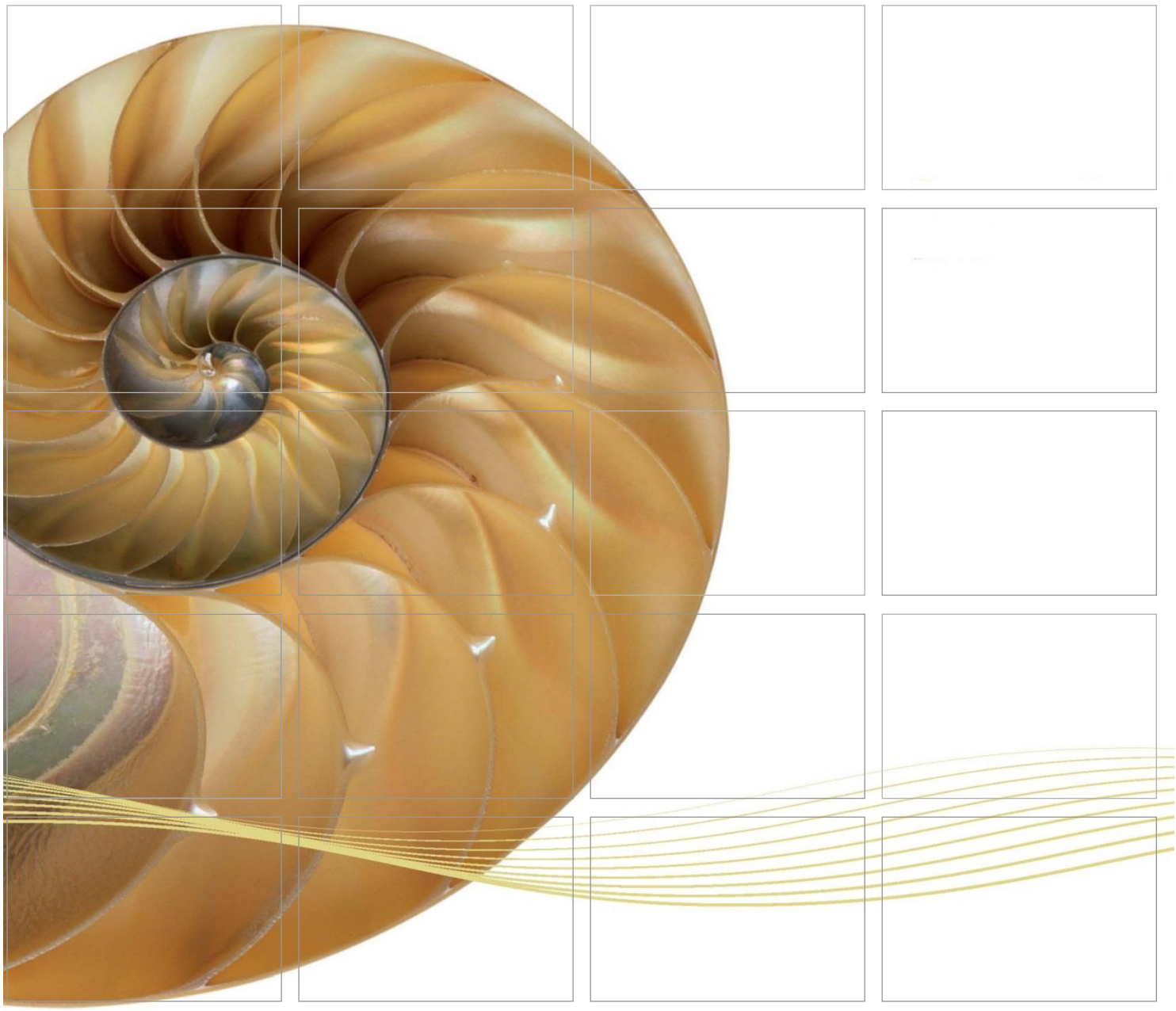
Report



Contract No. HY/2017/10
Tuen Mun – Chek Lap Kok Link – Northern Connection Tunnel Buildings, Electrical and Mechanical Works

Final Environmental Monitoring & Audit (EM&A) Report

21 October 2021

Environmental Resources Management
2509, 25/F One Harbourfront
18 Tak Fung Street
Hunghom, Kowloon
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Telephone 2271 3000
Facsimile 3015 8052

Contract No. HY/2017/10
Tuen Mun – Chek Lap Kok Link – Northern Connection Tunnel Buildings, Electrical and Mechanical Works

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Final Environmental Monitoring & Audit (EM&A) Report

Document Code:
0463091_Final EM&A Report_20211021.docx

Client: Gammon	Project No: 0463091
Summary: This document presents the Final EM&A Report for Tuen Mun – Chek Lap Kok Link – Northern Connection Tunnel Buildings, Electrical and Mechanical Works.	Date: 21 October 2021 Approved by: *Mr Craig Reid* *Partner* Certified by: *Dr Jasmine Ng* *ET Leader*

Revision	Description	By	Checked	Approved	Date
	Final EM&A Report	CW	JN	CAR	21/10/21

Distribution

☐ Internal

☒ Public

☐ Confidential

Ref.: HYDHZMBEEM00_0_8589L.21

26 October 2021

By Fax (2783 0155) and By Post

AECOM Asia Company Limited
Supervising Officer's Representative Office
No. 8 Mong Fat Street, Tuen Mun, New Territories, Hong Kong

Attention: Mr. Desmond Fung

Dear Mr. Fung,

Re: Agreement No. CE 48/2011 (EP)
Environmental Project Office for the
HZMB Hong Kong Link Road, HZMB Hong Kong Boundary Crossing Facilities, and
Tuen Mun-Chek Lap Kok Link – Investigation

Contract No. HY/2017/10
TM-CLKL – Northern Connection Tunnel Buildings, E&M Works
Final Environmental Monitoring & Audit (EM&A) Report

Reference is made to the Environmental Team's submission of the Final EM&A report (ET's ref.: "*0463091_Final EM&A_20211021.docx*" dated 21 October 2021) certified by the ET Leader and provided to us via e-mail on 21 October 2021.

Please be informed that we have no adverse comments on the captioned submission.

