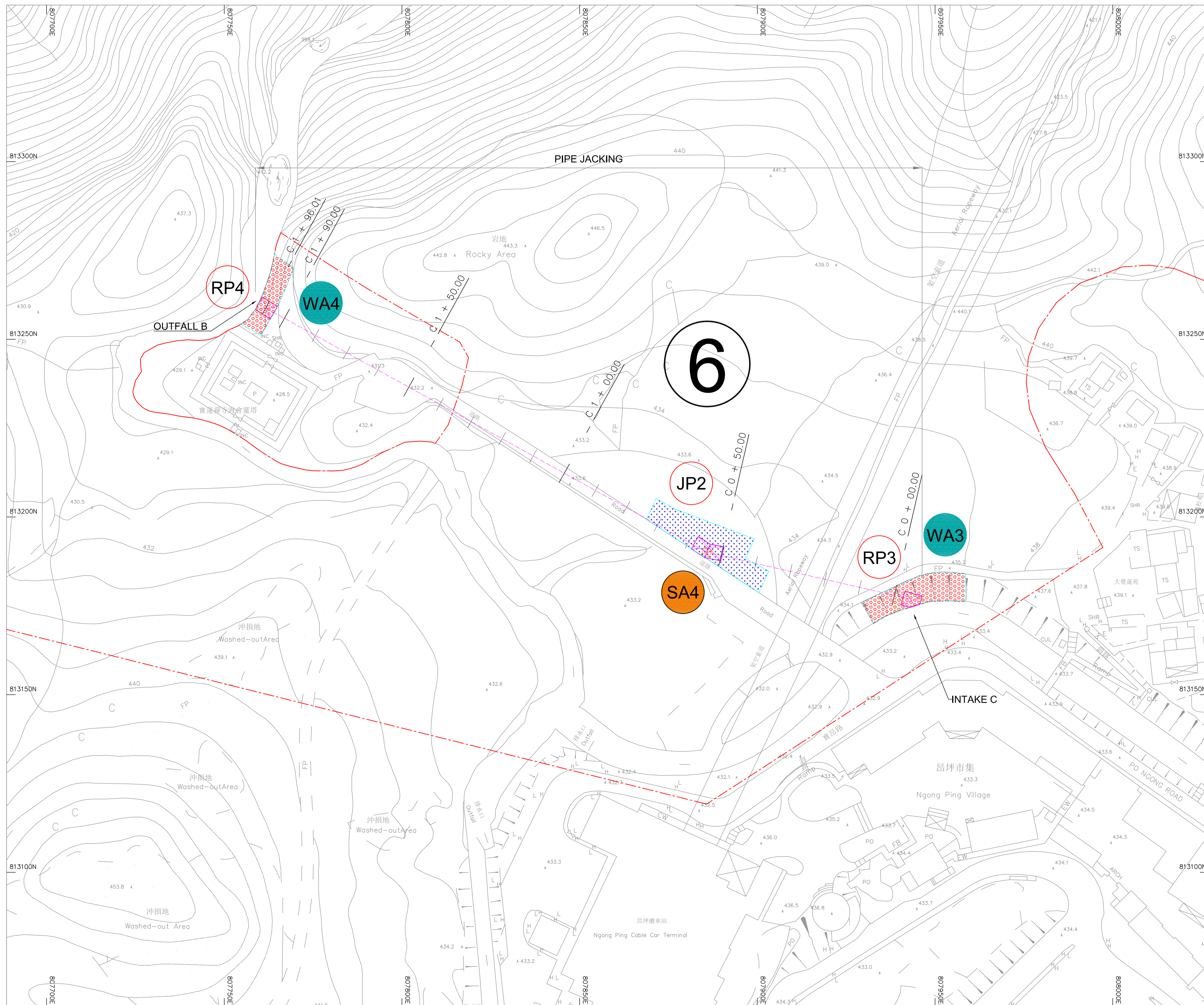
8/1/2013 10:50 KA9254 Ngong Ping Drainage EIA/DRM/ENV/Final EIA Figure 2.9f.dgn



**DRAINAGE SERVICES
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HONG KONG**

WORKS SECTION - 5

Figure:	A.4.5	Rev:	
Scale:	1 : 1000 (A3)		2



LEGEND:

- Country Park Boundary
- Proposed 1800mm Flood Relief Drain
- Proposed Stockpiling Area
- Proposed Works Area
- Stockpiling Area
- Works Area
- Jacking Pit
- Receiving Pit
- Jacking Pit/Receiving Pit
- Proposed Manhole

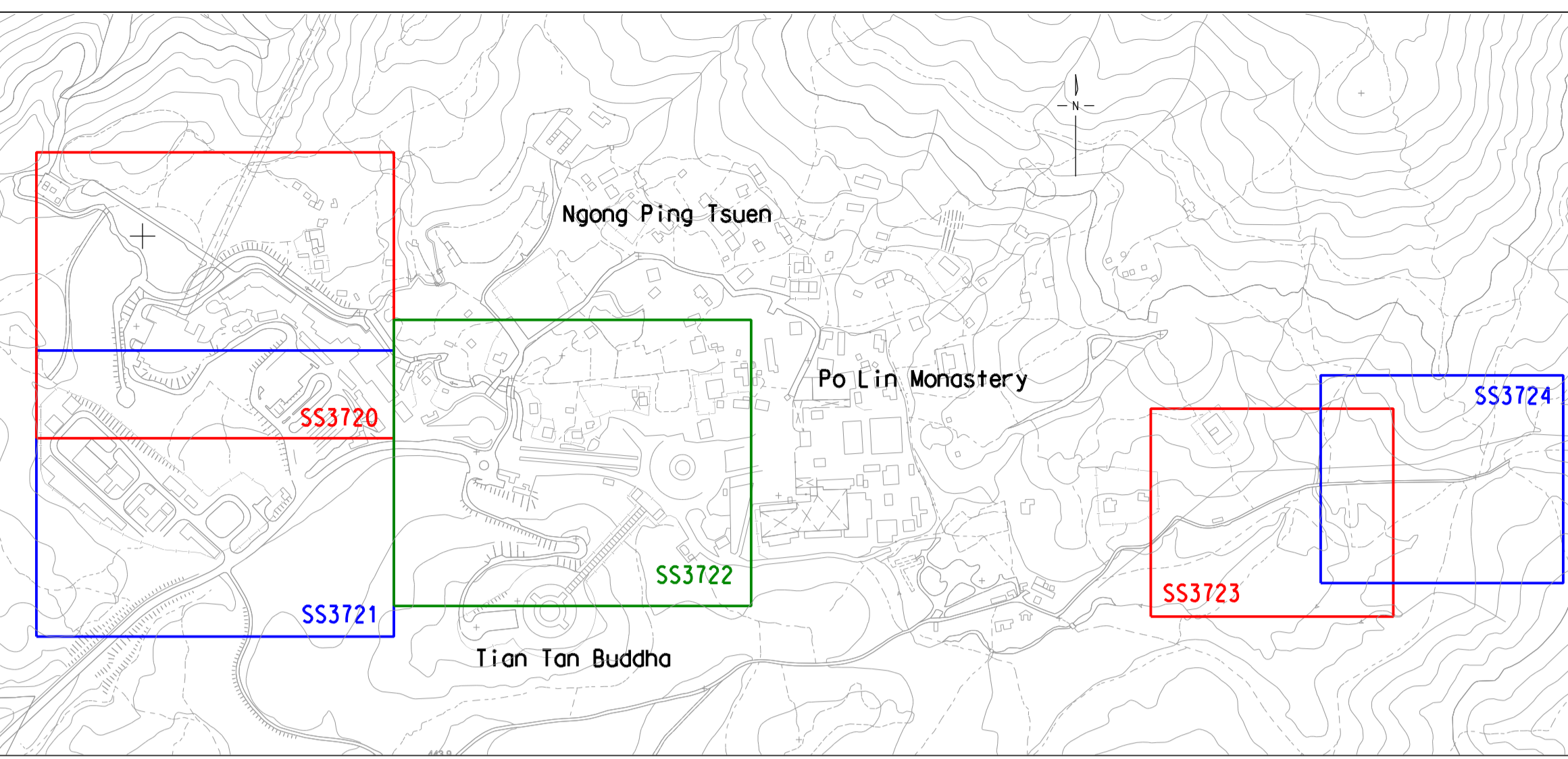
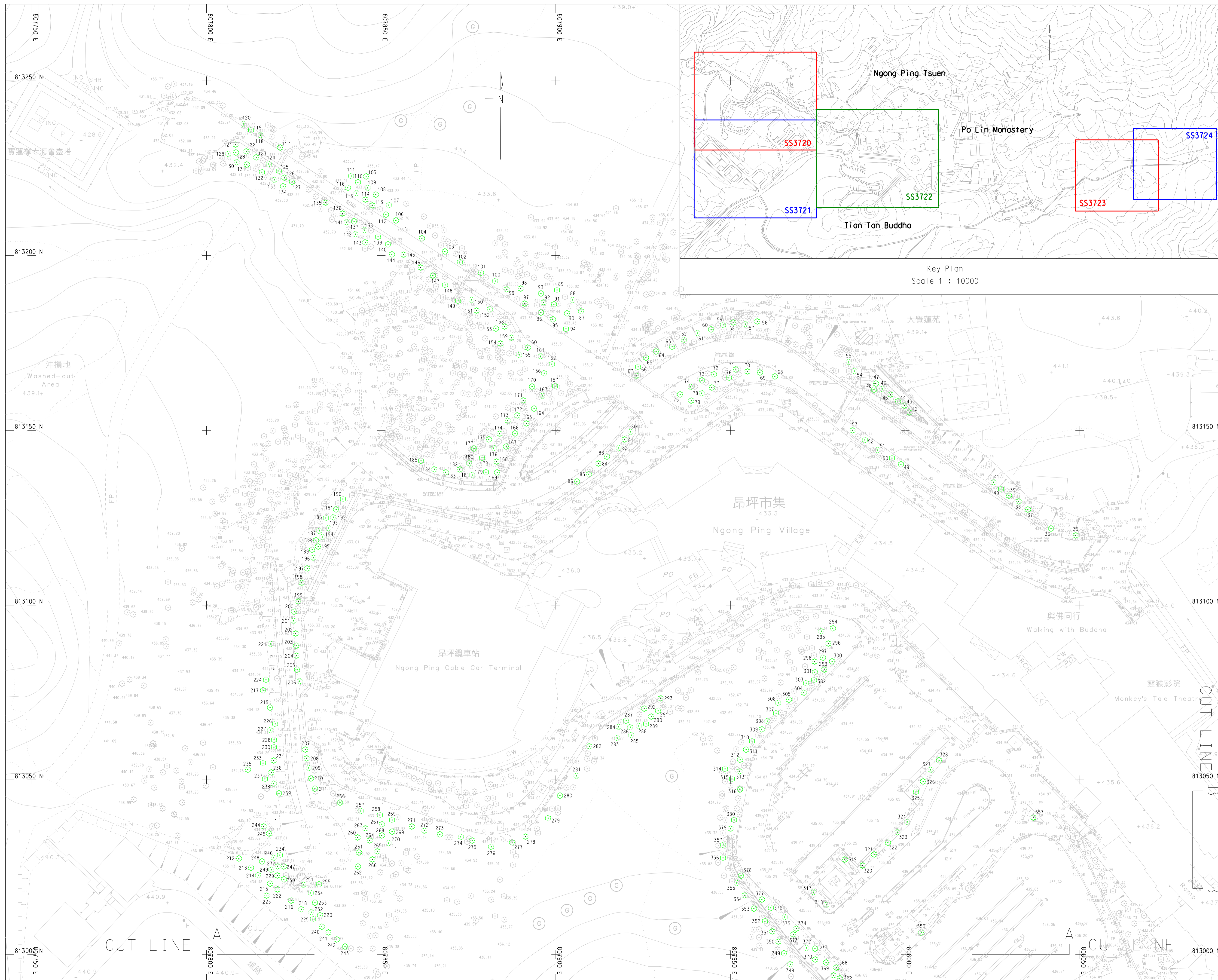
Notes:
 This figure was prepared with reference to Figure 2.9g of the approved EIA Report and the approved Floral Protection Plan.

PROJECT :	
WORKS SECTION-6	
SCALE AT A1 1: 500	
FIGURE NUMBER A.4.6	REVISION 0

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FUGRO



Key Plan
Scale 1 : 10000

- NOTES :
1. ALL LEVELS ARE IN METRES ABOVE H.K.P.D.
 2. CO-ORDINATES ARE OF HONG KONG 1980 GRID SYSTEM.
 3. CO-ORDINATES OF LOWER LEFT SHEET CORNER:
N: 812991; E: 807742; ROT. ANGLE : 0
 4. JOB NO. : D200340
 5. COMP. FOLDER : SC397/IX ENCL. 4
 6. BASEMAP SHOWN IN GREY REFER TO JOB NO. D160267 AND DRAWING PLAN NO. SS3459
 7. REFERENCE DRAWING: SS3720

- LEGEND :
- 56 NEW TREE WITH TREE PLATE NO.

no.	date	description	initial
A	07.12.20	Details updated	

REVISION

	name	date
surveyed		
drawn	W. T. CHAM	15-12-20
checked	K. C. NAGN	16-12-20

approved	ORIGINAL SIGNED	16-12-2020
	L. W. HO (LS/LW&D)	Date

contract no.

file no.

project no.

contract

LANDSCAPE IMPROVEMENT WORKS
IN NGONG PING

drawing title

AS-BUILT TREE SURVEY PLAN (SECTION 1)	scale
SS3720A (SHEET 1 OF 5)	1:500

office

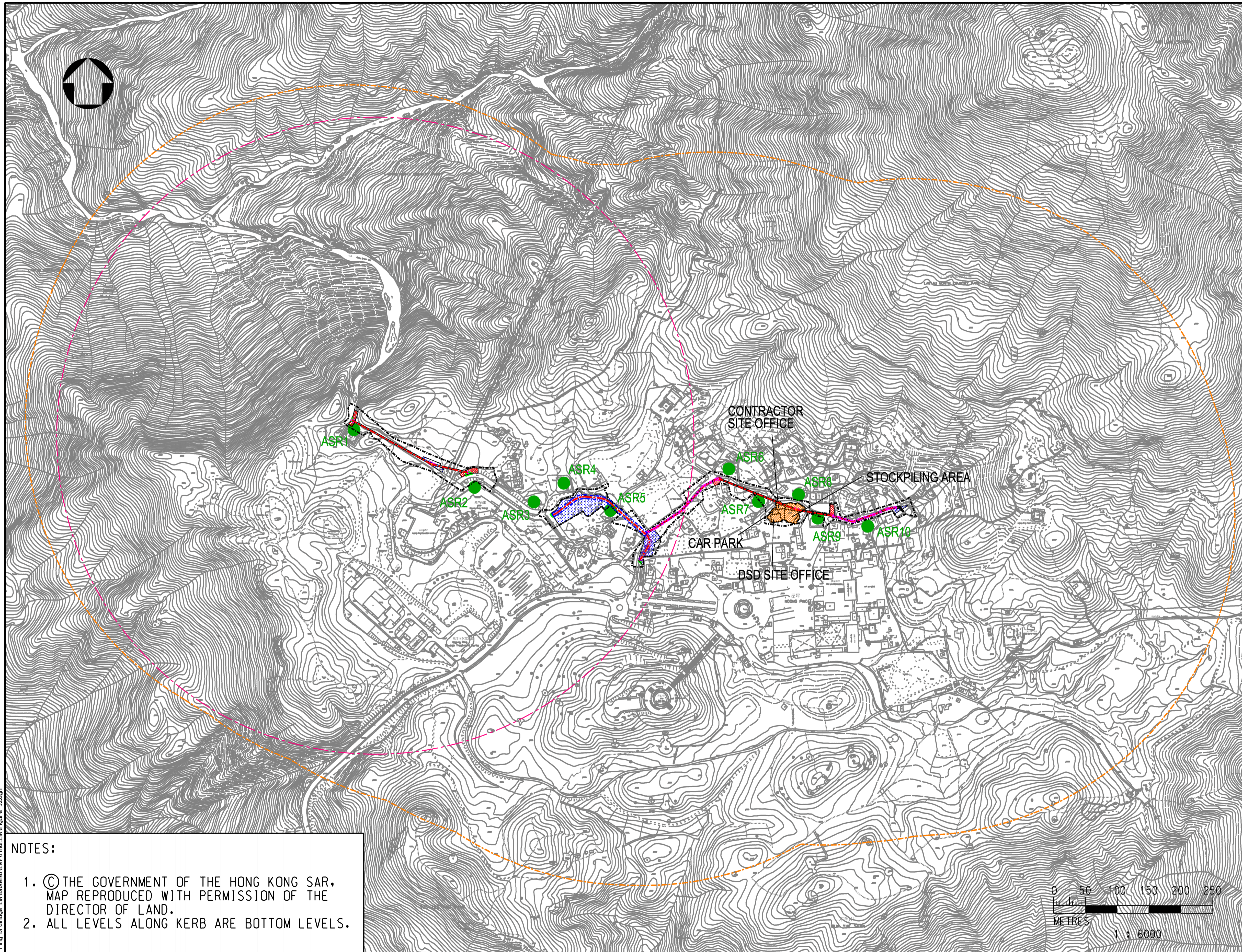
SURVEY DIVISION



Appendix B

Location of Sensitive Receivers

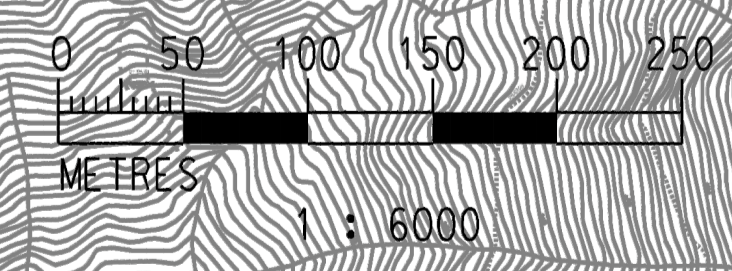
- B.1 Location of Air Sensitive Receivers**
- B.2 Location of Noise Sensitive Receivers**
- B.3 Location of Water Sensitive Receivers**
- B.4 Habitat Types within Survey Area**



- LEGENDS :**
- TENTATIVE WORKS BOUNDARY
 - WORKS AREA
 - STOCKPILING AREA
 - SITE OFFICE AREA
 - HOARDING
 - JACKING PIT/ RECEIVING PIT
 - MANHOLE
 - TRENCH 2.5m WIDE
 - TRENCH 5.5m WIDE
 - TRENCH 6m WIDE
 - 500m ZONE FROM WORKS BOUNDARY
 - PROPOSED ALIGNMENT
 - REPRESENTATIVE AIR SENSITIVE RECEIVERS
 - 500m ZONE FROM WORKS BOUNDARY OF THE ADDITIONAL JP/RP

NOTES:

1. © THE GOVERNMENT OF THE HONG KONG SAR, MAP REPRODUCED WITH PERMISSION OF THE DIRECTOR OF LAND.
2. ALL LEVELS ALONG KERB ARE BOTTOM LEVELS.