Thank you for your attention. Please feel free to contact the undersigned or the ENPO Leader, Mr. Y H Hui, should you require further information.

Yours sincerely,
For and on behalf of
Ramboll Hong Kong Limited

Brian Tam
Independent Environmental Checker
Tuen Mun-Chek Lap Kok Link

c.c.

HyD	Mr. Patrick Ng	(By Fax: 3188 6614)
HyD	Mr. Alan Ip	(By Fax: 3188 6614)
AECOM	Mr. Conrad Ng	(By Fax: 3922 9797)
ERM	Dr. Jasmine Ng	(By Fax: 2723 5660)
Gammon	Ms. Phoebe Ng	(By Fax: 3520 0486)

Internal: DY, YH

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TABLE OF CONTENTS

List of Appendices

Under *Contract No. HY/2017/10*, Gammon Construction Limited (GCL) is commissioned by the Highways Department (HyD) to undertake Northern Connection Tunnel Buildings, Electrical and Mechanical Works of the Tuen Mun – Chek Lap Kok Link Project (TM-CLK Link Project) while AECOM Asia Company Limited was appointed by HyD as the Engineer. For implementation of the environmental monitoring and audit (EM&A) programme under the Contract, ERM-Hong Kong, Limited (ERM) has been appointed as the Environmental Team (ET) in accordance with *Environmental Permit No. EP-354/2009/A*. Ramboll Hong Kong Ltd. was employed by HyD as the Independent Environmental Checker (IEC) and Environmental Project Office (ENPO). Subsequent applications for variation of environmental permits (VEP), *EP-354/2009/B*, *EP-354/2009/C* and *EP-354/2009/D*, were granted on 28 January 2014, 10 December 2014 and 13 March 2015, respectively.

The construction phase of the Contract commenced on 7 June 2018 and will tentatively be completed by 2021. The impact monitoring of the EM&A programme, including air quality and environmental site inspections, were commenced on 7 June 2018.

Termination proposal for construction EM&A programme was approved by EPD on 26 March 2021. The construction phase EM&A programme of the Contract has been terminated since 26 March 2021.

This is the Final EM&A Report presenting the EM&A works carried out during the period from 1 June 2018 to 26 March 2021 for the *Contract No. HY/2017/10 Northern Connection Tunnel Buildings, Electrical and Mechanical Works* (the "Contract") in accordance with the Updated EM&A Manual of the TM-CLK Link Project. As informed by the Contractor, major activities during the course of this Contract included:

Land-based Works

- Site preparation works, Bar bending, Timber formwork, Concreting, Electrical and Mechanical Works, Architectural Builder's Work and Finishes and Handover Inspection at Toll Control Building/Main Control Building;

- Bar bending and Timber formwork, Architectural, Builder's Work and Finishing, Electrical and Mechanical Works and Handover Inspection at Ventilation Plant Room;

- ER's and the Contractor's site offices erection at WA18;

- Additional land ground investigation (GI), Socket H-pilling, Excavation, Building Structure, Electrical and Mechanical Works, Architectural

Builders Work and Finishes and Handover Inspection at Administration Building, Trial pits and laboratory testing;

- Electrical and Mechanical Works and Handover Inspection at North Ventilation Building;
- Additional land ground investigation (GI), Socket H-pilling, Excavation, Building Structure, Electrical and Mechanical Works, Architectural Builders Work and Finishes and Handover Inspection at Maintenance Depot, Trial pits and laboratory testing;
- Pre-drilling, Socket H-piling, Excavation, Building Structure, Electrical and Mechanical Works, Architectural Builder's Work, Handover Inspection , External Cladding & Louvre Installation, Final Finishing Works and Minor Work at Customs & Excise Department Building;
- Trial pits, Pre-drilling, Socket H-piling, Excavation, Building Structure, Electrical and Mechanical Works, Architectural Builder's Work, Handover Inspection and Minor Work at Fire Service Department Building;
- Electrical and Mechanical Works, Architectural Builder's Work and Finishes, Handover Inspection and Minor Work at N1;
- Electrical and Mechanical Works and Architectural Builders' Works and Finishes, Handover Inspection and Minor Work at Kiosk N2;
- Electrical and Mechanical Works, Architectural Builder's Work and Finishes and Handover Inspection at Underpass at C3 area;
- Electrical and Mechanical Works, Architectural Builder's Work and Finishes, T&C and FSI at the Tunnel;
- Excavation, Building Structure, Electrical and Mechanical Works, Architectural Builders Work and Finishes and Handover Inspection at Satellite Control Building;
- Building Structure at Kiosk S1;
- Building Structure, Electrical and Mechanical Works, Architectural Builders Work and Finishes, Handover Inspection and Minor Work at Kiosk S2;
- Electrical and Mechanical Works and Handover Inspection at South Ventilation Building;
- Building Structure, Electrical and Mechanical Works and Architectural Builders Work and Finishes at Toll Booth; and

- Soil Mix and Landscape Works at Northern Landfall and Southern Landfall.

A summary of monitoring and audit activities conducted during the course of this Contract is listed below (1):

24-hour TSP Monitoring	306 sessions
1-hour TSP Monitoring	306 sessions
Landfill Gas Hazard Monitoring	445 days
Joint Environmental Site Inspection	147 sessions

Summary of Breaches of Action/Limit Levels

Breaches of Action and Limit Levels for Air Quality

Fifty-six (56) Action Level exceedances and eleven (11) Limit Level exceedances for 1-hour TSP and four (4) Action Level exceedances for 24-hour TSP were recorded by the Environmental Team of Contract No. *HY/2012/08* during the course of this Contract. No Limit Level exceedance of 24-hour TSP was recorded.

Breaches of Action and Limit Levels for Landfill Gas Hazard Monitoring

No exceedance of Action and Limit Level exceedance was recorded for landfill gas hazard monitoring during the course of this Contract.

Environmental Complaints, Non-compliance & Summons

There was one (1) environmental complaint received from EPD during the course of this Contract. No notification of summons or successful prosecution was received during the course of this Contract.

Reporting Change

Landscape and visual monitoring for 24-month establishment period conducted by Contract No. HY/2012/07 and HY/2013/12 was reported in the *Twenty-seventh* and *Thirtieth EM&A report* for this Contract.

Landscape and visual monitoring for 24-month establishment period conducted by Contract No. HY/2013/12 and HMWSD 2/2020 (HY) was reported in the *Thirty-Third EM&A report* for this Contract.

Landscape and visual monitoring for 24-month establishment period for Southern Landfall, Northern Landfall and Main Control Building under this Contract was reported in the *Thirty-Fourth EM&A report* for this Contract.

(1) ET justification on the Contract Specific Environmental Monitoring and Audit activities under this Contract was submitted to ENPO on 11 September 2018

Notification of temporary suspension of air quality monitoring has been approved by EPD on 16 March 2021.

Termination proposal for construction EM&A programme was approved by EPD on 26 March 2021. The construction phase EM&A programme of the Contract has been terminated since 26 March 2021.

1 INTRODUCTION

1.1 BACKGROUND

According to the findings of the Northwest New Territories (NWNT) Traffic and Infrastructure Review conducted by the Transport Department, Tuen Mun Road, Ting Kau Bridge, Lantau Link and North Lantau Highway would be operating beyond capacity after 2016. This forecast has been based on the estimated increase in cross boundary traffic, developments in the Northwest New Territories (NWNT), and possible developments in North Lantau, including the Airport developments, the Lantau Logistics Park (LLP) and the Hong Kong – Zhuhai – Macao Bridge (HZMB). In order to cope with the anticipated traffic demand, two new road sections between NWNT and North Lantau – Tuen Mun – Chek Lap Kok Link (TM-CLKL) and Tuen Mun Western Bypass (TMWB) are proposed.

An Environmental Impact Assessment (EIA) of TM-CLKL (the Project) was prepared in accordance with the EIA Study Brief (No. ESB-175/2007) and the *Technical Memorandum of the Environmental Impact Assessment Process* (*EIAO-TM*). The EIA Report was submitted under the Environmental Impact Assessment Ordinance (EIAO) in August 2009. Subsequent to the approval of the EIA Report (EIAO Register Number AEIAR-146/2009), an Environmental Permit (EP-354/2009) for TM-CLKL was granted by the Director of Environmental Protection (DEP) on 4 November 2009, and EP variation (VEP) (EP-354/2009/A) was issued on 8 December 2010. Subsequent applications for variation of environmental permits (VEPs), *EP-354/2009/B, EP-354/2009/C* and *EP-354/2009/D*, were granted on 28 January 2014, 10 December 2014 and 13 March 2015, respectively.

Under *Contract No. HY/2017/10*, Gammon Construction Limited (GCL) is commissioned by the Highways Department (HyD) to undertake the Northern Connection Tunnel Buildings, Electrical and Mechanical Works of TM-CLKL while AECOM Asia Company Limited was appointed by HyD as the Engineer. For implementation of the environmental monitoring and audit (EM&A) programme under the Contract, ERM-Hong Kong, Limited (ERM) has been appointed as the Environmental Team (ET). Ramboll Hong Kong Ltd. was employed by HyD as the Independent Environmental Checker (IEC) and Environmental Project Office (ENPO).

The construction phase of the Contract commenced on 7 June 2018 and will be tentatively completed by 2021. The impact monitoring phase of the EM&A programme, including air quality and environmental site inspections, commenced on 7 June 2018.

The general layout plan of the Contract components is presented in *Figures 1.1 & 1.2a to c.*

Project Management Initials: Designer: KATH Checked: SYLC Approved: CWN ISO A1 594mm x 841mm

N

TUEN MUN

LUNG KWU TAN

URMSTON ROAD

TAI LAM CHUNG RESERVOIR

TSING YI

A

01
7061

01
7063

TUEN MUN TO
CHEK LAP KOK LINK

SOUTH CHINA SEA

SIU MO TO

TAI MO TO

HONG KONG
BOUNDARY
CROSSING
FACILITIES

01
7062

CHEK LAP KOK

A

TUNG
CHUNG

LANTAU ISLAND

AECOM

PROJECT
TUEN MUN -
CHEK LAP KOK LINK

CONTRACT TITLE
TUEN MUN - CHEK LAP KOK LINK
- NORTHERN CONNECTION TUNNEL
BUILDINGS, ELECTRICAL AND
MECHANICAL WORKS

CLIENT
路政署
HIGHWAYS DEPARTMENT
港珠澳大橋香港工程管理處
Hong Kong - Zhuhai - Macao Bridge
Hong Kong Project Management Office

CONSULTANT
AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS

Figure 1.1

ISSUE/REVISION

I/R	DATE	DESCRIPTION	CHK.
A	JAN.18	TENDER ADDENDUM NO.1	SYLC
-	DEC.17	TENDER DRAWING	SYLC

STATUS

SCALE: A1 1 : 40000
DIMENSION UNIT: MILLIMETRES

KEY PLAN

PROJECT NO.: 60240249
CONTRACT NO.: HY/2017/10

SHEET TITLE
OVERALL SITE PLAN

SHEET NUMBER
60240249/C4/7051A

Plot File by: jerrywong
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AECOM

PROJECT

TUEN MUN - CHEK LAP KOK LINK

CONTRACT TITLE

TUEN MUN - CHEK LAP KOK LINK - NORTHERN CONNECTION TUNNEL BUILDINGS, ELECTRICAL AND MECHANICAL WORKS

CLIENT

路政署 HIGHWAYS DEPARTMENT

Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

CONSULTANT

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Figure 1.2a

ISSUE/REVISION

I/R	DATE	DESCRIPTION	CHK.
A	JAN.18	TENDER ADDENDUM NO.1	SYLC
-	DEC.17	TENDER DRAWING	SYLC

STATUS

SCALE: A1 1:2500

DIMENSION UNIT: MILLIMETRES

KEY PLAN

PROJECT NO.: 60240249

CONTRACT NO.: HY/2017/10

SHEET TITLE

ZONING PLAN (SHEET 1)

SHEET NUMBER

60240249/C4/7061A

Project Management Initials: Designer: KATH Checked: SYLC Approved: CWN ISO A1 594mm x 841mm