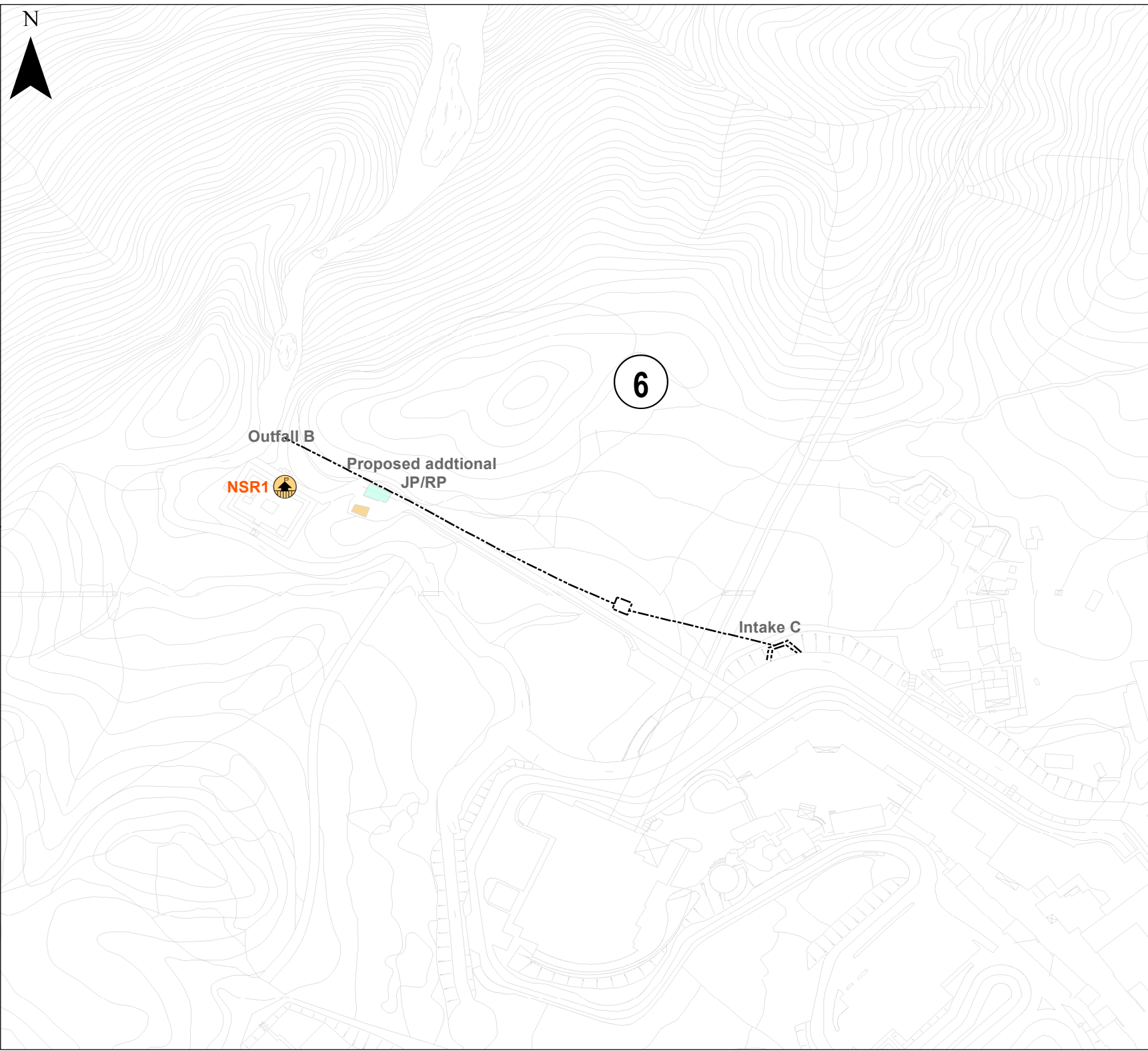
8/2/2002 2:56:22 PM K:\3\254\Nong Ping Drainage EIA\DRAWING\Find EIA\Figure 31.dgn
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DRAINAGE SERVICES DEPARTMENT HONG KONG

LOCATIONS OF REPRESENTATIVE AIR SENSITIVE RECEIVERS

Figure:	B.1	Rev:	1
Scale:	1 : 6000 (A3)		



- Legend**
-  Noise Sensitive Receiver
 -  Proposed Alignment
 -  Proposed Stockpiling Area
 -  Proposed Works Area

Key Plan



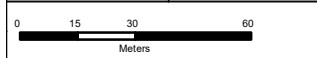
 **Drainage Services Department**
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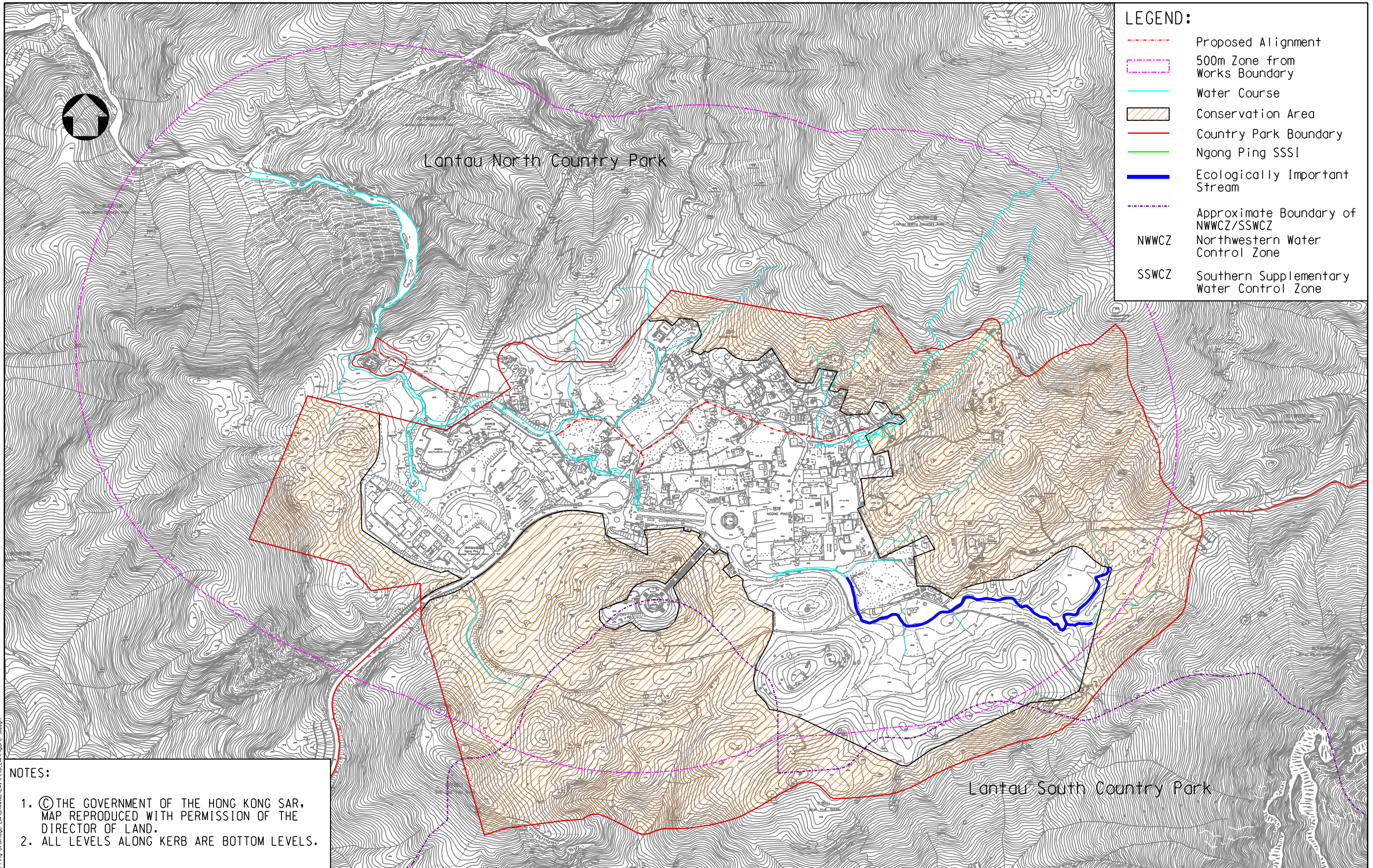
Project Title:
Contract No. DPW 01/2020 Environmental Team for Drainage Improvement Works at Ngong Ping

Figure Title:
Location of Noise Sensitive Receivers

Figure No: B.2	Rev.: 0
Prepared by: SMR	Checked: FMN



Date: 21/04/2021	Status: Draft
----------------------------	-------------------------



LEGEND:

- - - Proposed Alignment
- - - 500m Zone from Works Boundary
- Water Course
- Conservation Area
- Country Park Boundary
- Ngong Ping SSSI
- Ecologically Important Stream
- - - Approximate Boundary of NWWCZ/SSWCZ
- NWWCZ Northwestern Water Control Zone
- SSWCZ Southern Supplementary Water Control Zone

NOTES:

1. © THE GOVERNMENT OF THE HONG KONG SAR, MAP REPRODUCED WITH PERMISSION OF THE DIRECTOR OF LAND.
2. ALL LEVELS ALONG KERB ARE BOTTOM LEVELS.

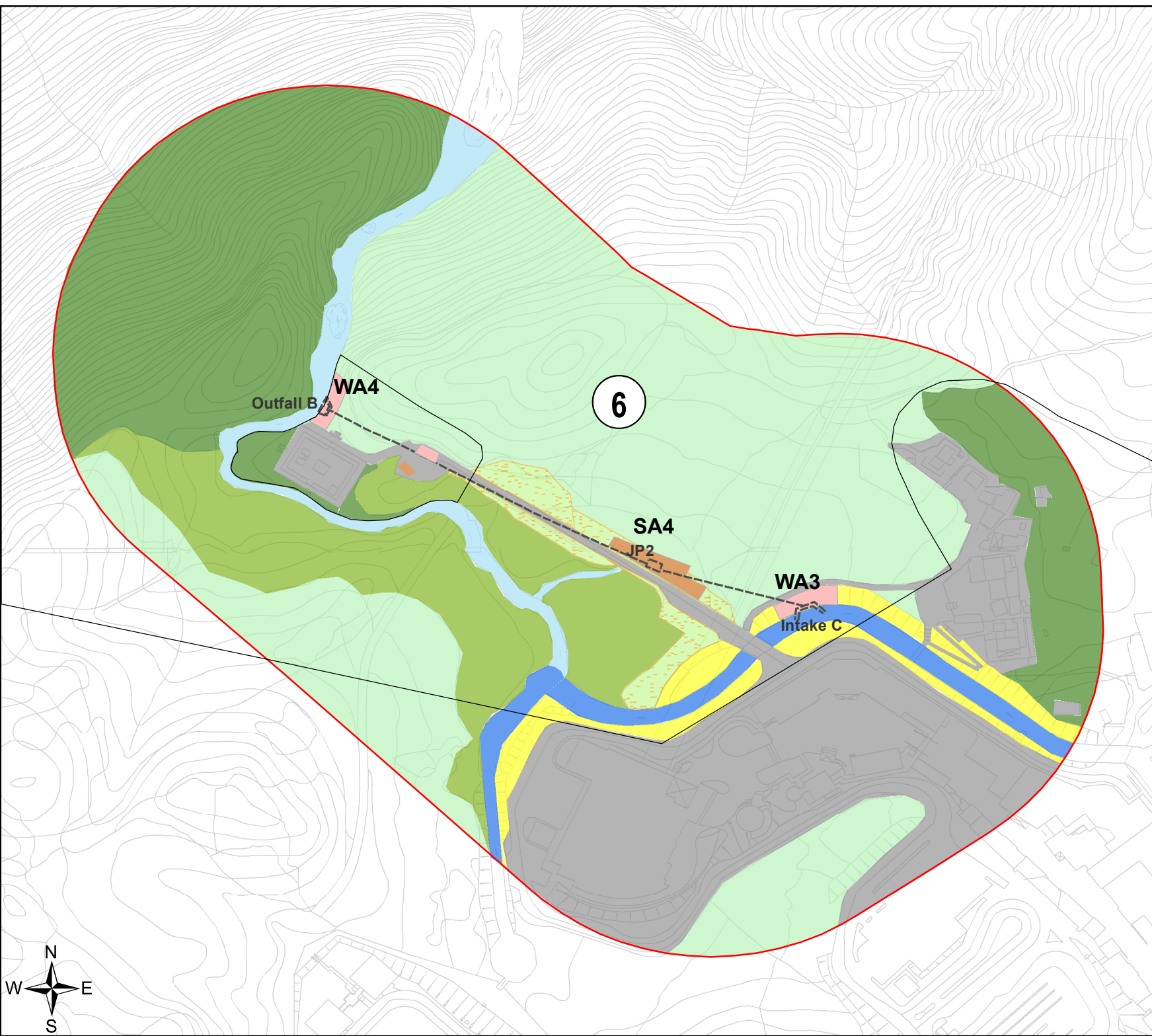
5/11/2012 9:58:10 KA 9254 Ngong Ping Drainage EIA/DRM/ENV Final EIA Figure 5.10a



DRAINAGE SERVICES DEPARTMENT HONG KONG

LOCATION OF WATER SENSITIVE RECEIVERS

Figure:	B.3	Rev:	2
Scale:	1 : 6 000 (A3)		



- Legend**
- Stream
 - Channelised Watercourse
 - Developed Area
 - Landscape Plantation
 - Secondary Woodland
 - Mixed Shrubland/Woodland
 - Shrubby Grassland
 - Shrubland
 - Country Park
 - Proposed Alignment
 - Proposed Stockpiling Area
 - Proposed Works Area
 - Survey Area
- SA** Stockpiling Area
WA Works Area
JP Jacking Pit

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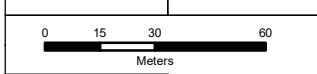


Project Title:
 Contract No. DPW 01/2020 Environmental Team
 for Drainage Improvement Works at Ngong Ping

Figure Title:
 Habitat Types within Survey Area

Figure No: B,4	Rev. 2
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Prepared by: SMR	Checked: FMN
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Date: 02/07/2021	Status: Draft
---------------------	------------------



Appendix C

Air and Noise Impacts Assessment

- C.1 Emission Inventory
- C.2 Specific Plant Inventory for Construction Works for the Unmitigated Scenario
- C.3 Specific Plant Inventory for Construction Works for the Mitigated Scenario
- C.4 Construction Noise Assessment-Unmitigated Scenario
- C.5 Construction Noise Assessment-Mitigated Scenario

**Appendix C1 Emission Inventory for Drainage Improvement works at Ngong Ping
Calculation of Emission Factors of Construction Works for TSP Modelling (Unmitigated Scenario)**

Heavy Construction

Construction Works Related: Site clearance; Excavation and backfilling of open trenches, jacking pits and receiving pits; Mucking-out at jacking pits; Loading and unloading activities at stockpile areas

Source IDs: S-1 to S-32

TSP Emission Factor	2.6900	(Mg/ha/month activity)	from EPA AP-42, 5th ed. Sec13.2.3.3
Source Emission Rate	2.0756E-04	(g/m ² /s)	Assuming 30 working days per month and 12 hours per day (from 07:00 to 19:00)
Source Emission Rate	2.0756E-04	(g/m ² /s)	Assuming 100% of Area Activity Operating
Source Emission Rate (w/o. Mitigation)	<u>2.0756E-04</u>	(g/m ² /s)	Assuming 0% of Dust Suppression for no watering

Wind Erosion of Exposed Areas for Daytime

Construction Works Related: Site clearance; Excavation and backfilling of open trenches, jacking pits and receiving pits; Mucking-out at jacking pits; Loading and unloading activities at stockpile areas

Source IDs: S-1 to S-32

TSP Emission Factor	0.8500	(Mg/ha/Yr)	from EPA AP-42, 5th ed. Sec11 Table 11.9.4
Source Emission Rate	2.6953E-06	(g/m ² /s)	Assuming Wind Erosion in 365 days and 24 hrs per day
Source Emission Rate	2.6953E-06	(g/m ² /s)	Assuming 100% of Area Activity Operating
Source Emission Rate (w/o. Mitigation)	<u>2.6953E-06</u>	(g/m ² /s)	Assuming 0% of Dust Suppression for no watering

Wind Erosion of Exposed Areas for Nighttime

Construction Works Related: Site clearance; Excavation and backfilling of open trenches, jacking pits and receiving pits; Mucking-out at jacking pits; Loading and unloading activities at stockpile areas

Source IDs: S-1 to S-32

TSP Emission Factor	0.8500	(Mg/ha/Yr)	from EPA AP-42, 5th ed. Sec11 Table 11.9.4
Source Emission Rate	2.6953E-06	(g/m ² /s)	Assuming Wind Erosion in 365 days and 24 hrs per day
Source Emission Rate	2.6953E-06	(g/m ² /s)	Assuming 100% of Area Activity Operating
Source Emission Rate (w/o. Mitigation)	<u>2.6953E-06</u>	(g/m ² /s)	Assuming 0% of Dust Suppression for no watering

Appendix C1 Emission Inventory for Drainage Improvement works at Ngong Ping
Locations and Details of Dust Emission Sources of Unmitigated Scenario for Dust Impact Assessment