N

AECOM

PROJECT
TUEN MUN -
CHEK LAP KOK LINK

CONTRACT TITLE
TUEN MUN - CHEK LAP KOK LINK - NORTHERN CONNECTION TUNNEL BUILDINGS, ELECTRICAL AND MECHANICAL WORKS

CLIENT
路政署
HIGHWAYS DEPARTMENT
港珠澳大橋香港工程管理處
Hong Kong - Zhuhai - Macao Bridge
Hong Kong Project Management Office

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Figure 1.2b

ISSUE/REVISION

I/R	DATE	DESCRIPTION	CHK.
A	JAN.18	TENDER ADDENDUM NO.1	SYLC
	DEC.17	TENDER DRAWING	SYLC

STATUS

SCALE: A1 1 : 2500
DIMENSION UNIT: MILLIMETRES

KEY PLAN

PROJECT NO.: 60240249
CONTRACT NO.: HY/2017/10

SHEET TITLE
ZONING PLAN
(SHEET 2)

SHEET NUMBER
60240249/C4/7062A

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AECOM

PROJECT
TUEN MUN -
CHEK LAP KOK LINK

CONTRACT TITLE
TUEN MUN - CHEK LAP KOK LINK - NORTHERN CONNECTION TUNNEL BUILDINGS, ELECTRICAL AND MECHANICAL WORKS

CLIENT
路政署
HIGHWAYS DEPARTMENT
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Hong Kong Project Management Office

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Figure 1.2c

ISSUE/REVISION

A	JAN.18	TENDER ADDENDUM NO.1	SYLC
	DEC.17	TENDER DRAWING	SYLC
	DATE	DESCRIPTION	CHK.

STATUS

SCALE
A1 1 : 2500

DIMENSION UNIT
MILLIMETRES

KEY PLAN

PROJECT NO.
60240249

CONTRACT NO.
HY/2017/10

SHEET TITLE
ZONING PLAN
(SHEET 3)

SHEET NUMBER
60240249/C4/7063A

Termination proposal for construction EM&A programme was approved by EPD on 26 March 2021. The construction phase EM&A programme of the Contract has been terminated since 26 March 2021.

1.2 SCOPE OF REPORT

This is the Final EM&A Report under the *Contract No. HY/2017/10 Tuen Mun – Chek Lap Kok Link – Northern Connection Tunnel Buildings, Electrical and Mechanical Works*. This report presents a summary of the environmental monitoring and audit works from 7 June 2018 to 26 March 2021.

1.3 ORGANIZATION STRUCTURE

The organization structure of the Contract is shown in *Appendix A*. The key personnel contact names and contact details are summarized in *Table 1.1* below.

Table 1.1 Contact Information of Key Personnel

Party	Position	Name	Telephone	Fax
HyD (Highways Department)	Project Coordinator	Joseph Lee	2762 4958	3188 6614
	Senior Engineer	Cheng Pan	2762 3383	3188 6614
ER (AECOM Asia Company Limited)	Principle Resident Engineer	S. W. Fok	2293 6200	2293 6300
	Resident Engineer	Desmond Fung	2293 6200	2293 6300
ENPO / IEC (Ramboll Hong Kong Ltd.)	ENPO Leader	Y.H. Hui	3465 2850	3465 2899
	IEC	Dr. F.C. Tsang	3465 2851	3465 2899
		Manson Yeung (1)	9700 6767	3465 2899
		Brian Tam (2)	9700 6767	3465 2899
Contractor (Gammon Construction Limited)	Site Agent	H. H. Lee	6096 6281	-
	Environmental Officer	Phoebe Ng	9869 1105	-
ET (ERM-HK)	ET Leader	Dr. Jasmine Ng	2271 3311	2723 5660

(1) The role and responsibilities as the IEC of the Contract has been taken up by Mr Manson Yeung instead of Dr. F.C. Tsang since 18 May 2020.
(2) The role and responsibilities as the IEC of the Contract has been taken up by Mr Brian Tam instead of Mr. Manson Yeung since 12 April 2021.

1.4 SUMMARY OF CONSTRUCTION WORKS

As informed by the Contractor, details of the major works carried out during the course of this Contract are listed below:

Land-based Works

- Site preparation works, Bar bending, Timber formwork, Concreting, Electrical and Mechanical Works, Architectural Builder's Work and Finishes and Handover Inspection at Toll Control Building/Main Control Building;

- Bar bending and Timber formwork, Architectural, Builder's Work and Finishing, Electrical and Mechanical Works and Handover Inspection at Ventilation Plant Room;

- ER's and the Contractor's site offices erection at WA18;

- Additional land ground investigation (GI), Socket H-pilling, Excavation, Building Structure, Electrical and Mechanical Works, Architectural Builders Work and Finishes and Handover Inspection at Administration Building, Trial pits and laboratory testing;

- Electrical and Mechanical Works and Handover Inspection at North Ventilation Building;

- Additional land ground investigation (GI), Socket H-pilling, Excavation, Building Structure, Electrical and Mechanical Works, Architectural Builders Work and Finishes and Handover Inspection at Maintenance Depot, Trial pits and laboratory testing;

- Pre-drilling, Socket H-piling, Excavation, Building Structure, Electrical and Mechanical Works, Architectural Builder's Work, Handover Inspection , External Cladding & Louvre Installation, Final Finishing Works and Minor Work at Customs & Excise Department Building;

- Trial pits, Pre-drilling, Socket H-piling, Excavation, Building Structure, Electrical and Mechanical Works, Architectural Builder's Work, Handover Inspection and Minor Work at Fire Service Department Building;

- Electrical and Mechanical Works, Architectural Builder's Work and Finishes, Handover Inspection and Minor Work at N1;

- Electrical and Mechanical Works and Architectural Builders' Works and Finishes, Handover Inspection and Minor Work at Kiosk N2;

- Electrical and Mechanical Works, Architectural Builder's Work and Finishes and Handover Inspection at Underpass at C3 area;

- Electrical and Mechanical Works, Architectural Builder's Work and Finishes, T&C and FSI at the Tunnel;

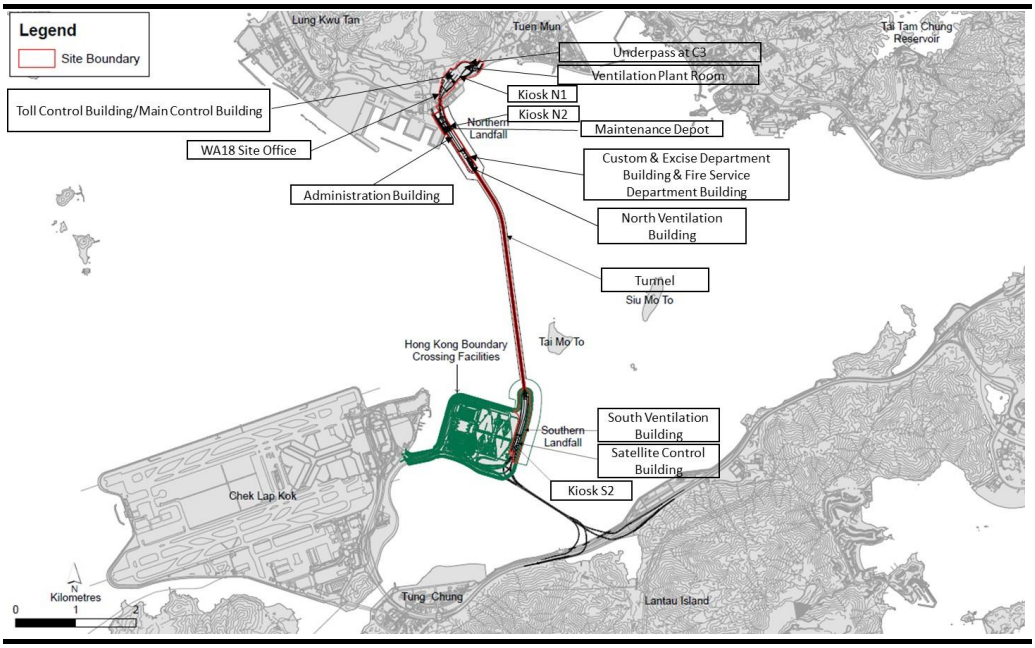
- Excavation, Building Structure, Electrical and Mechanical Works, Architectural Builders Work and Finishes and Handover Inspection at Satellite Control Building;

- Building Structure at Kiosk S1;
- Building Structure, Electrical and Mechanical Works, Architectural Builders Work and Finishes, Handover Inspection and Minor Work at Kiosk S2;
- Electrical and Mechanical Works and Handover Inspection at South Ventilation Building;
- Building Structure, Electrical and Mechanical Works and Architectural Builders Work and Finishes at Toll Booth; and
- Soil Mix and Landscape Works at Northern Landfall and Southern Landfall.

The locations of the construction activities are shown in *Figure 1.3*. The Environmental Sensitive Receivers in the vicinity of the Contract are shown in *Figure 1.4*.

The implementation schedule of environmental mitigation measures is presented in *Appendix B*.

Figure 1.3 Locations of Major Construction Activities during the course of this Contract



1.5 SUMMARY OF EM&A PROGRAMME REQUIREMENTS

The EM&A programme required environmental monitoring for air quality and environmental site inspections for air quality, waste management and landscape and visual impacts. The EM&A requirements and related findings for each component are described in the following sections, which include:

- Monitoring parameters;

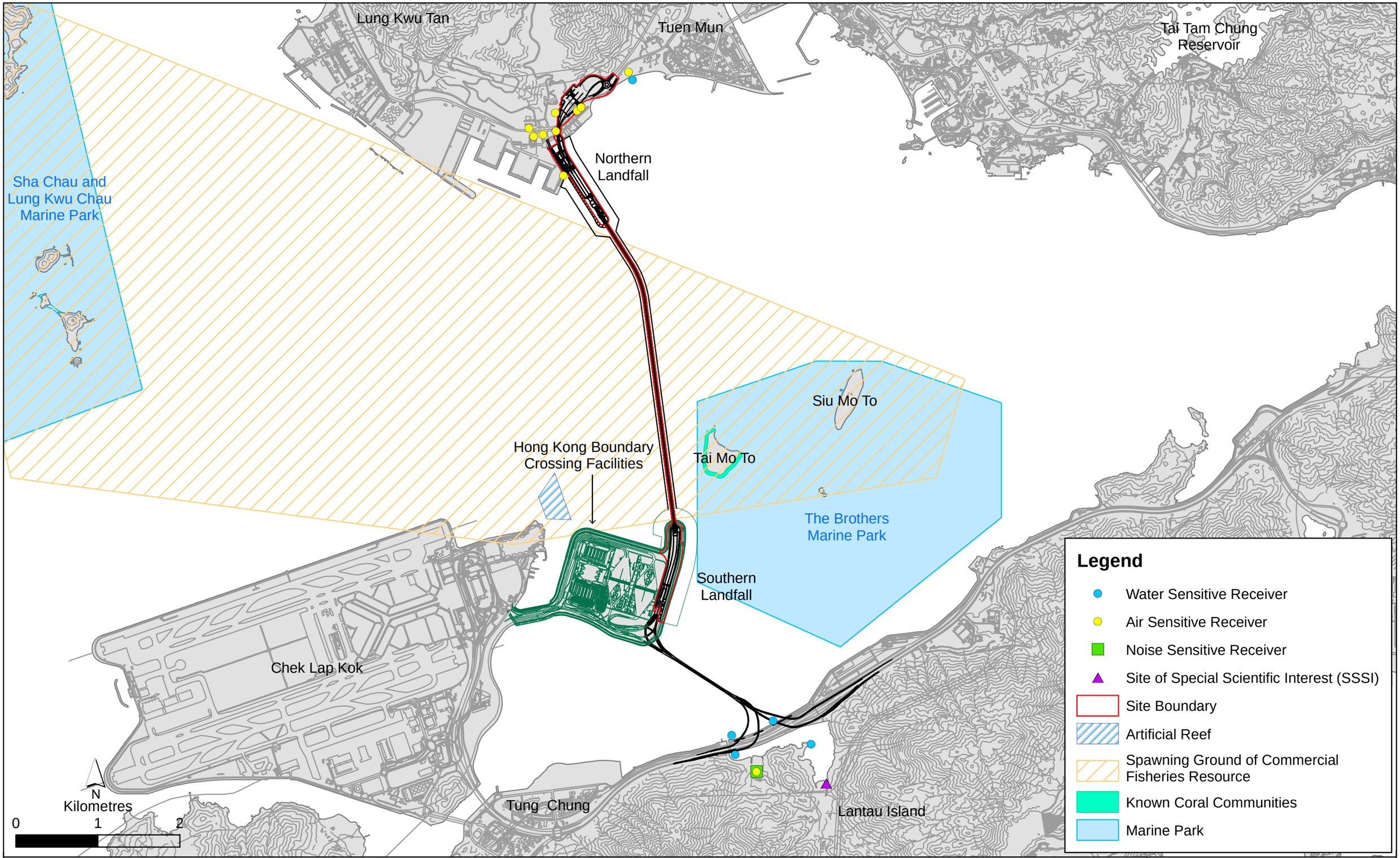


Figure 1.4

Environmental Sensitive Receivers in the Vicinity of the Project

File: T:\GIS\CONTRACT\0463091\mxd\0463091_Environmental_Sensitive_Receivers.mxd
Date: 12/7/2018