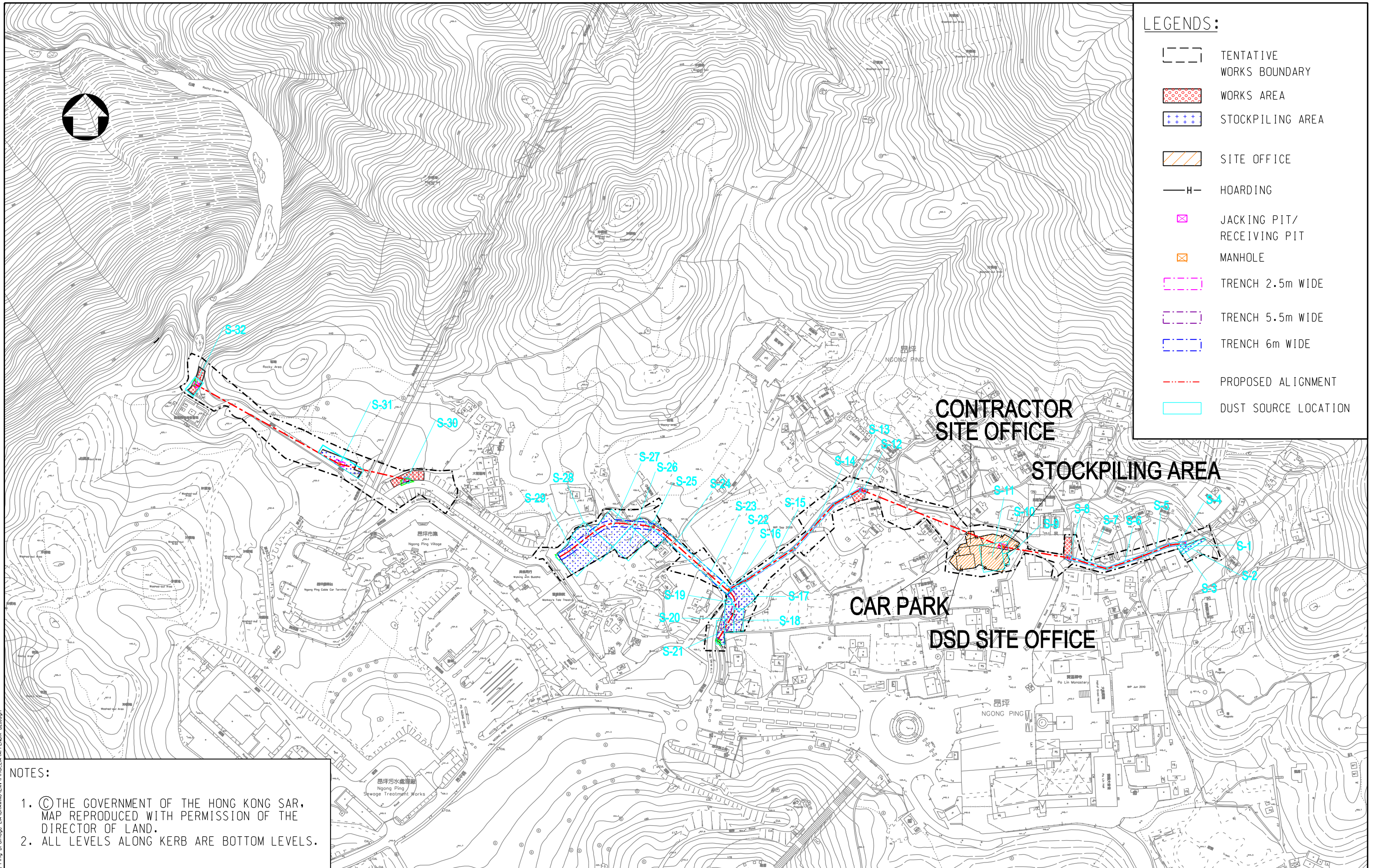
Source ID	Source Type	Coordinates of		Dimension (m)		Height (m)	Angle (deg)	Emission Rate (g/s/sq.m)			
		X1	Y1	X	Y			Heavy Construction		Wind Erosion	
		--	--	(m)	(m)			Daytime	Non-working Hours	Daytime	Non-working Hours
S-1	Area	808621.7	813119.9	24.3	2.8	0.5	32.2	2.0756E-04	0	2.6953E-06	2.6953E-06
S-2	Area	808616.5	813119.6	15.3	2.3	0.5	32.2	2.0756E-04	0	2.6953E-06	2.6953E-06
S-3	Area	808611.5	813119.6	6.7	3	0.5	32.2	2.0756E-04	0	2.6953E-06	2.6953E-06
S-4	Area	808608.7	813121.6	2.5	14.6	0.5	-82.3	2.0756E-04	0	2.6953E-06	2.6953E-06
S-5	Area	808589.7	813115.8	2.5	24.9	0.5	-67.8	2.0756E-04	0	2.6953E-06	2.6953E-06
S-6	Area	808562.9	813105.6	2.5	32.4	0.5	-70.3	2.0756E-04	0	2.6953E-06	2.6953E-06
S-7	Area	808532	813104.5	2.5	31.1	0.5	73.8	2.0756E-04	0	2.6953E-06	2.6953E-06
S-8	Area	808514.5	813109.6	5	4	0.5	-11.3	2.0756E-04	0	2.6953E-06	2.6953E-06
S-9	Area	808460.4	813108.5	9.8	4.5	0.5	-80.7	2.0756E-04	0	2.6953E-06	2.6953E-06
S-10	Area	808459.4	813118.4	10.1	5.8	0.5	-80.7	2.0756E-04	0	2.6953E-06	2.6953E-06
S-11	Area	808448.3	813110	23.1	18.8	0.5	-80.7	2.0756E-04	0	2.6953E-06	2.6953E-06
S-12	Area	808337.5	813167.4	5	4	0.5	-21.9	2.0756E-04	0	2.6953E-06	2.6953E-06
S-13	Area	808323.1	813161.7	2.5	24.6	0.5	-61.2	2.0756E-04	0	2.6953E-06	2.6953E-06
S-14	Area	808294.9	813136.4	2.5	51.2	0.5	-41.9	2.0756E-04	0	2.6953E-06	2.6953E-06
S-15	Area	808257.2	813103.8	2.5	48.7	0.5	-56.6	2.0756E-04	0	2.6953E-06	2.6953E-06
S-16	Area	808229.6	813086.6	2.5	16	0.5	-63.0	2.0756E-04	0	2.6953E-06	2.6953E-06
S-17	Area	808232.3	813076	18.3	18.9	0.5	-54.0	2.0756E-04	0	2.6953E-06	2.6953E-06
S-18	Area	808229.7	813055.7	20.1	8.1	0.5	90.0	2.0756E-04	0	2.6953E-06	2.6953E-06
S-19	Area	808220.9	813071.5	4.7	6.1	0.5	90.0	2.0756E-04	0	2.6953E-06	2.6953E-06
S-20	Area	808221.8	813057.2	23.8	7.8	0.5	90.0	2.0756E-04	0	2.6953E-06	2.6953E-06
S-21	Area	808214.3	813045.3	20.5	7.2	0.5	90.0	2.0756E-04	0	2.6953E-06	2.6953E-06
S-22	Area	808218.3	813083.5	6	9.5	0.5	44.0	2.0756E-04	0	2.6953E-06	2.6953E-06
S-23	Area	808204.9	813095.6	6	26.2	0.5	49.4	2.0756E-04	0	2.6953E-06	2.6953E-06
S-24	Area	808174.8	813122	6	53.9	0.5	48.5	2.0756E-04	0	2.6953E-06	2.6953E-06
S-25	Area	808151.6	813131.2	10.9	28.8	0.5	48.5	2.0756E-04	0	2.6953E-06	2.6953E-06
S-26	Area	808136	813121.8	23.9	18	0.5	48.5	2.0756E-04	0	2.6953E-06	2.6953E-06
S-27	Area	808120.9	813135.2	23.9	22.5	0.5	48.5	2.0756E-04	0	2.6953E-06	2.6953E-06
S-28	Area	808103.5	813123.7	16.3	33.3	0.5	48.5	2.0756E-04	0	2.6953E-06	2.6953E-06
S-29	Area	808088.8	813110.5	23.1	25.1	0.5	48.5	2.0756E-04	0	2.6953E-06	2.6953E-06
S-30	Area	807943.6	813176.3	5.7	4.5	0.5	-15.8	2.0756E-04	0	2.6953E-06	2.6953E-06
S-31	Area	807887.1	813192.6	41.3	8.7	0.5	-33.1	2.0756E-04	0	2.6953E-06	2.6953E-06
S-32	Area	807760.5	813257.2	13.8	8.8	0.5	48.7	2.0756E-04	0	2.6953E-06	2.6953E-06

**Appendix C1 Emission Inventory for Drainage Improvement works at Ngong Ping
Calculation of Emission Factors of Construction Works for TSP Modelling (Mitigated Scenario)**

Heavy Construction			
Construction Works Related: Site clearance; Excavation and backfilling of open trenches, jacking pits and receiving pits; Mucking-out at jacking pits; Loading and unloading activities at stockpile areas			
Source IDs: S-1 to S-32			
TSP Emission Factor	2.6900	(Mg/ha/month activity)	from EPA AP-42, 5th ed. Sec13.2.3.3
Source Emission Rate	2.0756E-04	(g/m ² /s)	Assuming 30 working days per month and 12 hours per day (from 07:00 to 19:00)
Source Emission Rate	2.0756E-04	(g/m ² /s)	Assuming 100% of Area Activity Operating
Source Emission Rate (w/. Mitigation)	<u>1.7228E-05</u>	(g/m ² /s)	Assuming 91.7% of Dust Suppression for watering once per hour
Wind Erosion of Exposed Areas for Daytime			
Construction Works Related: Site clearance; Excavation and backfilling of open trenches, jacking pits and receiving pits; Mucking-out at jacking pits; Loading and unloading activities at stockpile areas			
Source IDs: S-1 to S-32			
TSP Emission Factor	0.8500	(Mg/ha/Yr)	from EPA AP-42, 5th ed. Sec11 Table 11.9.4
Source Emission Rate	2.6953E-06	(g/m ² /s)	Assuming Wind Erosion in 365 days and 24 hrs per day
Source Emission Rate	2.6953E-06	(g/m ² /s)	Assuming 100% of Area Activity Operating
Source Emission Rate (w/. Mitigation)	<u>2.2371E-07</u>	(g/m ² /s)	Assuming 91.7% of Dust Suppression for watering once per hour
Wind Erosion of Exposed Areas for Nighttime			
Construction Works Related: Site clearance; Excavation and backfilling of open trenches, jacking pits and receiving pits; Mucking-out at jacking pits; Loading and unloading activities at stockpile areas			
Source IDs: S-1 to S-32			
TSP Emission Factor	0.8500	(Mg/ha/Yr)	from EPA AP-42, 5th ed. Sec11 Table 11.9.4
Source Emission Rate	2.6953E-06	(g/m ² /s)	Assuming Wind Erosion in 365 days and 24 hrs per day
Source Emission Rate	2.6953E-06	(g/m ² /s)	Assuming 100% of Area Activity Operating
Source Emission Rate (w/. Mitigation)	<u>2.6953E-06</u>	(g/m ² /s)	Assuming 0% of Dust Suppression for no watering

Appendix C1 Emission Inventory for Drainage Improvement works at Ngong Ping
Locations and Details of Dust Emission Sources of Mitigated Scenario for Dust Impact Assessment

Source ID	Source Type	Coordinates of		Dimension (m)		Height (m)	Angle (deg)	Emission Rate (g/s/sq.m)			
		X1	Y1	X	Y			Heavy Construction		Wind Erosion	
		--	--	(m)	(m)			Daytime	Non-working Hours	Daytime	Non-working Hours
S-1	Area	808621.7	813119.9	24.3	2.8	0.5	32.2	1.7228E-05	0	2.2371E-07	2.6953E-06
S-2	Area	808616.5	813119.6	15.3	2.3	0.5	32.2	1.7228E-05	0	2.2371E-07	2.6953E-06
S-3	Area	808611.5	813119.6	6.7	3	0.5	32.2	1.7228E-05	0	2.2371E-07	2.6953E-06
S-4	Area	808608.7	813121.6	2.5	14.6	0.5	-82.3	1.7228E-05	0	2.2371E-07	2.6953E-06
S-5	Area	808589.7	813115.8	2.5	24.9	0.5	-67.8	1.7228E-05	0	2.2371E-07	2.6953E-06
S-6	Area	808562.9	813105.6	2.5	32.4	0.5	-70.3	1.7228E-05	0	2.2371E-07	2.6953E-06
S-7	Area	808532	813104.5	2.5	31.1	0.5	73.8	1.7228E-05	0	2.2371E-07	2.6953E-06
S-8	Area	808514.5	813109.6	5	4	0.5	-11.3	1.7228E-05	0	2.2371E-07	2.6953E-06
S-9	Area	808460.4	813108.5	9.8	4.5	0.5	-80.7	1.7228E-05	0	2.2371E-07	2.6953E-06
S-10	Area	808459.4	813118.4	10.1	5.8	0.5	-80.7	1.7228E-05	0	2.2371E-07	2.6953E-06
S-11	Area	808448.3	813110	23.1	18.8	0.5	-80.7	1.7228E-05	0	2.2371E-07	2.6953E-06
S-12	Area	808337.5	813167.4	5	4	0.5	-21.9	1.7228E-05	0	2.2371E-07	2.6953E-06
S-13	Area	808323.1	813161.7	2.5	24.6	0.5	-61.2	1.7228E-05	0	2.2371E-07	2.6953E-06
S-14	Area	808294.9	813136.4	2.5	51.2	0.5	-41.9	1.7228E-05	0	2.2371E-07	2.6953E-06
S-15	Area	808257.2	813103.8	2.5	48.7	0.5	-56.6	1.7228E-05	0	2.2371E-07	2.6953E-06
S-16	Area	808229.6	813086.6	2.5	16	0.5	-63.0	1.7228E-05	0	2.2371E-07	2.6953E-06
S-17	Area	808232.3	813076	18.3	18.9	0.5	-54.0	1.7228E-05	0	2.2371E-07	2.6953E-06
S-18	Area	808229.7	813055.7	20.1	8.1	0.5	90.0	1.7228E-05	0	2.2371E-07	2.6953E-06
S-19	Area	808220.9	813071.5	4.7	6.1	0.5	90.0	1.7228E-05	0	2.2371E-07	2.6953E-06
S-20	Area	808221.8	813057.2	23.8	7.8	0.5	90.0	1.7228E-05	0	2.2371E-07	2.6953E-06
S-21	Area	808214.3	813045.3	20.5	7.2	0.5	90.0	1.7228E-05	0	2.2371E-07	2.6953E-06
S-22	Area	808218.3	813083.5	6	9.5	0.5	44.0	1.7228E-05	0	2.2371E-07	2.6953E-06
S-23	Area	808204.9	813095.6	6	26.2	0.5	49.4	1.7228E-05	0	2.2371E-07	2.6953E-06
S-24	Area	808174.8	813122	6	53.9	0.5	48.5	1.7228E-05	0	2.2371E-07	2.6953E-06
S-25	Area	808151.6	813131.2	10.9	28.8	0.5	48.5	1.7228E-05	0	2.2371E-07	2.6953E-06
S-26	Area	808136	813121.8	23.9	18	0.5	48.5	1.7228E-05	0	2.2371E-07	2.6953E-06
S-27	Area	808120.9	813135.2	23.9	22.5	0.5	48.5	1.7228E-05	0	2.2371E-07	2.6953E-06
S-28	Area	808103.5	813123.7	16.3	33.3	0.5	48.5	1.7228E-05	0	2.2371E-07	2.6953E-06
S-29	Area	808088.8	813110.5	23.1	25.1	0.5	48.5	1.7228E-05	0	2.2371E-07	2.6953E-06
S-30	Area	807943.6	813176.3	5.7	4.5	0.5	-15.8	1.7228E-05	0	2.2371E-07	2.6953E-06
S-31	Area	807887.1	813192.6	41.3	8.7	0.5	-33.1	1.7228E-05	0	2.2371E-07	2.6953E-06
S-32	Area	807760.5	813257.2	13.8	8.8	0.5	48.7	1.7228E-05	0	2.2371E-07	2.6953E-06



- LEGENDS:**
- TENTATIVE WORKS BOUNDARY
 - WORKS AREA
 - STOCKPILING AREA
 - SITE OFFICE
 - HOARDING
 - JACKING PIT/ RECEIVING PIT
 - MANHOLE
 - TRENCH 2.5m WIDE
 - TRENCH 5.5m WIDE
 - TRENCH 6m WIDE
 - PROPOSED ALIGNMENT
 - DUST SOURCE LOCATION

NOTES:

1. © THE GOVERNMENT OF THE HONG KONG SAR, MAP REPRODUCED WITH PERMISSION OF THE DIRECTOR OF LAND.
2. ALL LEVELS ALONG KERB ARE BOTTOM LEVELS.

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**DRAINAGE SERVICES
DEPARTMENT
HONG KONG**

DUST EMISSION SOURCES OF TSP MODELLING

Figure:	Appendix C1.1	Rev:	0
Scale:	1 : 3 000 (A3)		

Appendix C.2

Drainage Improvement Works at Ngong Ping

Plant Inventory

Unmitigated Scenario

ID	PME	CNP	No. of Item	% on time	SWL, dB(A)	Mitigation Measures	Attenuation	Total SWL, dB(A)
1	Activity 1 - Site Clearance							
1a	Felling of Trees							
	Saw, Chain, Hand-Held	CNP 202	1	50%	114	Nil		111
1b	Removal of Trees							
	Excavator/Loader, Wheeled/Tracked	CNP 081	1	70%	112	Nil		114
	Dump Truck, gross vehicle weight > 38 tonne	CNP 067	1	30%	117	Nil		
2	Activity 2 – Construction of Site Office							
	Concrete Lorry Mixer	CNP 044	1	50%	109	Nil		112
	Excavator/Loader, Wheeled/Tracked	CNP 081	1	70%	112	Nil		
	Generator, Silenced, 75 dB(A) at 7m	CNP 102	1	100%	100	Nil		
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105	Nil		
3	Activity 3 – Laying of Pipe by Open-cut Method							
3a	Excavation and installation of earth lateral support system							
3a-1	Excavation and installation of earth lateral support system - Sheet Piling							
	Piling, vibrating hammer	CNP 172	1	50%	115	Nil		112
3a-2	Excavation and installation of earth lateral support system - Excavation							
	Excavator/Loader, Wheeled/Tracked	CNP 081	1	70%	112	Nil		111
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105	Nil		
3a-3	Excavation and installation of earth lateral support system - Delivery of Precast Elements							
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105	Nil		100
3a-4	Excavation and installation of earth lateral support system - Generators and Pumps							
	Water Pump (Electric)	CNP 281	1	50%	88	Nil		100
	Generator, Silenced, 75 dB(A) at 7m	CNP 102	1	100%	100	Nil		
3b	Laying of pipe							
	Crane, Mobile/Barge Mounted (diesel)	CNP 048	1	70%	112	Nil		111
	Generator, Silenced, 75 dB(A) at 7m	CNP 102	1	100%	100	Nil		
	Water Pump (Electric)	CNP 281	1	50%	88	Nil		
	Winch (Electric)	CNP 262	1	50%	95	Nil		
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105	Nil		
3c	Backfilling the trench							
3c-1	Backfilling the trench - Filling							
	Dump Truck, gross vehicle weight > 38 tonne	CNP 067	1	30%	117	Nil		114
	Excavator/Loader, Wheeled/Tracked	CNP 081	1	70%	112	Nil		
3c-2	Backfilling the trench - Compacting							
	Compactor, Vibratory	CNP 050	1	50%	105	Nil		102
3d	Reinstatement of original pavement							
	Concrete Lorry Mixer	CNP 044	1	50%	109	Nil		112
	Poker, Vibratory, Hand-held	CNP 170	1	50%	113	Nil		
	Generator, Silenced, 75 dB(A) at 7m	CNP 102	1	100%	100	Nil		
4	Activity 4 – Construction of Box-culvert							
4a	Excavation and installation of earth lateral support system							
4a-1	Excavation and installation of earth lateral support system - Sheet Piling							
	Piling, vibrating hammer	CNP 172	1	50%	115	Nil		112
4a-2	Excavation and installation of earth lateral support system - Excavation							
	Excavator/Loader, Wheeled/Tracked	CNP 081	1	70%	112	Nil		111
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105	Nil		
4a-3	Excavation and installation of earth lateral support system - Delivery of Precast Elements							
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105	Nil		100
4a-4	Excavation and installation of earth lateral support system - Generators and Pumps							
	Water Pump (Electric)	CNP 281	1	50%	88	Nil		100
	Generator, Silenced, 75 dB(A) at 7m	CNP 102	1	100%	100	Nil		
4b	Erection of formwork, steel fixing and concreting							
4b-1	Erection of formwork							
	Saw, Circular, Wood	CNP 201	1	50%	108	Nil		105
	Water Pump (Electric)	CNP 281	1	50%	88	Nil		
4b-2	Steel fixing							
	Bar Bender and Cutter (Electric)	CNP 021	1	80%	90	Nil		90
	Water Pump (Electric)	CNP 281	1	50%	88	Nil		
4b-3	Concreting							
	Concrete Lorry Mixer	CNP 044	1	50%	109	Nil		114
	Crane, Mobile/Barge Mounted (diesel)	CNP 048	1	70%	112	Nil		
	Poker, Vibratory, Hand-held	CNP 170	1	50%	113	Nil		
	Water Pump (Electric)	CNP 281	1	50%	88	Nil		
4c	Backfilling the trench							
4c-1	Backfilling the trench - Filling							
	Dump Truck, gross vehicle weight > 38 tonne	CNP 067	1	30%	117	Nil		114
	Excavator/Loader, Wheeled/Tracked	CNP 081	1	70%	112	Nil		
4c-2	Backfilling the trench - Compacting							
	Compactor, Vibratory	CNP 050	1	50%	105	Nil		102
4d	Reinstatement of original pavement							
	Concrete Lorry Mixer	CNP 044	1	50%	109	Nil		112
	Poker, Vibratory, Hand-held	CNP 170	1	50%	113	Nil		
	Generator, Silenced, 75 dB(A) at 7m	CNP 102	1	100%	100	Nil		

Appendix C.2

Drainage Improvement Works at Ngong Ping

Plant Inventory

Unmitigated Scenario

ID	PME	CNP	No. of Item	% on time	SWL, dB(A)	Mitigation Measures	Attenuation	Total SWL, dB(A)
5	Activity 5 – Laying of Pipe by Pipe-jacking Method							
5a	Construction of jacking pits							
5a-1	Construction of jacking pits - Excavation							
	Breaker, Excavator Mounted (Hydraulic)	CNP 028	1	70%	122	Nil		120
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105	Nil		
5a-2	Construction of jacking pits - Delivery of Precast Elements							
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105	Nil		100
5a-3	Construction of jacking pits - Generators and Pumps							
	Water Pump (Electric)	CNP 281	1	50%	88	Nil		101
	Generator, Silenced, 75 dB(A) at 7m	CNP 102	1	100%	100	Nil		
	Air blower (electric)	CNP 006	1	50%	95	Nil		
5b	Pipe jacking							
	Crane, Mobile/Barge Mounted (diesel)	CNP 048	1	70%	112	Nil		111
	Winch (Electric)	CNP 262	1	50%	95	Nil		
	Grout mixer	CNP 105	1	80%	90	Nil		
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105	Nil		
	Pipe jacking machine*	No Noise Impact	1	--		Nil		
	Grout pump	CNP 106	1	--		Nil		
	Tunnel boring machine*	No Noise Impact	1	--		Nil		
5c	Construction of receiving pits							
5c-1	Construction of receiving pits - Excavation							
	Breaker, Excavator Mounted (Hydraulic)	CNP 028	1	70%	122	Nil		120
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105	Nil		
5c-2	Construction of receiving pits - Delivery of Precast Elements							
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105	Nil		100
5c-3	Construction of receiving pits - Generators and Pumps							
	Water Pump (Electric)	CNP 281	1	50%	88	Nil		101
	Generator, Silenced, 75 dB(A) at 7m	CNP 102	1	100%	100	Nil		
	Air blower (electric)	CNP 006	1	50%	95	Nil		
5d	Backfilling the pits							
5d-1	Backfilling the pits - Filling							
	Dump Truck, gross vehicle weight > 38 tonne	CNP 067	1	30%	117	Nil		114
	Excavator/Loader, Wheeled/Tracked	CNP 081	1	70%	112	Nil		
5d-2	Backfilling the pits - Compacting							
	Compactor, Vibratory	CNP 050	1	50%	105	Nil		102
6	Activity 6 – Construction of Manholes, Inlet and Outfall Structures							
6a	Excavation							
6a-1	Excavation - Rock Breaking							
	Breaker, Excavator Mounted (Hydraulic)	CNP 028	1	70%	122	Nil		120
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105	Nil		
6a-2	Excavation - Spoil Delivery							
	Dump Truck, gross vehicle weight > 38 tonne	CNP 067	1	30%	117	Nil		114
	Excavator/Loader, Wheeled/Tracked	CNP 081	1	70%	112	Nil		
6a-3	Excavation - Generators and Pumps							
	Water Pump (Electric)	CNP 281	1	50%	88	Nil		100
	Generator, Silenced, 75 dB(A) at 7m	CNP 102	1	100%	100	Nil		
6b	Erection of formwork, steel fixing and concreting							
6b-1	Erection of formwork							
	Saw, Circular, Wood	CNP 201	1	50%	108	Nil		105
	Water Pump (Electric)	CNP 281	1	50%	88	Nil		
6b-2	Steel fixing							
	Bar Bender and Cutter (Electric)	CNP 021	1	80%	90	Nil		90
	Water Pump (Electric)	CNP 281	1	50%	88	Nil		
6b-3	Concreting							
	Concrete Lorry Mixer	CNP 044	1	50%	109	Nil		114
	Crane, Mobile/Barge Mounted (diesel)	CNP 048	1	70%	112	Nil		
	Poker, Vibratory, Hand-held	CNP 170	1	50%	113	Nil		
	Water Pump (Electric)	CNP 281	1	50%	88	Nil		
6c	Backfilling							
6c-1	Backfilling - Filling							
	Dump Truck, gross vehicle weight > 38 tonne	CNP 067	1	30%	117	Nil		114
	Excavator/Loader, Wheeled/Tracked	CNP 081	1	70%	112	Nil		
6c-2	Backfilling - Compacting							
	Compactor, Vibratory	CNP 050	1	50%	105	Nil		102
7	Activity 7 – Demolition of Site Office with associated road reinstatement work and landscaping works							
	Breaker, Excavator Mounted (Hydraulic)	CNP 028	1	70%	122	Nil		121
	Dump Truck, gross vehicle weight > 38 tonne	CNP 067	1	30%	117	Nil		
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105	Nil		

Appendix C.2

Drainage Improvement Works at Ngong Ping
Plant Inventory
Unmitigated Scenario

Specific Plant Inventory for Construction Works at RP4 / Outfall B

ID	PME	CNP	No. of Item	% on time	SWL, dB(A)	Mitigation Measures	Attenuation	Total SWL, dB(A)
5	Activity 5 – Laying of Pipe by Pipe-jacking Method							
5c+	Construction of receiving pits							
5c-1	Construction of receiving pits - Excavation							
	Breaker, Excavator Mounted (Hydraulic)	CNP 028	1	70%	122	Nil		120
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105	Nil		
5c-2	Construction of receiving pits - Delivery of Precast Elements							
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105	Nil		100
5c-3	Construction of receiving pits - Generators and Pumps							
	Water Pump (Electric)	CNP 281	1	50%	88	Nil		101
	Generator, Silenced, 75 dB(A) at 7m	CNP 102	1	100%	100	Nil		
	Air blower (electric)	CNP 006	1	50%	95	Nil		
5d+	Backfilling the pits							
5d-1	Backfilling the pits - Filling							
	Dump Truck, gross vehicle weight > 38 tonne	CNP 067	1	30%	117	Nil		112
	Excavator, mini-robot mounted	CNP 082	1	70%	94	Nil		
5d-2	Backfilling the pits - Compacting							
	Compactor, Vibratory	CNP 050	1	50%	105	Nil		102
6	Activity 6 – Construction of Manholes, Inlet and Outfall Structures							
6a+	Excavation							
6a-1	Excavation - Rock Breaking							
	Breaker, Excavator Mounted (Hydraulic)	CNP 028	1	70%	122	Nil		120
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105	Nil		
6a-2	Excavation - Spoil Delivery							
	Dump Truck, gross vehicle weight > 38 tonne	CNP 067	1	30%	117	Nil		112
	Excavator, mini-robot mounted	CNP 082	1	70%	94	Nil		
6a-3	Excavation - Generators and Pumps							
	Water Pump (Electric)	CNP 281	1	50%	88	Nil		100
	Generator, Silenced, 75 dB(A) at 7m	CNP 102	1	100%	100	Nil		
6b+	Erection of formwork, steel fixing and concreting							
6b-1	Erection of formwork							
	Saw, Circular, Wood	CNP 201	1	50%	108	Nil		105
	Water Pump (Electric)	CNP 281	1	50%	88	Nil		
6b-2	Steel fixing							
	Bar Bender and Cutter (Electric)	CNP 021	1	80%	90	Nil		90
	Water Pump (Electric)	CNP 281	1	50%	88	Nil		
6b-3	Concreting							
	Concrete Lorry Mixer	CNP 044	1	50%	109	Nil		114
	Crane, Mobile/Barge Mounted (diesel)	CNP 048	1	70%	112	Nil		
	Poker, Vibratory, Hand-held	CNP 170	1	50%	113	Nil		
	Water Pump (Electric)	CNP 281	1	50%	88	Nil		
6c+	Backfilling							
6c-1	Backfilling - Filling							
	Dump Truck, gross vehicle weight > 38 tonne	CNP 067	1	30%	117	Nil		112
	Excavator, mini-robot mounted	CNP 082	1	70%	94	Nil		
6c-2	Backfilling - Compacting							
	Compactor, Vibratory	CNP 050	1	50%	105	Nil		102

Appendix C.3

Drainage Improvement Works at Ngong Ping

Plant Inventory

Mitigated Scenario

ID	PME	CNP	No. of Item	% on time	SWL, dB(A)	Mitigation Measures	Attenuation	Total SWL, dB(A)
1	Activity 1 - Site Clearance							
1a	Felling of Trees							
	Electric Chain-Saw, Hand-held	Ref 1	1	50%	103			100
1b	Removal of Trees							
	Tracked excavator (14t)	BS C2/7	1	70%	98	Temporary Noise barrier	-5	99
	Dump Truck	BS D9/39	1	30%	103			
2	Activity 2 – Construction of Site Office							
	Concrete lorry mixer	BS D6/33	1	50%	96			101
	Tracked excavator (14t)	BS C2/7	1	70%	98	Temporary Noise barrier	-5	
	Generator, Super Silenced, 70 dB(A) at 7m	CNP 103	1	100%	95	Noise Enclosure	-10	
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105			
3	Activity 3 – Laying of Pipe by Open-cut Method							
3a	Excavation and installation of earth lateral support system							
3a-1	Excavation and installation of earth lateral support system - Sheet Piling							
	Tracked excavator fitted with hydraulic rock breaker	BS D8/13	1	50%	110	Temporary Noise barrier	-5	102
3a-2	Excavation and installation of earth lateral support system - Excavation							
	Tracked excavator (14t)	BS C2/7	1	70%	98	Temporary Noise barrier	-5	100
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105			
3a-3	Excavation and installation of earth lateral support system - Delivery of Precast Elements							
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105			100
3a-4	Excavation and installation of earth lateral support system - Generators and Pumps							
	Water Pump, Submersible (Electric)	CNP 283	1	50%	85			87
	Generator, Super Silenced, 70 dB(A) at 7m	CNP 103	1	100%	95	Noise Enclosure	-10	
3b	Laying of pipe							
	Tracked mobile crane (132kW, 55t)	BS C3/29	1	70%	98			102
	Generator, Super Silenced, 70 dB(A) at 7m	CNP 103	1	100%	95	Noise Enclosure	-10	
	Water Pump, Submersible (Electric)	CNP 283	1	50%	85			
	Winch (Electric)	CNP 262	1	50%	95			
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105			
3c	Backfilling the trench							
3c-1	Backfilling the trench - Filling							
	Dump Truck	BS D9/39	1	30%	103			99
	Tracked excavator (14t)	BS C2/7	1	70%	98	Temporary Noise barrier	-5	
3c-2	Backfilling the trench - Compacting							
	Compactor, Vibratory	CNP 050	1	50%	105			102
3d	Reinstatement of original pavement							
	Concrete lorry mixer	BS D6/33	1	50%	96			97
	Poker vibratory	BS C4/34	1	50%	97			
	Generator, Super Silenced, 70 dB(A) at 7m	CNP 103	1	100%	95	Noise Enclosure	-10	
4	Activity 4 – Construction of Box-culvert							
4a	Excavation and installation of earth lateral support system							
4a-1	Excavation and installation of earth lateral support system - Sheet Piling							
	Tracked excavator fitted with hydraulic rock breaker	BS D8/13	1	50%	110			107
4a-2	Excavation and installation of earth lateral support system - Excavation							
	Tracked excavator (14t)	BS C2/7	1	70%	98	Temporary Noise barrier	-5	100
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105			
4a-3	Excavation and installation of earth lateral support system - Delivery of Precast Elements							
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105			100
4a-4	Excavation and installation of earth lateral support system - Generators and Pumps							
	Water Pump, Submersible (Electric)	CNP 283	1	50%	85			87
	Generator, Super Silenced, 70 dB(A) at 7m	CNP 103	1	100%	95	Noise Enclosure	-10	
4b	Erection of formwork, steel fixing and concreting							
4b-1	Erection of formwork							
	Hand Held Electric Circular Saw, 150mm Blade	BS D7/75	1	50%	105	Noise Enclosure	-10	92
	Water Pump, Submersible (Electric)	CNP 283	1	50%	85			
4b-2	Steel fixing							
	Bar Bender and Cutter (Electric)	CNP 021	1	80%	90	Noise Enclosure	-10	84
	Water Pump, Submersible (Electric)	CNP 283	1	50%	85			
4b-3	Concreting							
	Concrete lorry mixer	BS D6/33	1	50%	96			100
	Tracked mobile crane (132kW, 55t)	BS C3/29	1	70%	98			
	Poker vibratory	BS C4/34	1	50%	97			
	Water Pump, Submersible (Electric)	CNP 283	1	50%	85			
4c	Backfilling the trench							
4c-1	Backfilling the trench - Filling							
	Dump Truck	BS D9/39	1	30%	103			99
	Tracked excavator (14t)	BS C2/7	1	70%	98	Temporary Noise barrier	-5	
4c-2	Backfilling the trench - Compacting							
	Compactor, Vibratory	CNP 050	1	50%	105			102
4d	Reinstatement of original pavement							
	Concrete lorry mixer	BS D6/33	1	50%	96			97
	Poker vibratory	BS C4/34	1	50%	97			
	Generator, Super Silenced, 70 dB(A) at 7m	CNP 103	1	100%	95	Noise Enclosure	-10	

Appendix C.3

Drainage Improvement Works at Ngong Ping

Plant Inventory

Mitigated Scenario

ID	PME	CNP	No. of Item	% on time	SWL, dB(A)	Mitigation Measures	Attenuation	Total SWL, dB(A)
5	Activity 5 – Laying of Pipe by Pipe-jacking Method							
5a	Construction of jacking pits							
5a-1	Construction of jacking pits - Excavation							
	Tracked excavator fitted with hydraulic rock breaker	BS D8/13	1	70%	110	Temporary Noise barrier	-5	105
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105			
5a-2	Construction of jacking pits - Delivery of Precast Elements							
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105			100
5a-3	Construction of jacking pits - Generators and Pumps							
	Water Pump, Submersible (Electric)	CNP 283	1	50%	85			93
	Generator, Super Silenced, 70 dB(A) at 7m	CNP 103	1	100%	95	Noise Enclosure	-10	
	Air blower (electric)	CNP 006	1	50%	95			
5b	Pipe jacking							
	Tracked mobile crane (132kW, 55t)	BS C3/29	1	70%	98			102
	Winch (Electric)	CNP 262	1	50%	95			
	Grout mixer	CNP 105	1	80%	90			
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105			
	Pipe jacking machine*	No Noise Impact	1	--				
	Grout pump	CNP 106	1	--				
	Tunnel boring machine*	No Noise Impact	1	--				
5c	Construction of receiving pits							
5c-1	Construction of receiving pits - Excavation							
	Tracked excavator fitted with hydraulic rock breaker	BS D8/13	1	70%	110	Temporary Noise barrier	-5	105
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105			
5c-2	Construction of receiving pits - Delivery of Precast Elements							
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105			100
5c-3	Construction of receiving pits - Generators and Pumps							
	Water Pump, Submersible (Electric)	CNP 283	1	50%	85			93
	Generator, Super Silenced, 70 dB(A) at 7m	CNP 103	1	100%	95	Noise Enclosure	-10	
	Air blower (electric)	CNP 006	1	50%	95			
5d	Backfilling the pits							
5d-1	Backfilling the pits - Filling							
	Dump Truck	BS D9/39	1	30%	103			99
	Tracked excavator (14t)	BS C2/7	1	70%	98	Temporary Noise barrier	-5	
5d-2	Backfilling the pits - Compacting							
	Compactor, Vibratory	CNP 050	1	50%	105			102
6	Activity 6 – Construction of Manholes, Inlet and Outfall Structures							
6a	Excavation							
6a-1	Excavation - Rock Breaking							
	Tracked excavator fitted with hydraulic rock breaker	BS D8/13	1	70%	110	Temporary Noise barrier	-5	105
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105			
6a-2	Excavation - Spoil Delivery							
	Dump Truck	BS D9/39	1	30%	103			99
	Tracked excavator (14t)	BS C2/7	1	70%	98	Temporary Noise barrier	-5	
6a-3	Excavation - Generators and Pumps							
	Water Pump, Submersible (Electric)	CNP 283	1	50%	85			87
	Generator, Super Silenced, 70 dB(A) at 7m	CNP 103	1	100%	95	Noise Enclosure	-10	
6b	Erection of formwork, steel fixing and concreting							
6b-1	Erection of formwork							
	Hand Held Electric Circular Saw, 150mm Blade	BS D7/75	1	50%	105	Noise Enclosure	-10	92
	Water Pump, Submersible (Electric)	CNP 283	1	50%	85			
6b-2	Steel fixing							
	Bar Bender and Cutter (Electric)	CNP 021	1	80%	90	Noise Enclosure	-10	84
	Water Pump, Submersible (Electric)	CNP 283	1	50%	85			
6b-3	Concreting							
	Concrete lorry mixer	BS D6/33	1	50%	96			100
	Tracked mobile crane (132kW, 55t)	BS C3/29	1	70%	98			
	Poker vibratory	BS C4/34	1	50%	97			
	Water Pump, Submersible (Electric)	CNP 283	1	50%	85			
6c	Backfilling							
6c-1	Backfilling - Filling							
	Dump Truck	BS D9/39	1	30%	103			99
	Tracked excavator (14t)	BS C2/7	1	70%	98	Temporary Noise barrier	-5	
6c-2	Backfilling - Compacting							
	Compactor, Vibratory	CNP 050	1	50%	105			102
7	Activity 7 – Demolition of Site Office with associated road reinstatement work and landscaping works							
	Tracked excavator fitted with hydraulic rock breaker	BS D8/13	1	70%	110	Temporary Noise barrier	-5	106
	Dump Truck	BS D9/39	1	30%	103			
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105			

Appendix C.3

Drainage Improvement Works at Ngong Ping

Plant Inventory

Mitigated Scenario

Specific Plant Inventory for Construction Works at RP4 / Outfall B (Include Special Noise Barrier applicable to NSR 1)

ID	PME	CNP	No. of Item	% on time	SWL, dB(A)	Mitigation Measures	Attenuation	Total SWL, dB(A)
5	Activity 5 – Laying of Pipe by Pipe-jacking Method							
5c+	Construction of receiving pits							
5c-1	Construction of receiving pits - Excavation							
	Tracked excavator fitted with hydraulic rock breaker	BS D8/13	1	70%	110	Special Noise barrier	-10	99
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105	Special Noise barrier	-10	
5c-2	Construction of receiving pits - Delivery of Precast Elements							
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105	Special Noise barrier	-10	90
5c-3	Construction of receiving pits - Generators and Pumps							
	Water Pump, Submersible (Electric)	CNP 283	1	50%	85	Special Noise barrier	-10	87
	Generator, Super Silenced, 70 dB(A) at 7m	CNP 103	1	100%	95	Special Noise barrier	-10	
	Air blower (electric)	CNP 006	1	50%	95	Special Noise barrier	-10	
5d+	Backfilling the pits							
5d-1	Backfilling the pits - Filling							
	Dump Truck	BS D9/39	1	30%	103	Special Noise barrier	-10	89
	Excavator, mini-robot mounted	CNP 082	1	70%	94	Special Noise barrier	-10	
5d-2	Backfilling the pits - Compacting							
	Compactor, Vibratory	CNP 050	1	50%	105	Special Noise barrier	-10	92
6	Activity 6 – Construction of Manholes, Inlet and Outfall Structures							
6a+	Excavation							
6a-1	Excavation - Rock Breaking							
	Tracked excavator fitted with hydraulic rock breaker	BS D8/13	1	70%	110	Special Noise barrier	-10	99
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105	Special Noise barrier	-10	
6a-2	Excavation - Spoil Delivery							
	Dump Truck	BS D9/39	1	30%	103	Special Noise barrier	-10	89
	Excavator, mini-robot mounted	CNP 082	1	70%	94	Special Noise barrier	-10	
6a-3	Excavation - Generators and Pumps							
	Water Pump, Submersible (Electric)	CNP 283	1	50%	85	Special Noise barrier	-10	85
	Generator, Super Silenced, 70 dB(A) at 7m	CNP 103	1	100%	95	Special Noise barrier	-10	
6b+	Erection of formwork, steel fixing and concreting							
6b-1	Erection of formwork							
	Hand Held Electric Circular Saw, 150mm Blade	BS D7/75	1	50%	105	Special Noise barrier	-10	92
	Water Pump, Submersible (Electric)	CNP 283	1	50%	85	Special Noise barrier	-10	
6b-2	Steel fixing							
	Bar Bender and Cutter (Electric)	CNP 021	1	80%	90	Special Noise barrier	-10	80
	Water Pump, Submersible (Electric)	CNP 283	1	50%	85	Special Noise barrier	-10	
6b-3	Concreting							
	Concrete lorry mixer	BS D6/33	1	50%	96	Special Noise barrier	-10	90
	Tracked mobile crane (132kW, 55t)	BS C3/29	1	70%	98	Special Noise barrier	-10	
	Poker vibratory	BS C4/34	1	50%	97	Special Noise barrier	-10	
	Water Pump, Submersible (Electric)	CNP 283	1	50%	85	Special Noise barrier	-10	
6c+	Backfilling							
6c-1	Backfilling - Filling							
	Dump Truck	BS D9/39	1	30%	103	Special Noise barrier	-10	89
	Excavator, mini-robot mounted	CNP 082	1	70%	94	Special Noise barrier	-10	
6c-2	Backfilling - Compacting							
	Compactor, Vibratory	CNP 050	1	50%	105	Special Noise barrier	-10	92