Environmental Resources Management

ERM

- Action and Limit levels for all environmental parameters;
- Event Action Plan;
- Tested environmental impact hypotheses;
- Environmental mitigation measures, as recommended in the approved EIA Report; and
- Environmental requirement in contract documents.

2 EM&A RESULTS

The EM&A programme required environmental monitoring for air quality and environmental site inspections for air quality, waste management and landscape and visual impacts. The EM&A requirements and related findings for each component are summarized in the following sections

2.1 AIR QUALITY

2.1.1 Monitoring Requirements and Equipment

In accordance with the Updated EM&A Manual and the Enhanced TSP Monitoring Plan, impact 1-hour TSP monitoring was conducted three (3) times every six (6) days and impact 24-hour TSP monitoring was carried out once every six (6) days when the highest dust impact was expected. 1-hr and 24-hr TSP monitoring frequency was increased to three times per day every three days and daily every three days, respectively, as excavation works for launching shaft under *Contract No. HY/2012/08 Tuen Mun-Chek Lap Kok Link – Northern Connection Sub-sea Tunnel Section* commenced on 24 October 2014.

Results of air quality monitoring were adopted from the published EM&A data of *Contract No. HY/2012/08 Tuen Mun-Chek Lap Kok Link – Northern Connection Sub-sea Tunnel Section* [(1)].

The Action and Limit Levels of the air quality monitoring were adopted from the published EM&A reports of *Contract No. HY/2012/08 Tuen Mun-Chek Lap Kok Link – Northern Connection Sub-sea Tunnel Section* [(2)]. The Action and Limit Levels are provided in *Appendix C*.

The locations of the monitoring stations overlapped with Contract No. HY/2012/08 are shown in *Figure 2.1* and presented in *Table 2.1*.

Informed by the Environmental Team of *Contract No. HY/2012/08 Tuen Mun-Chek Lap Kok Link – Northern Connection Sub-sea Tunnel Section*, excavation works for lauching shaft were completed and notification of change on air quality monitoring frequency was submitted to EPD on 14 September 2020. 1-hr and 24-hr TSP monitoring frequency was changed to three times per day every six days and daily every six days, respectively, since 14 September 2020.

Notification of temporary suspension of air quality monitoring has been approved by EPD on 16 March 2021.

(1) Published EM&A data for impact air quality monitoring by *Contract No. HY/2012/08* are available at: http://www.hzmbenpo.com/

(2) Published EM&A reports of *Contract No. HY/2012/08* are available at: http://www.hzmbenpo.com/