Appendix C.3

Drainage Improvement Works at Ngong Ping

Plant Inventory

Mitigated Scenario

Specific Mitigation Measures for Construction Works at Section B for NSR 5

ID	PME	CNP	No. of Item	% on time	SWL, dB(A)	Mitigation Measures	Attenuation	Total SWL, dB(A)
4+	Activity 4+ – Construction of Box-culvert with additional Noise Barrier							
4a	Excavation and installation of earth lateral support system							
4a-1	Excavation and installation of earth lateral support system - Sheet Piling							
	Tracked excavator fitted with hydraulic rock breaker	BS D8/13	1	50%	110	Fixed Noise barrier	-5	102
4a-2	Excavation and installation of earth lateral support system - Excavation							
	Tracked excavator (14t)	BS C2/7	1	70%	98	Fixed Noise barrier	-5	100
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105			
4a-3	Excavation and installation of earth lateral support system - Delivery of Precast Elements							
	Lorry, 5.5 tonne < gross vehicle weight <= 38 tonne	CNP 145	1	30%	105			100
4a-4	Excavation and installation of earth lateral support system - Generators and Pumps							
	Water Pump, Submersible (Electric)	CNP 283	1	50%	85	Fixed Noise barrier	-5	86
	Generator, Super Silenced, 70 dB(A) at 7m	CNP 103	1	100%	95	Noise Enclosure	-10	
4b	Erection of formwork, steel fixing and concreting							
4b-1	Erection of formwork							
	Hand Held Electric Circular Saw, 150mm Blade	BS D7/75	1	50%	105	Noise Enclosure	-10	92
	Water Pump, Submersible (Electric)	CNP 283	1	50%	85	Fixed Noise barrier	-5	
4b-2	Steel fixing							
	Bar Bender and Cutter (Electric)	CNP 021	1	80%	90	Noise Enclosure	-10	81
	Water Pump, Submersible (Electric)	CNP 283	1	50%	85	Fixed Noise barrier	-5	
4b-3	Concreting							
	Concrete lorry mixer	BS D6/33	1	50%	96			96
	Tracked mobile crane (132kW, 55t)	BS C3/29	1	70%	98	Fixed Noise barrier	-5	
	Poker vibratory	BS C4/34	1	50%	97	Fixed Noise barrier	-5	
	Water Pump, Submersible (Electric)	CNP 283	1	50%	85	Fixed Noise barrier	-5	
4c	Backfilling the trench							
4c-1	Backfilling the trench - Filling							
	Dump Truck	BS D9/39	1	30%	103			99
	Tracked excavator (14t)	BS C2/7	1	70%	98	Fixed Noise barrier	-5	
4c-2	Backfilling the trench - Compacting							
	Compactor, Vibratory	CNP 050	1	50%	105	Fixed Noise barrier	-5	97
4d	Reinstatement of original pavement							
	Concrete lorry mixer	BS D6/33	1	50%	96			95
	Poker vibratory	BS C4/34	1	50%	97	Fixed Noise barrier	-5	
	Generator, Super Silenced, 70 dB(A) at 7m	CNP 103	1	100%	95	Noise Enclosure	-10	

Appendix C.4
Drainage Improvement Works at Ngong Ping
Construction Noise Assessment
Unmitigated Scenario

ID	Description	SWL, dB(A)	Source Location	Distance (m)	SPL, dB(A)	SPL, dB(A)
5a	Construction of jacking pits					
5a-1	Construction of jacking pits-Excavation	120	Additional JP/RP	20	88.9794	89
5a-2	Construction of jacking pits - Delivery of Precast Elements	100	Additional JP/RP	20	68.9794	69
5a-3	Construction of jacking pits - Generators and Pumps	101	Additional JP/RP	20	69.9794	70
5b	Pipe jacking	111	Additional JP/RP	20	79.9794	80
5c	Construction of receiving pits					
5c-1	Construction of receiving pits-Excavation	120	Additional JP/RP	20	88.9794	89
5c-2	Construction of receiving pits – Delivery of Precast Elements	100	Additional JP/RP	20	68.9794	69
5c-3	Construction of receiving pits – Generators and Pumps	101	Additional JP/RP	20	69.9794	70
5d	Backfilling the pits					
5d-1	Backfilling the pits-Filling	112	Additional JP/RP	20	80.9794	81
5d-2	Backfilling the pits-Compacting	102	Additional JP/RP	20	70.9794	71

Notes:

The theoretical Sound Pressure Level (SPL) at the source was calculated using below equation:

$$\text{SPL, dB(A)} = \text{SWL} - (20 * \log D + 8) + 3$$

where:

SPL = Sound Pressure Level, the averaged noise level measured at distance D

SWL = The SWLs of the PME have been taken from Appendix C4 of the EIA Report which also referred to Table 3 of the GW-TM

D = the distance from noise measurement point to the Source.

A +3 dB (A) façade correction is added to the predicted noise levels to account for the façade reflection effect at representative NSR

Appendix C.5
Drainage Improvement Works at Ngong Ping
Construction Noise Assessment
Mitigated Scenario

ID	Description	*SWL, dB(A)	Source Location	Distance (m)	SPL, dB(A)	SPL, dB(A)
5a	Construction of jacking pits					
5a-1	Construction of jacking pits-Excavation	99	Additional JP/RP	20	67.97940009	68
5a-2	Construction of jacking pits - Delivery of Precast Elements	90	Additional JP/RP	20	58.97940009	59
5a-3	Construction of jacking pits - Generators and Pumps	87	Additional JP/RP	20	55.97940009	56
5b	Pipe jacking					
5c	Construction of receiving pits					
5c-1	Construction of receiving pits-Excavation	99	Additional JP/RP	20	67.97940009	68
5c-2	Construction of receiving pits – Delivery of Precast Elements	90	Additional JP/RP	20	58.97940009	59
5c-3	Construction of receiving pits – Generators and Pumps	87	Additional JP/RP	20	55.97940009	56
5d	Backfilling the pits					
5d-1	Backfilling the pits-Filling	89	Additional JP/RP	20	57.97940009	58
5d-2	Backfilling the pits-Compacting	92	Additional JP/RP	20	60.97940009	61

Notes:

The theoretical Sound Pressure Level (SPL) at the source was calculated using below equation:

$$SPL, dB(A) = SWL - (20 * \log D + 8) + 3$$

where:

SPL = Sound Pressure Level, the averaged noise level measured at distance D

*SWL = The SWLs of the PME have been taken from Appendix C6 of the EIA Report

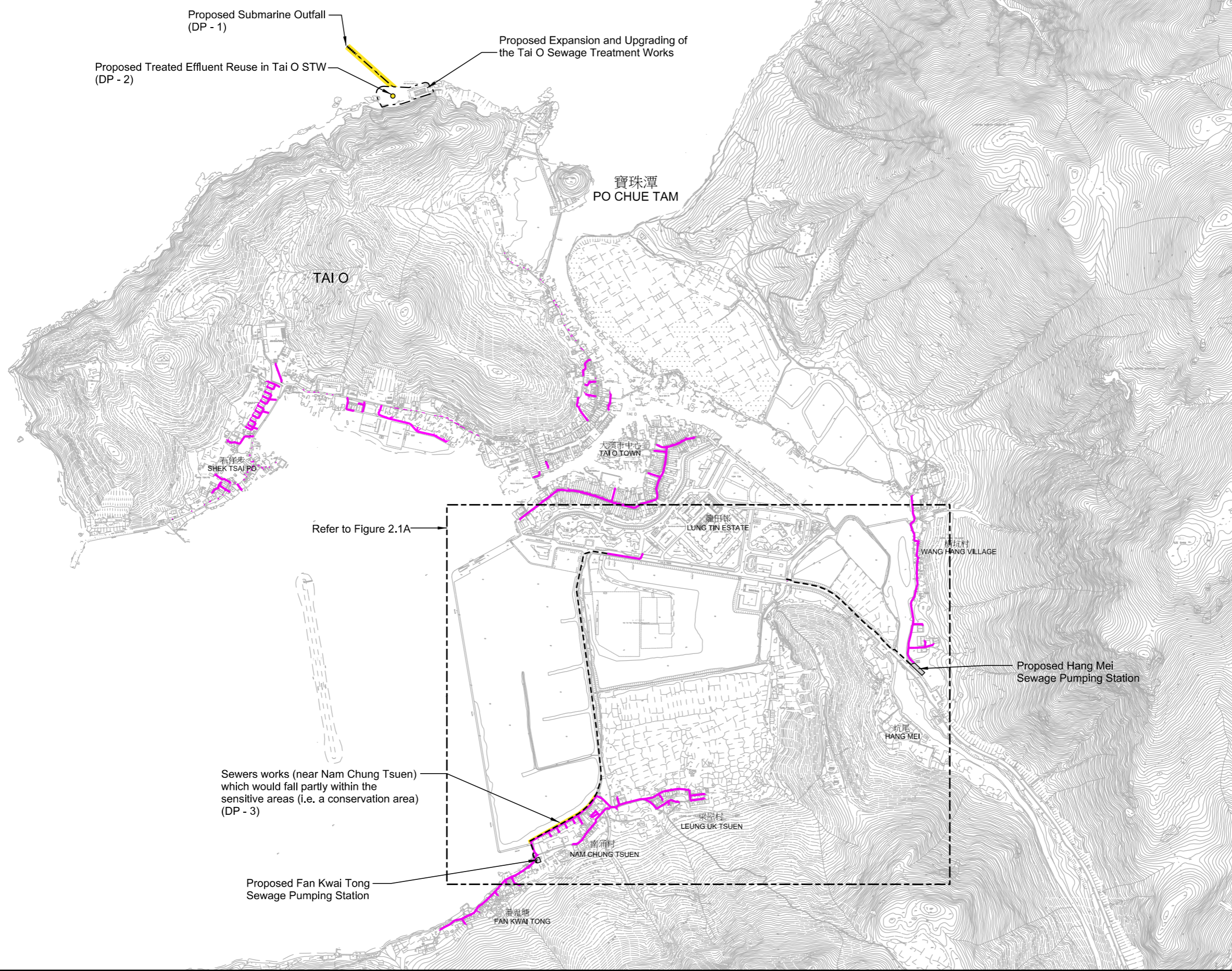
D = the distance from noise measurement point to the Source.

A +3 dB (A) façade correction is added to the predicted noise levels to account for the façade reflection effect at representative NSR

Appendix D

Supplementary Information
from AEIAR-209/2017

- D.1 Proposed Works in Tai O**
- D.2 List of Air Sensitive Receivers**
- D.3 Location of ASR Tai O Fire Station**
- D.4 Predicted TSP, RSP and FSP Concentrations under Unmitigated Scenario**
- D.5 Predicted TSP, RSP and FSP Concentrations under Mitigated Scenario**
- D.6 Construction Plant Inventory Mitigated Scenario**



- LEGEND :**
- Proposed Sewer
 - - - - - Proposed Rising Main
 - Designated Projects Components
 - DP - 1: Proposed submarine outfall;
 - DP - 2: Proposed Treated Effluent Reuse in Tai O STW;
 - DP - 3: Proposed sewers works near Nam Chung Tsuen

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3.3.5 Odour patrol was conducted in areas near the Tai O STW, proposed Hang Mei SPS and proposed Fan Kwai Tong SPS to review the existing background odour intensity of ambient air in the vicinity of the three locations in August 2012. As there has been no major change of land uses in the vicinity of these sites since the odour patrol was conducted, the background odour conditions are expected to be unchanged.

3.3.6 Based on the odour patrol survey results, sewage type odour was detected in areas close to the Tai O STW. No sewage type odour was detected in the other two surveyed locations near the proposed SPS's locations. Details of the odour survey methodology, locations and survey results are provided in **Appendix 3.1**.

3.4 Air Sensitive Receivers

3.4.1 The assessment area for air quality impact is defined by a distance of 500 meters from the boundary of the Project site. Within the assessment area, representative Air Sensitive Receivers (ASRs) have been identified, in accordance with the Annex 12 of the TM-EIAO. Domestic premises, hotel, hostel, hospital, clinic, nursery, temporary housing accommodation, school, educational institution, office, factory, shop, shopping centre, home for the aged and recreational activity areas are classified as ASRs.

3.4.2 The ASRs in the vicinity of the proposed works site were identified for the assessment and the locations of these ASRs and their nearest horizontal separation from the proposed works are listed in **Table 3.3**. **Figure 3.1** to **Figure 3.14** show the locations of the ASRs.

Table 3.3: Representative Air Sensitive Receivers

ASR ID	Description of ASR	Nature of Use	Horizontal Distance to Nearest Works Area (m)	Nearest Works	Figure No.
SST*	CZSA Drug Treatment and Rehabilitation Centre for Male Drug Abusers**	Rehab Centre	1	Sewers works	3.1
RA*	Resting Area at Kau San Tei	Recreational activity areas	71	Sewers works	3.1
HST	Hung Shing Temple	Temple	19	Sewers works	3.3
SWCC	Hong Kong Shaolin Wushu Culture Centre	Recreational activity areas	6	Sewers works	3.3
STP3	No.6 Shek Tsai Po Street	Residential	1	Sewers works	3.3
STP2	No.16 Shek Tsai Po Street	Residential	1	Sewers works	3.3
STA1	No. 92 Shek Tsai Po Street	Residential	1	Sewers works	3.4
STA2	Tai O Alliance Church, Shek Tsai Po Street Section A	Church	1	Sewers works	3.3
STP4	No.88 Shek Tsai Po Street	Residential	1	Sewers works	3.4
STP5	No.21 Shek Tsai Po Street	Residential	1	Sewers works	3.4
STP6	No. 106 Shek Tsai Po Street	Residential	6	Sewers works	3.5
STP7	No. 100B Shek Tsai Po Street	Residential	7	Sewers works	3.3
STP	No. 63 Shek Tsai Po Street	Residential	1	Sewers works	3.4
STP1	No.391A Shek Tsai Po Street	Residential	1	Sewers works	3.5
PCT1*	No. 104 Po Chue Tam	Residential	135	Sewers works	3.2
PCT2*	No. 95 Po Chue Tam	Residential	8	Sewers works	3.2
TOJCC	Tai O Jockey Club Clinic	Clinic	9	Sewers works	3.5
TOTH	Tai O Town Hall	Recreational activity areas	2	Sewers works	3.5
KHB1	No. 81 Kat Hing Back Street	Residential	2	Sewers works	3.6
KHB2	No.33 Kat Hing Back Street	Residential	2	Sewers works	3.6
KHB3	No.69 Kat Hing Back Street	Residential	2	Sewers works	3.6
TOM	No.4 Tai O Market Street	Residential	1	Sewers works	3.6
TOWO1	No.10 Tai O Wing On Street	Residential	1	Sewers works	3.7
TWO2	No.25 Tai O Wing On Street	Residential	1	Sewers works	3.7



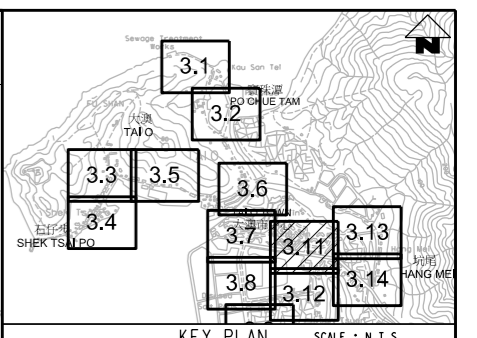
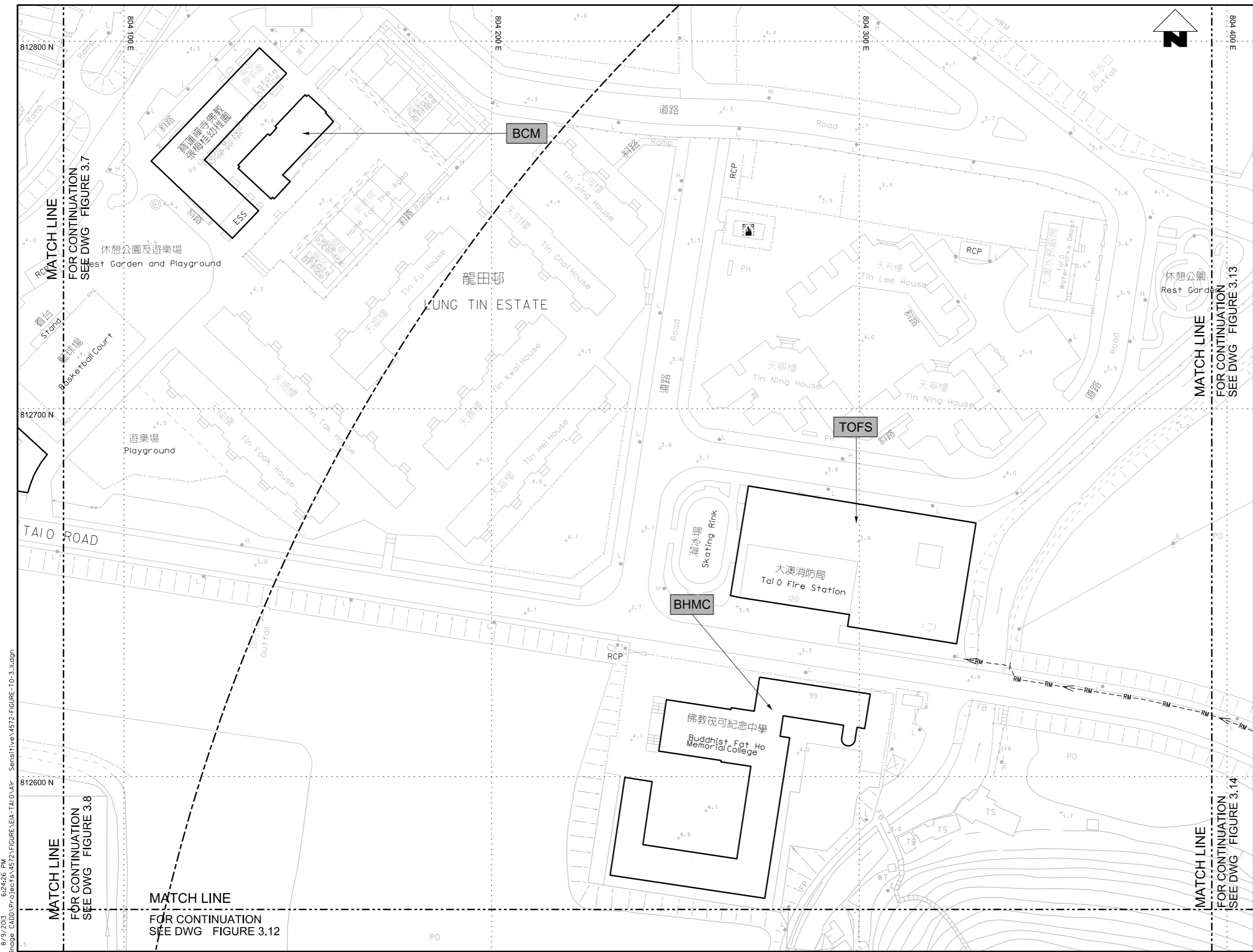
ASR ID	Description of ASR	Nature of Use	Horizontal Distance to Nearest Works Area (m)	Nearest Works	Figure No.
TOWO2	No.52 Tai O Wing On Street	Residential	1	Sewers works	3.7
TWO3	Christian and Missionary Alliance Tai O Kindergarten	Educational	1	Sewers works	3.7
TOWO3	No.100 Tai O Wing On Street	Residential	1	Sewers works	3.7
TOTP4	Wing Chor School	School	6	Sewers works	3.7
TTP2	No. 135 Tai O Tai Ping Street	Residential	1	Sewers works	3.7
TOT3	No.150 Tai O Tai Ping Street	Residential	1	Sewers works	3.6
TTP1	No.178 Tai O Tai Ping Street	Residential	1	Sewers works	3.6
TOT1	No.190 Tai O Tai Ping Street	Residential	2	Sewers works	3.6
BCM	Buddhist Cheung Mui Kwai Kindergarten	School	49	Sewers works	3.11
LHC	Lun Hin House, Lung Hin Court	Residential	14	Sewers works	3.7
KHH	Kam Him House	Residential	17	Sewers works	3.7
RG	Rest Garden, Tai O Road	Recreational activity areas	1	Sewers works	3.7
YTP*	Yim Tin Playground	Recreational activity areas	76	Sewers works	3.8
BHMC*	Buddhist Fat Ho Memorial College	School	32	Sewers works	3.11
TOFS*	Tai O Fire Station	GIC	17	Sewers works	3.11
WHV3*	No.1 Wang Hang Village	Residential	1	Sewers works	3.13
WHV2*	No. 4 Wang Hang Village	Residential	1	Sewers works	3.13
WHV1*	Wah Kwong Temple (Wang Hang Village)	Temple	1	Sewers works	3.13
WHV5*	No.14 Wang Hang Village	Residential	9	Sewers works	3.14
WHV4*	No.21 Wang Hang Village	Residential	1	Sewers works	3.14
WHV4a*	No.22 Wang Hang Village	Residential	1	Sewers works	3.14
WHV6*	No.18 Wang Hang Village	Residential	1	Sewers works	3.14
WHV7*	No. 25 Wang Hang Village	Residential	7	Sewers works	3.14
LUT4*	No.18 Leung UK Tsuen	Residential	1	Sewers works	3.9
LUT2*	No.21A Leung UK Tsuen	Residential	3	Sewers works	3.9
LUT1*	No.53 Leung UK Tsuen	Residential	1	Sewers works	3.9
LUT3*	No.52 Leung UK Tsuen	Residential	1	Sewers works	3.9
LUPG*	Leung Uk Playground	Recreational activity areas	1	Sewers works	3.9
NCT1*	No. 6 Nam Chung Tsuen	Residential	3	Sewers works	3.10
NCT3*	No. 7C Nam Chung Tsuen	Residential	1	Sewers works	3.10
NCT2*	No. 7I Nam Chung Tsuen	Residential	2	Sewers works	3.10
NCT5*	No. 9 Nam Chung Tsuen	Residential	15	Fan Kwai Tong SPS	3.10
PT2*[1]	Nam Chung Village Aqua Privy	GIC	1	Sewers works	3.10
NCT6*	No.10 Nam Chung Tsuen	Residential	8	Sewers works	3.10
NCT4*	No. 24 Nam Chung Tsuen	Residential	8	Sewers works	3.10
NTST1*	No.4 Nam Tong Sun Tsuen	Residential	1	Sewers works	3.10
GIC1*	Tin Hau Temple	Temple	258	Hang Mei SPS	3.12
GIC2*	Yeung Hau Temple	Temple	200	Sewers works	3.2
GIC3*	Open Area near public toilet of Kat Hing Back Street	GIC	20	Sewers works	3.2

Notes:

* ASR located within the 500m radius of the boundary of the Tai O STW, Hang Mei SPS and Fan Kwai Tong SPS

** The site is also known as “St. Stephen’s Tai O Family”.

[1] The existing land-use of the location is Aqua Privy. According the Tai O Outline Zoning Plan (No. S/I-TOF/1), this site is zoned as Government / Institution and Community (G/IC) use which may be used for potential air sensitive use. This is considered planned ASR.



- LEGEND AND ABBREVIATION:
- Proposed Sewer
 - Proposed Manhole
 - Proposed Rising Main
 - Proposed Tapping Pipe (subject to consultation with owners of houses with topographical problem)
 - Proposed Sewage Pumping Station
 - Label for Air Sensitive Receiver
 - 500m Radius Boundary of Tai O STW, Hang Mei SPS and Fan Kwai Tong SPS



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Agreement No. CE 15/2010 (DS)
 Upgrading of Cheung Chau and Tai O Sewerage Collection, Treatment and Disposal Facilities - Design and Construction
Outlying Islands Sewerage Stage 2 -
 Upgrading of Tai O Sewerage Collection, Treatment and Disposal Facilities

Title :	AIR SENSITIVE RECEIVERS (Sheet 11 of 14)		
Date :	MAY 2015	Figure :	3.11



Table 3.4 : Predicted TSP, RSP and FSP Concentrations under Unmitigated Scenario

ASR	Maximum 1-hour Averaged TSP, $\mu\text{g}/\text{m}^3$		Maximum Daily Averaged RSP, $\mu\text{g}/\text{m}^3$ ^[1]		Maximum Daily Averaged FSP, $\mu\text{g}/\text{m}^3$ ^[1]		10 th Maximum Daily Averaged RSP, $\mu\text{g}/\text{m}^3$		10 th Maximum Daily Averaged FSP, $\mu\text{g}/\text{m}^3$		Annual Averaged RSP, $\mu\text{g}/\text{m}^3$		Annual Averaged FSP, $\mu\text{g}/\text{m}^3$	
	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m
SST*	159.5	158.9	121.7 (1)	121.6 (1)	91.0 (1)	90.9 (1)	79.70	79.64	59.74	59.73	39.88	39.79	29.74	29.72
RA*	233.8	222.2	121.6 (1)	121.5 (1)	90.4 (1)	90.3 (1)	79.19	79.17	58.95	58.94	39.55	39.54	29.58	29.57
HST	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.70	79.70	59.74	59.74	39.67	39.67	29.69	29.69
SWCC	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.69	79.69	59.74	59.74	39.66	39.66	29.69	29.69
STP3	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.68	79.68	59.74	59.74	39.64	39.64	29.68	29.68
STP2	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.67	79.67	59.73	59.73	39.63	39.63	29.68	29.68
STA1	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.66	79.66	59.73	59.73	39.62	39.62	29.68	29.68
STA2	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.68	79.68	59.74	59.74	39.64	39.64	29.68	29.68
STP4	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.70	79.69	59.74	59.74	39.62	39.62	29.68	29.68
STP5	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.66	79.66	59.73	59.73	39.61	39.61	29.68	29.67
STP6*	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.86	79.86	59.78	59.78	39.61	39.61	29.68	29.67
STP7*	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.72	79.72	59.75	59.74	39.66	39.66	29.69	29.69
STP	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.66	79.66	59.73	59.73	39.61	39.60	29.67	29.67
STP1	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.87	79.86	59.78	59.78	39.64	39.63	29.68	29.68
PCT1*	158.3	152.8	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	80.67	80.59	59.97	59.95	39.77	39.75	29.71	29.71
PCT2*	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.97	79.96	59.81	59.80	39.66	39.66	29.69	29.69
TOJCC	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.90	79.89	59.79	59.78	39.66	39.66	29.69	29.69
TOTH	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.83	79.83	59.77	59.77	39.63	39.62	29.68	29.68
KHB1	156.2	156.2	120.1 (1)	120.1 (1)	90.0 (1)	90.0 (1)	78.53	78.52	58.79	58.79	39.46	39.46	29.56	29.56
KHB2	156.2	156.2	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.51	78.51	58.79	58.79	39.46	39.46	29.56	29.55
KHB3	156.2	156.2	120.1 (1)	120.1 (1)	90.0 (1)	90.0 (1)	78.53	78.53	58.79	58.79	39.46	39.46	29.56	29.56
TOM	156.2	156.2	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.64	78.62	58.81	58.80	39.46	39.46	29.55	29.55
TOWO1	156.2	156.2	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.44	78.44	58.78	58.77	39.45	39.45	29.55	29.55
TWO2	156.2	156.2	120.1 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.64	78.62	58.81	58.80	39.46	39.46	29.56	29.55
TOWO2	156.2	156.2	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.54	78.53	58.79	58.79	39.47	39.47	29.56	29.56
TWO3	156.2	156.2	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.49	78.49	58.78	58.78	39.51	39.50	29.56	29.56
TOWO3	156.2	156.2	120.3 (1)	120.2 (1)	90.1 (1)	90.0 (1)	78.66	78.64	58.81	58.80	39.53	39.52	29.57	29.56



ASR	Maximum 1-hour Averaged TSP, $\mu\text{g}/\text{m}^3$		Maximum Daily Averaged RSP, $\mu\text{g}/\text{m}^3$ ^[1]		Maximum Daily Averaged FSP, $\mu\text{g}/\text{m}^3$ ^[1]		10 th Maximum Daily Averaged RSP, $\mu\text{g}/\text{m}^3$		10 th Maximum Daily Averaged FSP, $\mu\text{g}/\text{m}^3$		Annual Averaged RSP, $\mu\text{g}/\text{m}^3$		Annual Averaged FSP, $\mu\text{g}/\text{m}^3$	
	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m
TOTP4	156.2	156.2	120.1 (1)	120.1 (1)	90.0 (1)	90.0 (1)	78.56	78.55	58.79	58.79	39.52	39.51	29.57	29.56
TTP2	156.2	156.2	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.41	78.41	58.77	58.77	39.50	39.49	29.56	29.56
TOTP3	156.2	156.2	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.40	78.40	58.77	58.77	39.48	39.48	29.56	29.56
TTP1	156.2	156.2	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.39	78.39	58.76	58.76	39.47	39.47	29.56	29.56
TOTP1	156.2	156.2	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.38	78.38	58.76	58.76	39.47	39.46	29.56	29.56
BCM	156.3	156.3	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.40	78.40	58.77	58.77	39.52	39.51	29.57	29.56
LHC	156.2	156.2	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.80	78.71	58.83	58.82	39.53	39.51	29.57	29.57
KHH	156.2	156.2	120.3 (1)	120.1 (1)	90.1 (1)	90.0 (1)	78.79	78.73	58.83	58.82	39.63	39.59	29.59	29.58
RG	156.3	156.3	120.2 (1)	120.1 (1)	90.1 (1)	90.0 (1)	78.63	78.59	58.80	58.80	39.68	39.62	29.60	29.58
YTP*	171.1	154.2	116.1 (1)	116.1 (1)	87.1 (1)	87.1 (1)	77.29	76.86	57.70	57.58	38.75	38.59	28.85	28.82
BHMC*	156.4	156.4	120.4 (1)	120.3 (1)	90.1 (1)	90.1 (1)	78.40	78.37	58.77	58.76	39.48	39.46	29.56	29.55
TOFS*	156.4	156.4	120.2 (1)	120.2 (1)	90.0 (1)	90.0 (1)	78.42	78.37	58.77	58.76	39.50	39.45	29.56	29.55
WHV3*	156.2	156.2	120.8 (1)	120.1 (1)	90.2 (1)	90.0 (1)	78.57	78.34	58.81	58.75	39.58	39.45	29.58	29.55
WHV2*	156.2	156.2	120.3 (1)	120.1 (1)	90.1 (1)	90.0 (1)	78.72	78.39	58.84	58.76	39.61	39.46	29.59	29.56
WHV1*	156.2	156.2	120.2 (1)	120.1 (1)	90.0 (1)	90.0 (1)	78.88	78.43	58.87	58.77	39.64	39.46	29.60	29.56
WHV5*	156.8	156.1	116.9 (1)	116.3 (1)	87.3 (1)	87.1 (1)	77.01	76.86	57.61	57.57	38.59	38.46	28.83	28.80
WHV4*	171.3	158.2	116.6 (1)	116.3 (1)	87.2 (1)	87.1 (1)	76.88	76.86	57.58	57.57	38.84	38.49	28.89	28.80
WHV4a*	171.4	157.4	116.6 (1)	116.3 (1)	87.2 (1)	87.1 (1)	76.87	76.86	57.57	57.57	38.78	38.49	28.87	28.81
WHV6*	175.0	155.5	116.6 (1)	116.2 (1)	87.2 (1)	87.1 (1)	77.11	76.85	57.63	57.57	38.94	38.49	28.91	28.80
WHV7*	153.9	153.8	116.2 (1)	116.2 (1)	87.1 (1)	87.1 (1)	76.91	76.86	57.59	57.57	38.81	38.52	28.88	28.81
LUT4*	153.8	153.8	116.8 (1)	116.3 (1)	87.3 (1)	87.1 (1)	77.03	76.94	57.61	57.59	38.56	38.44	28.82	28.79
LUT2*	153.8	153.8	116.7 (1)	116.3 (1)	87.2 (1)	87.1 (1)	76.96	76.90	57.60	57.58	38.67	38.44	28.85	28.79
LUT1*	154.1	153.8	116.6 (1)	116.3 (1)	87.2 (1)	87.1 (1)	76.83	76.82	57.56	57.56	38.65	38.46	28.84	28.80
LUT3*	154.1	153.8	116.7 (1)	116.3 (1)	87.2 (1)	87.1 (1)	76.82	76.81	57.56	57.56	38.66	38.46	28.84	28.80
LUPG*	153.9	153.8	116.3 (1)	116.3 (1)	87.1 (1)	87.1 (1)	77.04	76.81	57.62	57.56	38.62	38.47	28.83	28.80
NCT1*	153.8	153.8	116.7 (1)	116.3 (1)	87.2 (1)	87.1 (1)	77.14	76.82	57.64	57.56	38.64	38.47	28.84	28.80
NCT3*	153.8	153.8	116.9 (1)	116.4 (1)	87.3 (1)	87.2 (1)	76.98	76.86	57.61	57.58	38.62	38.48	28.84	28.80



ASR	Maximum 1-hour Averaged TSP, $\mu\text{g}/\text{m}^3$		Maximum Daily Averaged RSP, $\mu\text{g}/\text{m}^3$ ^[1]		Maximum Daily Averaged FSP, $\mu\text{g}/\text{m}^3$ ^[1]		10 th Maximum Daily Averaged RSP, $\mu\text{g}/\text{m}^3$		10 th Maximum Daily Averaged FSP, $\mu\text{g}/\text{m}^3$		Annual Averaged RSP, $\mu\text{g}/\text{m}^3$		Annual Averaged FSP, $\mu\text{g}/\text{m}^3$	
	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m
NCT2*	159.0	154.6	116.5 (1)	116.2 (1)	87.2 (1)	87.1 (1)	77.00	76.81	57.61	57.56	38.79	38.51	28.87	28.81
NCT5*	158.3	153.8	117.7 (1)	116.3 (1)	87.5 (1)	87.1 (1)	76.99	76.90	57.61	57.59	38.66	38.48	28.84	28.80
PT2 ⁽¹⁾	156.0	153.8	116.2 (1)	116.2 (1)	87.1 (1)	87.1 (1)	76.83	76.80	57.57	57.56	38.85	38.46	28.89	28.80
NCT6*	153.8	153.8	116.7 (1)	116.2 (1)	87.2 (1)	87.1 (1)	78.14	76.88	57.87	57.58	38.93	38.46	28.91	28.80
NCT4*	148.0	148.0	117.1 (1)	117.0 (1)	87.8 (1)	87.7 (1)	77.43	77.17	57.79	57.69	38.56	38.44	28.80	28.77
NTST1*	148.7	148.0	117.6 (1)	117.0 (1)	87.9 (1)	87.7 (1)	77.08	77.00	57.70	57.69	38.56	38.40	28.80	28.76
GIC1*	153.8	153.8	116.3 (1)	116.3 (1)	87.1 (1)	87.1 (1)	76.97	76.96	57.60	57.60	38.44	38.43	28.79	28.79
GIC2*	156.2	156.2	120.2 (1)	120.2 (1)	90.1 (1)	90.1 (1)	78.40	78.39	58.76	58.76	39.51	39.51	29.57	29.57
GIC3*	156.2	156.2	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.58	78.58	58.81	58.80	39.49	39.49	29.56	29.56
<i>Maximum Concentration in AQOs^[2]</i>	<i>500^[4]</i>		<i>100 (9)</i>		<i>75 (9)</i>		<i>100 (9)</i>		<i>75 (9)</i>		<i>50</i>		<i>35</i>	

Notes:

- [1] Values in () mean the number of exceedances against the AQOs.
- [2] Values in () mean the number of exceedances allowed.
- [3] The existing land-use of the location is Aqua Privy. According the Tai O Outline Zoning Plan (No. S/I-TOF/1), this site is zoned as Government / Institution and Community (G/IC) use which may be used for potential air sensitive use. This is considered planned ASR.
- [4] Not an AQO but is a criteria for evaluating air quality impacts as stated in Annex 4 of TM-EIAO.
- * ASR located within the 500m radius of the boundary of the Tai O STW, Hang Mei SPS and Fan Kwai Tong SPS.
- All the results presented in the table have included background concentration.
- Bold figure indicates exceedance of the concentration limit of relevant AQO.