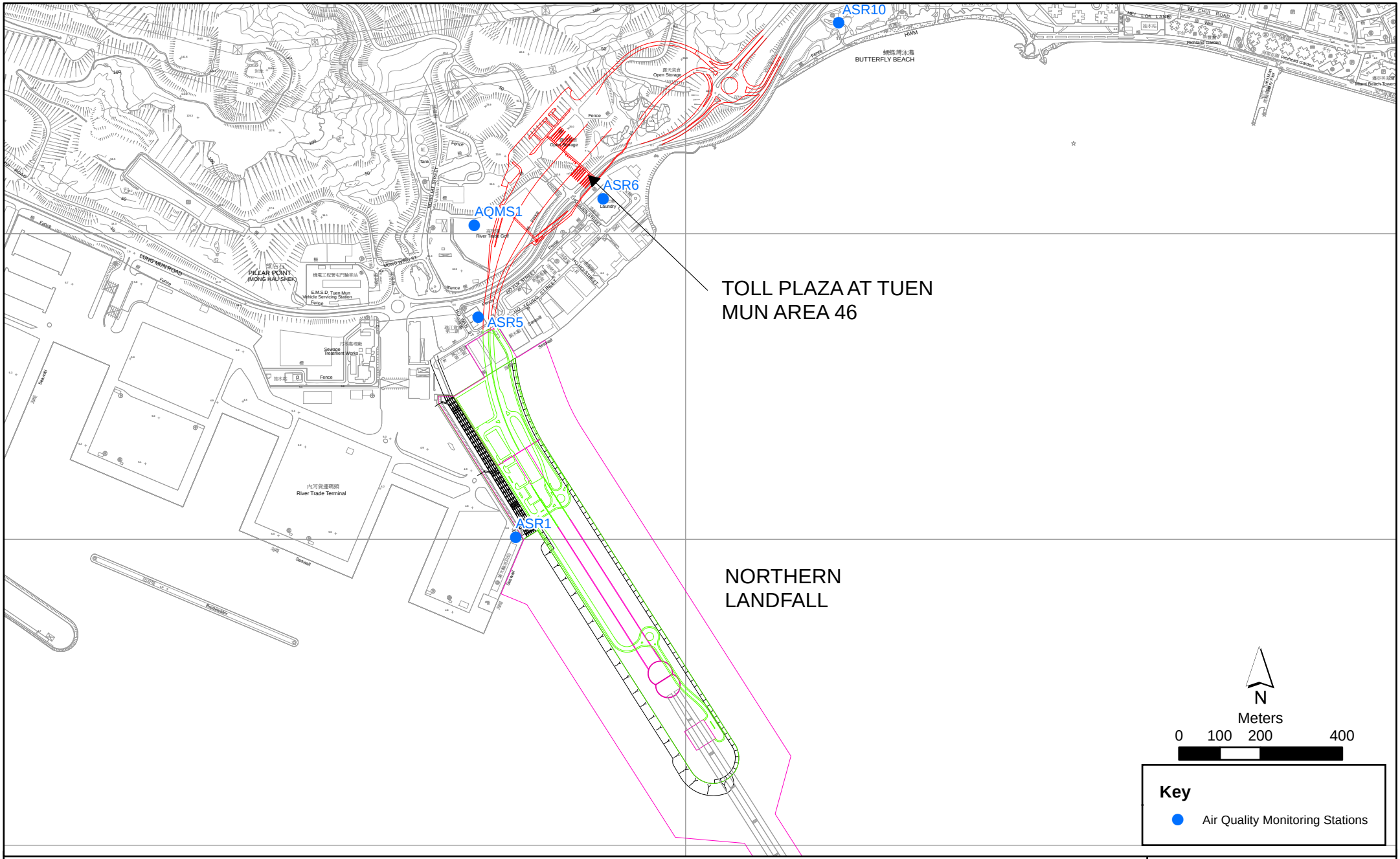


Figure 2.1

Air Quality Monitoring Stations for the Enhanced TSP Monitoring
(Source: Adopted from Contract No. HY/2012/08 Tuen Mun-Chek Lap Kok Link - Northern Connection Sub-sea Tunnel Section)

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Date: 21/2/2014

Environmental Resources Management

ERM

Table 2.1 Locations of Impact Air Quality Monitoring Stations and its Corresponding Monitoring Requirements

Monitoring Station	Monitoring Period	Location	Description	Parameters & Frequency
ASR1	From 1 June 2018 to 26 March 2021	Tuen Mun Fireboat Station	Office	TSP monitoring • 1-hour Total Suspended Particulates (1-hour TSP, µg/m³), 3 times in every 6 days • 24-hour Total Suspended Particulates (24-hour TSP, µg/m³), daily for 24-hour in every 6 days Enhanced TSP monitoring (commenced on 24 October 2014 under *Contract No. HY/2012/08*) • 1-hour Total Suspended Particulates (1-hour TSP, µg/m³), 3 times in every 3 days • 24-hour Total Suspended Particulates (24-hour TSP, µg/m³), daily for 24-hour in every 3 days
ASR5		Pillar Point Fire Station	Office	
AQMS1		Previous River Trade Golf	Bare ground	
ASR6		Butterfly Beach Laundry	Office	
ASR10		Butterfly Beach Park	Recreational uses	

2.1.2 *Results and Observations*

Results of air quality monitoring were adopted from the published EM&A data of *Contract No. HY/2012/08 Tuen Mun-Chek Lap Kok Link – Northern Connection Sub-sea Tunnel Section* [(1)].

Fifty-six (56) Action Level exceedances and eleven (11) Limit Level exceedances for 1-hour TSP and four (4) Action Level exceedances for 24-hour TSP were recorded by the Environmental Team of Contract No. *HY/2012/08* during the course of this Contract. The exceedances were considered not related to this Contract upon further investigation. No action is required to be undertaken in accordance with the Event Action Plan as presented in *Appendix D*.

2.2 *LANDFILL GAS HAZARD MONITORING*

In accordance with the Updated EM&A Manual of the TM-CLK Link Project, landfill gas hazard monitoring should be perform to ensure that the works area at Pillar Point Valley (PPV) Landfill is free of landfill gas during any excavations works. A total of 445 days of landfill gas hazard monitoring was conducted during the course of this Contract.

The schedules for landfill gas hazard monitoring were provided in the *Eighth, Tenth* to *Twelfth, Fourteenth* to *Twentieth, Twenty-sixth* to *Thirty-fourth Monthly EM&A Reports.*

(1) Published EM&A data for impact water quality monitoring by *Contract No. HY/2012/08* are available at: http://www.hzmbenpo.com/

The Action and Limit Levels of the landfill gas hazard monitoring were adopted from the Undated EM&A Manual of the TM-CLK Link Project and are provided in *Appendix C*.

2.2.1 Results and Observations

Results for landfill gas hazard monitoring are summarized in *Table 2.2* and the monitoring results were presented graphycally in *Appendix E*.

No exceedance of Action and Limit Levels for methane, oxygen and carbon dioxide was recorded during the course of this Contract.

Table 2.2 Summary of Landfill Gas Hazard Monitoring Results during the course of this Contract

		Average (%)	Range (%)	Action / Limit Level (%)
January 2019, March – May 2019, July 2019 - January 2020 [(b)], July 2020 – March 2021 [(c)] [(a)]	Methane	0	0	10/20
	Oxygen	20.8	20.7-20.9	19/18
	Carbon Dioxide	0.04	0.03-0.08	0.5/1.5

Notes:

(a) Depending on the results of the measurements, actions required will vary. Actions in the event of landfill gas being detected in excavation/confined area was adopted from the Updated EM&A Manual of the TM-CLK Link Project.

(b) No landfill gas monitoring was scheduled since 25 January 2020 as no excavation work at Toll Control Building/Main Control Building was undertaken since 25 January 2020.

(c) No landfill gas monitoring was scheduled in June 2020 as no excavation work at Main Control Building was undertaken in June 2020.

2.3 EM&A SITE INSPECTION

Site inspections were carried out on weekly basis to monitor the implementation of proper environmental pollution control and mitigation measures under the Contract. One hundred and forty seven (147) site inspections were carried out during the course of this Contract. Key observations were summarized in the section of *EM&A Site Inspection* in the *First to Thirty-fourth Monthly EM&A Reports*. The Contractor has rectified all of the observations identified during environmental site inspections during the course of this Contract.

2.4 WASTE MANAGEMENT STATUS

The Contractor had submitted application form for registration as chemical waste producer under the Contract. Sufficient numbers of receptacles were available for general refuse collection and sorting.

Wastes generated during the course of this Contract included mainly construction wastes (inert and non-inert). Reference has been made to the waste flow table prepared by the Contractor (*Appendix F*).

Waste monitoring and audit programme has been undertaken during the impact monitoring period. Wastes arising from this Contract have been managed in accordance with the recommendations in the EIA Report, the EM&A Manual, the Waste Management Plan and other relevant statutory requirements.