Table 3.6 : Predicted TSP, RSP and FSP Concentrations under Mitigated Scenario

ASR	Maximum 1-hour Averaged TSP, $\mu\text{g}/\text{m}^3$		Maximum Daily Averaged RSP, $\mu\text{g}/\text{m}^3$ ^[1]		Maximum Daily Averaged FSP, $\mu\text{g}/\text{m}^3$ ^[1]		10 th Maximum Daily Averaged RSP, $\mu\text{g}/\text{m}^3$		10 th Maximum Daily Averaged FSP, $\mu\text{g}/\text{m}^3$		Annual Averaged RSP, $\mu\text{g}/\text{m}^3$		Annual Averaged FSP, $\mu\text{g}/\text{m}^3$	
	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m
SST*	147.9	147.9	121.5 (1)	121.4 (1)	90.9 (1)	90.9 (1)	79.67	79.64	59.74	59.73	39.75	39.70	29.71	29.70
RA*	156.2	156.2	121.0 (1)	120.9 (1)	90.2 (1)	90.2 (1)	78.85	78.84	58.88	58.87	39.49	39.48	29.56	29.56
HST	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.68	79.68	59.74	59.74	39.63	39.62	29.68	29.68
SWCC	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.68	79.68	59.74	59.74	39.62	39.62	29.68	29.68
STP3	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.67	79.67	59.73	59.73	39.61	39.61	29.68	29.68
STP2	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.66	79.66	59.73	59.73	39.60	39.60	29.67	29.67
STA1	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.66	79.66	59.73	59.73	39.59	39.59	29.67	29.67
STA2	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.67	79.67	59.73	59.73	39.61	39.60	29.68	29.67
STP4	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.67	79.67	59.74	59.74	39.59	39.59	29.67	29.67
STP5	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.66	79.66	59.73	59.73	39.59	39.59	29.67	29.67
STP6*	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.77	79.77	59.76	59.76	39.59	39.59	29.67	29.67
STP7*	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.69	79.69	59.74	59.74	39.62	39.62	29.68	29.68
STP	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.65	79.65	59.73	59.73	39.59	39.58	29.67	29.67
STP1	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.78	79.77	59.76	59.76	39.60	39.60	29.67	29.67
PCT1*	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	80.30	80.25	59.89	59.88	39.69	39.68	29.69	29.69
PCT2*	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.86	79.85	59.78	59.78	39.62	39.62	29.68	29.68
TOJCC	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.79	79.79	59.76	59.76	39.62	39.62	29.68	29.68
TOTH	147.9	147.9	121.1 (1)	121.1 (1)	90.8 (1)	90.8 (1)	79.76	79.75	59.76	59.76	39.60	39.60	29.67	29.67
KHB1	156.2	156.2	120.1 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.45	78.45	58.77	58.77	39.43	39.43	29.55	29.55
KHB2	156.2	156.2	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.44	78.44	58.77	58.77	39.44	39.43	29.55	29.55
KHB3	156.2	156.2	120.1 (1)	120.1 (1)	90.0 (1)	90.0 (1)	78.45	78.45	58.78	58.77	39.44	39.43	29.55	29.55
TOM	156.2	156.2	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.51	78.50	58.79	58.78	39.43	39.43	29.55	29.55
TOWO1	156.2	156.2	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.40	78.40	58.77	58.77	39.43	39.43	29.55	29.55
TWO2	156.2	156.2	120.1 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.51	78.50	58.78	58.78	39.44	39.43	29.55	29.55
TOWO2	156.2	156.2	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.45	78.45	58.78	58.77	39.45	39.44	29.55	29.55
TWO3	156.2	156.2	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.43	78.42	58.77	58.77	39.47	39.46	29.56	29.56
TOWO3	156.2	156.2	120.3 (1)	120.2 (1)	90.1 (1)	90.0 (1)	78.52	78.51	58.79	58.78	39.48	39.47	29.56	29.56



ASR	Maximum 1-hour Averaged TSP, $\mu\text{g}/\text{m}^3$		Maximum Daily Averaged RSP, $\mu\text{g}/\text{m}^3$ ^[1]		Maximum Daily Averaged FSP, $\mu\text{g}/\text{m}^3$ ^[1]		10 th Maximum Daily Averaged RSP, $\mu\text{g}/\text{m}^3$		10 th Maximum Daily Averaged FSP, $\mu\text{g}/\text{m}^3$		Annual Averaged RSP, $\mu\text{g}/\text{m}^3$		Annual Averaged FSP, $\mu\text{g}/\text{m}^3$	
	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m
TOTP4	156.2	156.2	120.1 (1)	120.1 (1)	90.0 (1)	90.0 (1)	78.47	78.46	58.78	58.78	39.47	39.47	29.56	29.56
TTP2	156.2	156.2	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.38	78.38	58.76	58.76	39.46	39.46	29.56	29.55
TOTP3	156.2	156.2	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.38	78.37	58.76	58.76	39.45	39.45	29.55	29.55
TTP1	156.2	156.2	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.37	78.37	58.76	58.76	39.44	39.44	29.55	29.55
TOTP1	156.2	156.2	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.36	78.36	58.76	58.76	39.44	39.44	29.55	29.55
BCM	156.2	156.2	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.38	78.38	58.76	58.76	39.48	39.47	29.56	29.56
LHC	156.2	156.2	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.60	78.55	58.80	58.79	39.49	39.47	29.56	29.56
KHH	156.2	156.2	120.3 (1)	120.1 (1)	90.1 (1)	90.0 (1)	78.59	78.56	58.80	58.79	39.55	39.52	29.58	29.57
RG	156.2	156.2	120.2 (1)	120.1 (1)	90.1 (1)	90.0 (1)	78.51	78.48	58.78	58.78	39.58	39.54	29.58	29.57
YTP*	153.9	153.9	116.1 (1)	116.1 (1)	87.1 (1)	87.1 (1)	77.26	76.83	57.70	57.57	38.63	38.52	28.83	28.81
BHMC*	156.2	156.2	120.2 (1)	120.2 (1)	90.0 (1)	90.0 (1)	78.38	78.36	58.76	58.76	39.45	39.43	29.55	29.55
TOFS*	156.2	156.2	120.1 (1)	120.1 (1)	90.0 (1)	90.0 (1)	78.40	78.36	58.77	58.76	39.46	39.42	29.56	29.55
WHV3*	156.2	156.2	120.5 (1)	120.1 (1)	90.1 (1)	90.0 (1)	78.48	78.34	58.79	58.75	39.51	39.43	29.57	29.55
WHV2*	156.2	156.2	120.2 (1)	120.1 (1)	90.0 (1)	90.0 (1)	78.56	78.36	58.81	58.76	39.52	39.43	29.57	29.55
WHV1*	156.2	156.2	120.1 (1)	120.1 (1)	90.0 (1)	90.0 (1)	78.66	78.39	58.83	58.76	39.54	39.43	29.58	29.55
WHV5*	154.3	154.2	116.6 (1)	116.2 (1)	87.2 (1)	87.1 (1)	76.90	76.81	57.59	57.56	38.51	38.43	28.81	28.79
WHV4*	156.8	154.5	116.4 (1)	116.2 (1)	87.2 (1)	87.1 (1)	76.82	76.81	57.56	57.56	38.67	38.45	28.85	28.80
WHV4a*	156.8	154.4	116.4 (1)	116.2 (1)	87.2 (1)	87.1 (1)	76.81	76.80	57.56	57.56	38.63	38.45	28.84	28.80
WHV6*	157.4	154.1	116.4 (1)	116.2 (1)	87.2 (1)	87.1 (1)	76.96	76.80	57.60	57.56	38.73	38.44	28.87	28.79
WHV7*	153.8	153.8	116.2 (1)	116.2 (1)	87.1 (1)	87.1 (1)	76.85	76.81	57.57	57.56	38.66	38.46	28.85	28.80
LUT4*	153.8	153.8	116.6 (1)	116.2 (1)	87.2 (1)	87.1 (1)	76.94	76.87	57.60	57.58	38.49	38.41	28.81	28.79
LUT2*	153.8	153.8	116.5 (1)	116.2 (1)	87.2 (1)	87.1 (1)	76.90	76.85	57.59	57.57	38.56	38.41	28.82	28.79
LUT1*	153.8	153.8	116.4 (1)	116.2 (1)	87.2 (1)	87.1 (1)	76.79	76.78	57.55	57.55	38.54	38.43	28.82	28.79
LUT3*	153.9	153.8	116.5 (1)	116.2 (1)	87.2 (1)	87.1 (1)	76.78	76.78	57.55	57.55	38.55	38.43	28.82	28.79
LUPG*	153.8	153.8	116.3 (1)	116.2 (1)	87.1 (1)	87.1 (1)	76.94	76.79	57.60	57.56	38.53	38.44	28.82	28.79
NCT1*	153.8	153.8	116.5 (1)	116.3 (1)	87.2 (1)	87.1 (1)	76.99	76.79	57.61	57.56	38.54	38.43	28.82	28.79
NCT3*	153.8	153.8	116.6 (1)	116.3 (1)	87.2 (1)	87.1 (1)	76.92	76.84	57.60	57.57	38.53	38.44	28.82	28.79



ASR	Maximum 1-hour Averaged TSP, µg/m ³		Maximum Daily Averaged RSP, µg/m ³ ^[1]		Maximum Daily Averaged FSP, µg/m ³ ^[1]		10 th Maximum Daily Averaged RSP, µg/m ³		10 th Maximum Daily Averaged FSP, µg/m ³		Annual Averaged RSP, µg/m ³		Annual Averaged FSP, µg/m ³	
	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m	1.5m	5m
NCT2*	154.7	153.9	116.4 (1)	116.2 (1)	87.2 (1)	87.1 (1)	76.92	76.79	57.59	57.56	38.63	38.46	28.84	28.80
NCT5*	153.8	153.8	117.1 (1)	116.3 (1)	87.3 (1)	87.1 (1)	76.92	76.86	57.60	57.58	38.55	38.44	28.82	28.80
PT2* ^[1]	153.8	153.8	116.2 (1)	116.2 (1)	87.1 (1)	87.1 (1)	76.81	76.79	57.57	57.56	38.67	38.43	28.85	28.79
NCT6*	153.8	153.8	116.5 (1)	116.2 (1)	87.2 (1)	87.1 (1)	77.59	76.84	57.76	57.57	38.71	38.43	28.86	28.79
NCT4*	148.0	148.0	117.1 (1)	117.0 (1)	87.8 (1)	87.7 (1)	77.25	77.03	57.76	57.69	38.47	38.40	28.78	28.76
NTST1*	148.1	148.0	117.3 (1)	117.0 (1)	87.8 (1)	87.7 (1)	76.99	76.98	57.69	57.69	38.47	38.38	28.78	28.75
GIC1*	153.8	153.8	116.2 (1)	116.2 (1)	87.1 (1)	87.1 (1)	76.87	76.87	57.58	57.58	38.41	38.41	28.79	28.79
GIC2*	156.2	156.2	120.2 (1)	120.2 (1)	90.0 (1)	90.0 (1)	78.37	78.37	58.76	58.76	39.47	39.46	29.56	29.56
GIC3*	156.2	156.2	120.0 (1)	120.0 (1)	90.0 (1)	90.0 (1)	78.48	78.48	58.79	58.79	39.45	39.45	29.55	29.55
<i>Maximum Concentration in AQOs^[2]</i>	<u>500^[4]</u>		<u>100 (9)</u>		<u>75 (9)</u>		<u>100 (9)</u>		<u>75 (9)</u>		<u>50</u>		<u>35</u>	

Notes:

- [1] Values in () mean the number of exceedances against the AQOs.
- [2] Values in () mean the number of exceedances allowed.
- [3] The existing land-use of the location is Aqua Privy. According the Tai O Outline Zoning Plan (No. S/I-TOF/1), this site is zoned as Government / Institution and Community (G/IC) use which may be used for potential air sensitive use. This is considered planned ASR.
- [4] Not an AQO but is a criteria for evaluating air quality impacts as stated in Annex 4 of TM-EIAO.
- * ASR located within the 500m radius of the boundary of the Tai O STW, Hang Mei SPS and Fan Kwai Tong SPS.
- All the results presented in the table have included background concentration.
- Bold figure indicates exceedance of the concentration limit of relevant AQO.

Construction Plant Inventory - Mitigated Scenario
 Work Type 1 - Construction of Sewer (Open Cut Method)

Mitigated

Project Specific PME Item	TM Ref./ other Ref	No. of Items	SWL	On-time %	On-time Cor.	Mitigation	Barrier Cor.	Total SWL, dB(A)	Total SWL, dB(A)
Stage 1 - Breaking up of road surface									
Pulverizer mounted on excavator	BS C1/5	1	100	30%	-5	(b)	-10	84.8	-
Generator	BS C4/78	1	94	100%	0	(a) (b)	-15	79.0	-
Total								85.8	0.0
Stage 2 - Excavation of soil material									
Backhoe (mini)	CNP 082	1	94	100%	0	(b)	-5	89.0	-
Generator	BS C4/78	1	94	100%	0	(a) (b)	-15	-	79.0
Submersible Pump	CNP 283	1	85	100%	0	(b)	-10	-	75.0
Total								89.0	80.5
Stage 3 - Steel fixing & concreting of manholes									
Bar bender and cutter (electric)	CNP 021	1	90	20%	-7	(b)	-15	-	68.0
Generator	BS C4/78	1	94	100%	0	(a) (b)	-15	79.0	79.0
Poker, vibratory, hand-held	BS C4/34	1	97	50%	-3	(a) (b)	-15	79.0	-
Total								82.0	79.3
Stage 4 - Laying of bedding material									
Generator	BS C4/78	1	94	100%	0	(a) (b)	-15	-	79.0
Poker, vibratory, hand-held - 2	BS C4/34	1	97	100%	0	(a) (b)	-15	-	82.0
Total								0.0	83.8
Stage 5 - Backfilling and soil compaction									
Vibratory compactor	QPME EPD 00055	1	102	50%	-3	(a) (b)	-10	89.0	-
Total								89.0	0.0
Stage 6 - Reinstatement of road surface									
Poker, vibratory, hand-held - 2	BS C4/34	1	97	100%	0	(a) (b)	-15	82.0	-
Generator	BS C4/78	1	94	100%	0	(a) (b)	-15	79.0	-
Total								83.8	0.0

Max Noise Level
89.0

Remarks:

(a) Use of Quiet PME; (b) Use of Temporary Barrier

*EPD - Details extracted from EPD website: http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf

Due to space constraint, concrete will be delivered manually from the temporary working area for the construction of trunk sewer, sewer and rising main; and upgrading of existing sewer in the villages. Certain PMEs will be operated on site for a short period of time for the proposed works tasks. A 20, 30 and 50 percentage on-time has been given accordingly.

Construction Plant Inventory - Mitigated Scenario
 Work Type 2 - Construction of Sewer (Trenchless Method)

Mitigated ▼

Project Specific PME Item	TM Ref./ other Ref	No. of Items	SWL, dB(A)	On-time %	On-time Cor.	Mitigation	Barrier Cor.	Total SWL, dB(A)	Total SWL, dB(A)	Total SWL, dB(A)	Total SWL, dB(A)
Stage 1 - Excavation of Pits											
Piling, earth auger, auger	CNP 167	1	114	100%	0	(b)	-10	104.0	-	-	-
Hoist (electric)	CNP 122	1	95	100%	0	(b)	-10	85.0	-	-	-
Breaker, excavator mounted	BS C9/12	1	113	100%	0	(a) (b)	-5	-	108.0	-	-
Excavator	BS C4/65	1	99	100%	0	(a) (b)	-5	-	-	94.0	-
Dumper	BS D3/98	1	101	100%	0	(b)	-5	-	-	96.0	-
Generator	BS C4/78	1	94	100%	0	(a) (b)	-15	79.0	-	79.0	-
Submersible Pump	CNP 283	2	85	100%	0	(b)	-10	-	-	78.0	-
Grout Mixer	CNP 105	1	90	100%	0	(b)	-10	-	-	-	80.0
Grout Pump	CNP 106	1	105	100%	0	(b)	-10	-	-	-	95.0
Total								104.1	108.0	98.2	95.1
Stage 2 - Pipe Laid by Trenchless Method											
Tunnel Boring Machine	CNP 183	1	116	100%	0	(b)	-10	106.0	-	-	-
Bentonite Filtering Plant	CNP 162	1	105	100%	0	(b)	-10	95.0	-	-	-
Generator	BS C4/78	1	94	100%	0	(a) (b)	-15	79.0	-	-	-
Dumper - 2	BS D3/98	1	101	70%	-2	(b)	-5	94.5	-	-	-
Hoist (electric) - 2	CNP 122	1	95	70%	-2	-	0	93.5	-	-	-
Submersible Pump	CNP 283	1	85	100%	0	(b)	-10	75.0	-	-	-
Ventilation Fan	CNP 241	1	108	100%	0	(b)	-10	98.0	-	-	-
Grout Mixer	CNP 105	1	90	100%	0	(b)	-10	-	80.0	-	-
Grout Pump	CNP 106	1	105	100%	0	(b)	-10	-	95.0	-	-
Total								107.4	95.1	0.0	0.0
Stage 3 - Steel fixing and concreting of manholes											
Bar bender and cutter (electric)	CNP 021	1	90	20%	-7	(b)	-15	68.0	-	-	-
Generator	BS C4/78	1	94	100%	0	(a) (b)	-15	-	79.0	-	-
Poker, vibratory, hand-held	BS C4/34	1	97	50%	-3	(a) (b)	-15	-	-	-	-
Total								68.0	82.0	0.0	0.0
Stage 4 - Reinstatement of road surface											
Generator	BS C4/78	1	94	100%	0	(a) (b)	-15	79.0	-	-	-
Poker, vibratory, hand-held	BS C4/34	1	97	50%	-3	(a) (b)	-15	79.0	-	-	-
Total								82.0	0.0	0.0	0.0

Max Noise Level
108.0

Remarks:

(a) Use of Quiet PME; (b) Use of Temporary Barrier

Due to space constraint, concrete will be delivered manually from the temporary working area for the construction of trunk sewer, sewer and rising main; and upgrading of existing sewer in the villages.
 Certain PMEs will be operated on site for a short period of time for the proposed works tasks. A 50 and 70 percentage on-time has been given accordingly.

Construction Plant Inventory - Mitigated Scenario
 Work Type 3 - Upgrading of Existing Sewer

Mitigated ▼

Project Specific PME Item	TM Ref./ other Ref	No. of Items	SWL, dB(A)	On-time %	On-time Cor.	Mitigation	Barrier Cor.	Total SWL, dB(A)	Total SWL, dB(A)
Stage 1 - Breaking up of road surface									
Generator	BS C4/78	1	94	100%	0	(a) (b)	-15	79.0	-
Pulverizer mounted on excavator	BS C1/5	1	100	30%	-5	(b)	-10	84.8	-
Total								85.8	0.0
Stage 2 - Excavation of soil material									
Backhoe (mini)	CNP 082	1	94	100%	0	(b)	-5	89.0	-
Generator	BS C4/78	1	94	100%	0	(a) (b)	-15	-	79.0
Submersible Pump	CNP 283	1	85	100%	0	(b)	-10	-	75.0
Total								89.0	80.5
Stage 3 - Removal of existing sewers and laying of new sewers									
Backhoe (mini)	CNP 082	1	94	100%	0	(b)	-5	89.0	-
Total								89.0	0.0
Stage 4 - Steel fixing and concreting of manholes									
Bar bender and cutter (electric)	CNP 021	1	90	20%	-7	(b)	-15	68.0	-
Generator	BS C4/78	1	94	100%	0	(a) (b)	-15	-	79.0
Poker, vibrator, hand-held	BS C4/34	1	97	50%	-3	(a) (b)	-15	-	79.0
Total								68.0	82.0
Stage 5 - Laying of bedding material									
Poker, vibrator, hand-held - 2	BS C4/34	1	97	100%	0	(a) (b)	-15	82.0	-
Generator	BS C4/78	1	94	100%	0	(a) (b)	-15	79.0	-
Total								83.8	0.0
Stage 6 - Backfilling and soil compaction									
Vibratory compactor	QPME EPD 00055	1	102	50%	-3	(a) (b)	-10	89.0	-
Total								89.0	0.0
Stage 7 - Reinstatement of road surface									
Poker, vibrator, hand-held - 2	BS C4/34	1	97	100%	0	(a) (b)	-15	82.0	-
Generator	BS C4/78	1	94	100%	0	(a) (b)	-15	79.0	-
Total								83.8	0.0

Max Noise Level
89.0

Remarks:

(a) Use of Quiet PME; (b) Use of Temporary Barrier

*EPD - Details extracted from EPD website: http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf

Due to space constraint, concrete will be delivered manually from the temporary working area for the construction of trunk sewer, sewer and rising main; and upgrading of existing sewer in the villages. Certain PMEs will be operated on site for a short period of time for the proposed works tasks. A 20, 30, 50 and 70 percentage on-time has been given accordingly.

Construction Plant Inventory - Mitigated Scenario
 Work Type 4 - Construction of Tai O STW & Seawall Construction

Mitigated

Project Specific PME Item	TM Ref./ other Ref	No. of Items	SWL, dB(A)	On-time %	On-time Cor.	Mitigation	Barrier Cor.	Total SWL, dB(A)	Total SWL, dB(A)	Total SWL, dB(A)	Total SWL, dB(A)
Stage 1 - Form part of permanent seawall - by forming rock / Gabion wall											
Tug Boat	CNP 221	1	110	100%	0		0	110.0	-	-	-
Derrick Barge	CNP 061	1	104	100%	0		0	104.0	-	-	-
Total								111.0	0.0	0.0	0.0
Stage 2 - Fill the reclamation to 3mPD											
Tug Boat	CNP 221	1	110	100%	0		0	110.0	-	-	-
Derrick Barge	CNP 061	1	104	100%	0		0	104.0	-	-	-
Generator	BS C4/78	1	94	100%	0	(a)	0	94.0	-	-	-
Submersible Pump	CNP 283	2	85	100%	0		0	88.0	-	-	-
Total								111.1	0.0	0.0	0.0
Stage 3 - Core boreholes											
Drill Rig	BS D10/2	1	112	100%	0	(a)	0	112.0	-	-	-
Generator	BS C4/78	1	94	100%	0	(a)	0	94.0	-	-	-
Air Compressor	CNP 002	1	102	100%	0		0	102.0	-	-	-
Total								112.5	0.0	0.0	0.0
Stage 4 - 1 - 1: Excavation and Construction of substructures in new reclamation areas											
Tug Boat	CNP 221	1	110	100%	0		0	110.0	110.0	110.0	110.0
Hoist (electric)	CNP 122	1	95	100%	0		0	95.0	95.0	95.0	95.0
Generator	BS C4/78	2	94	100%	0	(a)	0	97.0	97.0	97.0	97.0
Air Compressor	CNP 002	2	102	100%	0		0	105.0	105.0	105.0	105.0
Stage 4 - 1 - 2: Construct bored piles for above-ground-structures: 350m³ boring in rock											
Piling, large diameter bored, grab and chisel	CNP 164	1	115	100%	0		0	-	115.0	-	115.0
Piling, large diameter bored, oscillator	CNP 165	1	115	100%	0		0	-	115.0	-	115.0
Piling, Crawler crane/chisel/oscillator/RCD	CNP 164	1	115	100%	0		0	-	115.0	-	115.0
Air Compressor	CNP 002	1	102	100%	0		0	-	102.0	-	102.0
Bar Bender and Cutter	CNP 021	1	90	100%	0		0	-	90.0	-	90.0
Stage 4 - 1 - 3: Construct sheet pile walls for excavation of substructure: 625 m³ boring in rock											
Hydraulic Vibratory Driver for driving Sheet Piling	BS D4/12	1	94	100%	0	(a)	0	94.0	-	94.0	-
Piling, large diameter bored, grab and chisel	CNP 164	1	115	100%	0		0	115.0	-	115.0	-
Piling, large diameter bored, oscillator	CNP 165	1	115	100%	0		0	115.0	-	115.0	-
Piling, Crawler crane/chisel/oscillator/RCD	CNP 164	1	115	100%	0		0	115.0	-	115.0	-
Air Compressor	CNP 002	1	102	100%	0		0	102.0	-	102.0	-
Stage 4 - 1 - 4: Excavation for substructures: 1000m³ excavation in rock											
Breaker, excavator mounted	BS C9/12	1	113	100%	0	(a)	0	113.0	113.0	113.0	-
Excavator	BS C4/65	1	99	100%	0	(a)	0	99.0	99.0	99.0	-
Submersible Pump	CNP 283	2	85	100%	0		0	88.0	88.0	88.0	-
Drill/grinder, hand-held	CNP 065	1	98	100%	0		0	98.0	98.0	98.0	-
Stage 4 - 1 - 5: Construction of Substructures											
Submersible Pump	CNP 283	2	85	100%	0		0	88.0	88.0	-	88.0
Bar Bender and Cutter	CNP 021	1	90	100%	0		0	90.0	90.0	-	90.0
Concrete Pump	CNP 047	2	109	100%	0		0	112.0	112.0	-	112.0
Saw, circular, wood	CNP 201	1	108	100%	0		0	108.0	108.0	-	108.0
Poker, vibratory, hand-held	BS C4/34	3	97	100%	0	(a)	0	101.8	101.8	-	101.8
Drill/grinder, hand-held	CNP 065	1	98	100%	0		0	98.0	98.0	-	98.0
Stage 4 - 2: Construct Temporary Outfall Chamber through existing seawall and on existing outfall pipes											
Saw, circular, wood	CNP 201	1	108	100%	0		0	108.0	-	-	-
Drill/grinder, hand-held	CNP 065	1	98	100%	0		0	98.0	-	-	-
Total								122.1	121.9	121.2	121.3
Stage 5 - 1: Install Temporary Treatment Installation											
Tug Boat	CNP 221	1	110	100%	0		0	110.0	-	-	-
Hoist (electric)	CNP 122	1	95	100%	0		0	95.0	-	-	-
Generator	BS C4/78	1	94	100%	0	(a)	0	94.0	-	-	-
Drill/grinder, hand-held	CNP 065	1	98	100%	0		0	98.0	-	-	-
Stage 5 - 2: Construct Temporary Sewage Inlet Pipe from existing Inlet Chamber to Temporary Treatment											
Submersible Pump	CNP 283	1	85	100%	0		0	85.0	-	-	-
Air Compressor	CNP 002	1	102	100%	0		0	102.0	-	-	-
Saw, circular, wood	CNP 201	1	108	100%	0		0	108.0	-	-	-
Stage 5 - 3: Construct Temporary Treated Effluent Outlet Pipe from Temporary Treatment Installation to the Temporary Outfall Chamber											
Submersible Pump	CNP 283	1	85	100%	0		0	85.0	-	-	-
Total								112.8	0.0	0.0	0.0
Stage 6 - 1 - 1: Demolish and remove the Imhoff Tank, pipework, chambers and workshop											
Breaker, excavator mounted	BS C9/12	1	113	100%	0	(a)	0	113.0	113.0	-	-
Excavator	BS C4/65	1	99	100%	0	(a)	0	99.0	99.0	-	-
Generator	BS C4/78	2	94	100%	0	(a)	0	97.0	97.0	-	-
Submersible Pump	CNP 283	2	85	100%	0		0	88.0	88.0	-	-
Stage 6 - 1 - 2: Construct sheet pile walls for excavation of substructure: 850m³ boring in rock											
Hydraulic Vibratory Driver for driving Sheet Piling	BS D4/12	1	94	100%	0	(a)	0	94.0	-	-	-
Piling, large diameter bored, grab and chisel	CNP 164	1	115	100%	0		0	115.0	-	-	-
Piling, large diameter bored, oscillator	CNP 165	1	115	100%	0		0	115.0	-	-	-
Piling, Crawler crane/chisel/oscillator/RCD	CNP 164	1	115	100%	0		0	115.0	-	-	-
Air Compressor	CNP 002	1	102	100%	0		0	102.0	-	-	-
Stage 6 - 1 - 3: Excavation for substructures: 1000m³ excavation in reinforced concrete (by saw-cut) and rock											
Saw/grinder, concrete (petrol)	CNP 203	2	115	100%	0		0	-	118.0	-	-
Total								120.7	119.3	0.0	0.0
Stage 7 - 1: Construct the new Preliminary Treatment											
Submersible Pump	CNP 283	2	85	100%	0		0	88.0	-	-	-
Bar Bender and Cutter	CNP 021	1	90	100%	0		0	90.0	-	-	-
Saw, circular, wood	CNP 201	1	108	100%	0		0	108.0	-	-	-
Drill/grinder, hand-held	CNP 065	1	98	100%	0		0	98.0	-	-	-
Stage 7 - 2: Construct the superstructures of MBR, Pump House and Header Tank, Sludge Thickening Tanks, Sludge Pump House, Air Blower, Sludge Digestors, Sludge Holding Tanks, Dangerous Goods Store, Fire Pump Room and Workshop											
Tug Boat	CNP 221	1	110	100%	0		0	110.0	110.0	-	-
Hoist (electric)	CNP 122	1	95	100%	0		0	95.0	95.0	-	-
Generator	BS C4/78	2	94	100%	0	(a)	0	97.0	97.0	-	-
Air Compressor	CNP 002	2	102	100%	0		0	105.0	105.0	-	-
Bar Bender and Cutter	CNP 021	1	90	100%	0		0	90.0	90.0	-	-
Concrete Pump	CNP 047	2	109	100%	0		0	112.0	112.0	-	-
Saw, circular, wood	CNP 201	1	108	100%	0		0	108.0	108.0	-	-
Poker, vibratory, hand-held	BS C4/34	2	97	100%	0	(a)	0	100.0	100.0	-	-
Drill/grinder, hand-held	CNP 065	1	98	100%	0		0	98.0	98.0	-	-
Total								116.5	115.8	0.0	0.0
Stage 8 - 1: Installation of major E&M equipments											
Hoist (electric)	CNP 122	1	95	100%	0		0	95.0	-	-	-
Generator	BS C4/78	2	94	100%	0	(a)	0	97.0	-	-	-
Air Compressor	CNP 002	1	102	100%	0		0	102.0	-	-	-
Saw, circular, wood	CNP 201	1	108	100%	0		0	108.0	-	-	-
Drill/grinder, hand-held	CNP 065	1	98	100%	0		0	98.0	-	-	-
Winch (electric)	CNP 262	1	95	100%	0		0	95.0	-	-	-
Stage 8 - 3: Construct pipelines within the STW site and install a temporary pipeline											
Poker, vibratory, hand-held	BS C4/34	1	97	100%	0	(a)	0	97.0	-	-	-
Total								110.1	0.0	0.0	0.0
Stage 9 - Remove Temporary Treatment Units and construct the new Sludge Dewatering House											
Tug Boat	CNP 221	1	110	100%	0		0	110.0	-	-	-
Generator	BS C4/78	1	94	100%	0	(a)	0	94.0	-	-	-
Air Compressor	CNP 002	1	102	100%	0		0	102.0	-	-	-
Bar Bender and Cutter	CNP 021	1	90	100%	0		0	90.0	-	-	-
Concrete Pump	CNP 047	2	109	100%	0		0	112.0	-	-	-
Saw, circular, wood	CNP 201	1	108	100%	0		0	108.0	-	-	-
Poker, vibratory, hand-held	BS C4/34	2	97	100%	0	(a)	0	100.0	-	-	-
Drill/grinder, hand-held	CNP 065	1	98	100%	0		0	98.0	-	-	-
Total								115.5	0.0	0.0	0.0
Stage 10 - Installation of ancillary equipments and remove temporary platform											
Hoist (electric)	CNP 122	1	95	100%	0		0	95.0	-	-	-
Generator	BS C4/78	1	94	100%	0	(a)	0	94.0	-	-	-
Air Compressor	CNP 002	1	102	100%	0		0	102.0	-	-	-
Saw, circular, wood	CNP 201	1	108	100%	0		0	108.0	-	-	-
Drill/grinder, hand-held	CNP 065	1	98	100%	0		0	98.0	-	-	-
Winch (electric)	CNP 262	1	95	100%	0		0	95.0	-	-	-
Total								109.7	0.0	0.0	0.0
Construction of the remaining permanent seawall											
Tug Boat	CNP 221	1	110	100%	0		0	110.0	-	-	-
Derrick Barge	CNP 061	1	104	100%	0		0	104.0	-	-	-
Total								111.0	0.0	0.0	0.0
Laying of submarine outfall											
Tug Boat	CNP 221	1	110	100%	0		0	110.0	-	-	-
Dredger, grab	CNP 063	1	112	100%	0		0	112.0	-	-	-
Derrick Barge	CNP 061	1	104	100%	0		0	104.0	-	-	-
Total								114.5	0.0	0.0	0.0

Max Noise Level
122.1

Remarks:
 (a) Use of Quiet PME; (b) Use of Temporary Barrier
 Due to space constraint, concrete will be delivered manually from the temporary working area for the construction of trunk sewer, sewer and rising main; and upgrading of existing sewer in the villages.
 Certain PMEs will be operated on site for a short period of time for the proposed works tasks. A 10, 20, 30, 60, 70 and 80 percentage on-time has been given accordingly.

Construction Plant Inventory - Mitigated Scenario

Work Type 5 - Construction of Hang Mei Sewerage Pumping Station

Mitigated

Project Specific PME Item	TM Ref./ other Ref	No. of Items	SWL, dB(A)	On-time %	On-time Cor.	Mitigation	Barrier Cor.	Total SWL, dB(A)	Total SWL, dB(A)	Total SWL, dB(A)
Stage 1 - Site Clearance										
Backhoe (mini)	CNP 082	1	94	100%	0	(b)	-5	89.0	-	-
Total								89.0	0.0	0.0
Stage 2 - Piling										
Hydraulic Vibratory Driver for driving Sheet Piling	BS D4/12	1	94	100%	0	(a) (b)	-10	84.0	-	-
Crane, mobile mounted - 2	BS C4/50	1	99	70%	-2	(a) (b)	-5	92.5	-	-
Generator	BS C4/78	1	94	100%	0	(a) (b)	-15	79.0	-	-
Total								93.2	0.0	0.0
Stage 3 - Excavation										
Breaker, hand-held, mass≥20kg and ≤35kg	CNP 025	1	111	100%	0	(b)	-10	101.0	-	-
Excavator	BS C4/65	1	99	100%	0	(a) (b)	-5	-	94.0	-
Generator	BS C4/78	1	94	100%	0	(a) (b)	-15	-	79.0	79.0
Dumper	BS D3/98	1	101	100%	0	(b)	-5	-	-	96.0
Crane, mobile mounted - 2	BS C4/50	1	99	70%	-2	(a) (b)	-5	-	92.5	92.5
Submersible Pump	CNP 283	1	85	100%	0	(b)	-10	-	75.0	75.0
Welding Machine	*AEIAR 052/2002	1	78	60%	-2	(b)	-10	-	65.8	-
Total								101.0	96.4	97.7
Stage 4 - Steel fixing and concreting for structure										
Bar bender and cutter (electric)	CNP 021	1	90	30%	-5	(b)	-15	69.8	-	-
Concrete Pump	CNP 047	1	109	100%	0	(b)	-10	-	99.0	-
Saw, circular, wood	CNP 201	1	108	100%	0	(b)	-10	98.0	-	-
Poker, vibratory, hand-held	BS C4/34	1	97	100%	0	(a) (b)	-15	-	82.0	-
Generator	BS C4/78	1	94	100%	0	(a) (b)	-15	79.0	79.0	-
Total								98.1	99.1	0.0
Stage 5 - Backfilling and Soil Compaction										
Vibratory Compactor	QPME EPD 00055	1	102	100%	0	(a) (b)	-10	92.0	-	-
Backhoe (mini)	CNP 082	1	94	100%	0	(b)	-5	89.0	-	-
Total								93.8	0.0	0.0
Stage 6 - Installation of E&M equipments										
Crane, mobile mounted	BS C4/50	1	99	100%	0	(a) (b)	-5	94.0	-	-
Generator	BS C4/78	1	94	100%	0	(a) (b)	-15	79.0	-	-
Winch (electric)	CNP 262	1	95	100%	0	(b)	-10	85.0	-	-
Drill/grinder, hand-held	CNP 065	1	98	100%	0	(b)	-10	88.0	-	-
Total								95.5	0.0	0.0

Max Noise Level
101.0

Remarks:

(a) Use of Quiet PME; (b) Use of Temporary Barrier

*EPD - Details extracted from EPD website: http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf

AEIAR-052/2002: Noise level of PME extracted from the Approved EIA Report in the Register: AEIAR-052/2002

Due to space constraint, concrete will be delivered manually from the temporary working area for the construction of trunk sewer, sewer and rising main; and upgrading of existing sewer in the villages. Certain PMEs will be operated on site for a short period of time for the proposed works tasks. A 30 and 60 percentage on-time has been given accordingly.

Construction Plant Inventory - Mitigated Scenario

Work Type 6 - Construction of Fan Kwai Tong Sewerage Pumping Station

Mitigated

Project Specific PME Item	TM Ref./ other Ref	No. of Items	SWL, dB(A)	On-time %	On-time Cor.	Mitigation	Barrier Cor.	Total SWL, dB(A)	Total SWL, dB(A)	Total SWL, dB(A)
Stage 1 - Site Clearance										
Backhoe (mini)	CNP 082	1	94	100%	0	(b)	-5	89.0	-	-
Total								89.0	0.0	0.0
Stage 2 - Piling										
Hydraulic Vibratory Driver for driving Sheet Piling	BS D4/12	1	94	100%	0	(a) (b)	-10	84.0	-	-
Crane, mobile mounted - 2	BS C4/50	1	99	70%	-2	(a) (b)	-5	92.5	-	-
Generator	BS C4/78	1	94	100%	0	(a) (b)	-15	79.0	-	-
Total								93.2	0.0	0.0
Stage 3 - Excavation										
Breaker, hand-held, mass≥20kg and ≤35kg	CNP 025	1	111	100%	0	(b)	-10	101.0	-	-
Excavator	BS C4/65	1	99	100%	0	(a) (b)	-5	-	94.0	-
Generator	BS C4/78	1	94	100%	0	(a) (b)	-15	-	79.0	79.0
Dumper	BS D3/98	1	101	100%	0	(b)	-5	-	-	96.0
Crane, mobile mounted - 2	BS C4/50	1	99	70%	-2	(a) (b)	-5	-	92.5	92.5
Submersible Pump	CNP 283	1	85	100%	0	(b)	-10	-	75.0	75.0
Welding Machine	*AEIAR 052/2002	1	78	60%	-2	(b)	-10	-	65.8	-
Total								101.0	96.4	97.7
Stage 4 - Steel fixing and concreting for structure										
Bar bender and cutter (electric)	CNP 021	1	90	30%	-5	(b)	-15	69.8	-	-
Concrete Pump	CNP 047	1	109	100%	0	(b)	-10	-	99.0	-
Saw, circular, wood	CNP 201	1	108	100%	0	(b)	-10	98.0	-	-
Poker, vibratory, hand-held	BS C4/34	1	97	100%	0	(a) (b)	-15	-	82.0	-
Generator	BS C4/78	1	94	100%	0	(a) (b)	-15	79.0	79.0	-
Total								98.1	99.1	0.0
Stage 5 - Backfilling and Soil Compaction										
Vibratory Compactor	QPME EPD 00055	1	102	100%	0	(a) (b)	-10	92.0	-	-
Backhoe (mini)	CNP 082	1	94	100%	0	(b)	-5	89.0	-	-
Total								93.8	0.0	0.0
Stage 6 - Installation of E&M equipments										
Crane, mobile mounted	BS C4/50	1	99	100%	0	(a) (b)	-5	94.0	-	-
Generator	BS C4/78	1	94	100%	0	(a) (b)	-15	79.0	-	-
Winch (electric)	CNP 262	1	95	100%	0	(b)	-10	85.0	-	-
Drill/grinder, hand-held	CNP 065	1	98	100%	0	(b)	-10	88.0	-	-
Total								95.5	0.0	0.0

Max Noise Level
101.0

Remarks:

(a) Use of Quiet PME; (b) Use of Temporary Barrier

*EPD - Details extracted from EPD website: http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf

AEIAR-052/2002: Noise level of PME extracted from the Approved EIA Report in the Register: AEIAR-052/2002

Due to space constraint, concrete will be delivered manually from the temporary working area for the construction of trunk sewer, sewer and rising main; and upgrading of existing sewer in the villages.

Certain PMEs will be operated on site for a short period of time for the proposed works tasks. A 30 and 60 percentage on-time has been given accordingly.

Construction Plant Inventory - Mitigated Scenario

Work Type 7 - Temporary Workings Area

Mitigated ▼

Project Specific PME Item	TM Ref./ other Ref	No. of Items	SWL, dB(A)	On-time %	On-time Cor.	Mitigation	Barrier Cor.	Total SWL, dB(A)	Total SWL, dB(A)
Stage 1 - Site Clearance									
Backhoe (mini)	CNP 082	1	94	100%	0	-	0	94.0	-
Total								94.0	0.0
Stage 2 - Operation of concrete mixer									
Concrete mixer (petrol)	CNP 046	1	96	100%	0	-	0	96.0	-
Total								96.0	0.0

Max Noise Level
96.0