2.5 *ENVIRONMENTAL LICENSES AND PERMITS*

The status of environmental licensing and permit is summarized in *Table 2.4* below.

Table 2.4 Summary of Environmental Licensing and Permit Status

License/ Permit	License or Permit No.	Date of Issue	Date of Expiry	License/ Permit Holder	Remarks
Environmental Permit	EP-354/2009/D	13 March 2015	N/A	HyD	Tuen Mun- Chek Lap Kok Link
APCO Construction Dust Notification	433493	14 May 2018	N/A	GCL	For Tuen Mun working area
Construction Waste Billing Account	7030836	15 May 2018	N/A	GCL	N/A
Chemical Waste Producer Registration	5213-422-G2827-01	13 June 2018	N/A	GCL	N/A
Discharge License under WPCO for Buildings at C2 area	WT00031783-2018	22 October 2018	31 October 2023	GCL	Sampling Frequency: Bimonthly
Discharge License under WPCO for Buildings at C3 area	WT00032062-2018	30 October 2018	31 October 2023	GCL	Sampling Frequency: Quarterly
Discharge License under WPCO for Southern Landfall	WT00034878-2019	1 April 2020	31 March 2025	GCL	Sampling Frequency: Quarterly
Construction Noise Permit	GW-RW0262-18	9 July 2018	9 January 2019	GCL	For Toll Control Building, Administration Building and WA18
Construction Noise Permit	GW-RW0384-18	14 September 2018	6 March 2019	GCL	For Toll Control Building, Administration Building, Maintenance Depot and WA18
Construction Noise Permit	GW-RW0451-18	2 November 2018	25 April 2019	GCL	For Toll Control Building, Administration Building, Maintenance Depot and WA18
Construction Noise Permit	GW-RW0560-18	28 December 2018	18 June 2019	GCL	For Toll Control Building, Administration Building, Maintenance Depot and WA18
Construction Noise Permit	GW-RW0037-19	28 January 2019	23 July 2019	GCL	For Toll Control Building, Administration Building, Maintenance Depot and WA18
Construction Noise Permit	GW-RW0135-19	27 March 2019	30 September 2019	GCL	For Toll Control Building, Administration Building, Maintenance Depot, FSD, C&ED, Bouundary Wall and WA18
Construction Noise Permit	GW-RW0267-19	21 June 2019	14 October 2019	GCL	For Toll Control Building, Administration Building, Maintenance Depot, FSD, C&ED, Bouundary Wall, Tunnel, Approach ramp, NVB, and WA18
Construction Noise	GW-RW0524-19	3 November 2019	29 April 2020	GCL	For Toll Control Building, Administration

License/ Permit	License or Permit No.	Date of Issue	Date of Expiry	License/ Permit Holder	Remarks
Permit					Building, Maintenance Depot, FSD, C&ED, Boundary Wall, Tunnel, Approach ramp, NVB and WA18
Construction Noise Permit	GW-RS0202-19	4 March 2019	3 September 2019	GCL	For Kiosk S2
Construction Noise Permit	GW-RS0340-19	18 April 2019	17 October 2019	GCL	For Kiosk S2
Construction Noise Permit	GW-RS0778-19	30 August 2019	28 Februry 2020	GCL	For Kiosk S2 and SCB
Construction Noise Permit	GW-RS1130-19	19 December 2019	18 June 2020	GCL	For Kiosk S2 and SCB
Construction Noise Permit	GW-RS0448-19	25 September 2019	14 December 2019	GCL	For Deck Void Lighting Installation
Construction Noise Permit	GW-RW0054-20	11 February 2020	11 August 2020	GCL	For Northern Landfall and Tunnel
Construction Noise Permit	GW-RW0351-20	3 August 2020	29 January 2021	GCL	For Northern Landfall and Tunnel
Construction Noise Permit	GW-RW0578-20	31 December 2020	14 June 2021	GCL	For Northern Landfall and Tunnel
Construction Noise Permit	GW-RW0003-21	30 January 2021	29 July 2021	GCL	For Northern Landfall and Tunnel
Construction Noise Permit	GW-RS0039-20	23 January 2020	22 July 2020	GCL	For HKBCF Area
Construction Noise Permit	GW-RS0413-20	19 June 2020	15 December 2020	GCL	For HKBCF Area
Construction Noise Permit	GW-RS0904-20	16 December 2020	14 June 2021	GCL	For HKBCF Area
Construction Noise Permit	GW-RW0501-20	27 October 2020	24 December 2020	GCL	For Lung Mun Road Overnight Works
Construction Noise Permit	GW-RW0578-20	31 December 2020	14 June 2021	GCL	For Lung Mun Road near Ho Wan Street

2.6 IMPLEMENTATION STATUS OF ENVIRONMENTAL MITIGATION MEASURES

In response to the site audit findings, the Contractors carried out all corrective actions.

A summary of the Implementation Schedule of Environmental Mitigation Measures (EMIS) is presented in *Appendix B*. The necessary mitigation measures relevant to this Contract were implemented properly.

2.7 SUMMARY OF EXCEEDANCES OF THE ENVIRONMENTAL QUALITY PERFORMANCE LIMIT

Fifty-six (56) Action Level exceedances and eleven (11) Limit Level exceedances for 1-hour TSP and four (4) Action Level exceedances for 24-hour TSP were recorded by the Environmental Team of Contract No. *HY/2012/08* during the course of this Contract. The exceedances were considered not related to this Contract upon further investigation. No action is required to be undertaken in accordance with the Event Action Plan as presented in *Appendix D*.

No exceedance of Action and Limit Levels for methane, oxygen and carbon dioxide was recorded landfill gas hazard monitoring during the course of this Contract.

Cumulative statistics are provided in *Appendix G*.

2.8 SUMMARY OF COMPLAINTS, NOTIFICATION OF SUMMONS AND SUCCESSFUL PROSECUTIONS

The Environmental Complaint Handling Procedure is provided in *Figure 2.2*.

There was one (1) environmental complaint received from EPD during the course of this Contract. Upon investigation, there were no adequate evidences to conclude that the complaint case was related to this Contract.

No notification of summons or successful prosecution was received during the course of this Contract.

Statistics on complaints, notifications of summons, successful prosecutions are summarized in *Appendix G*.

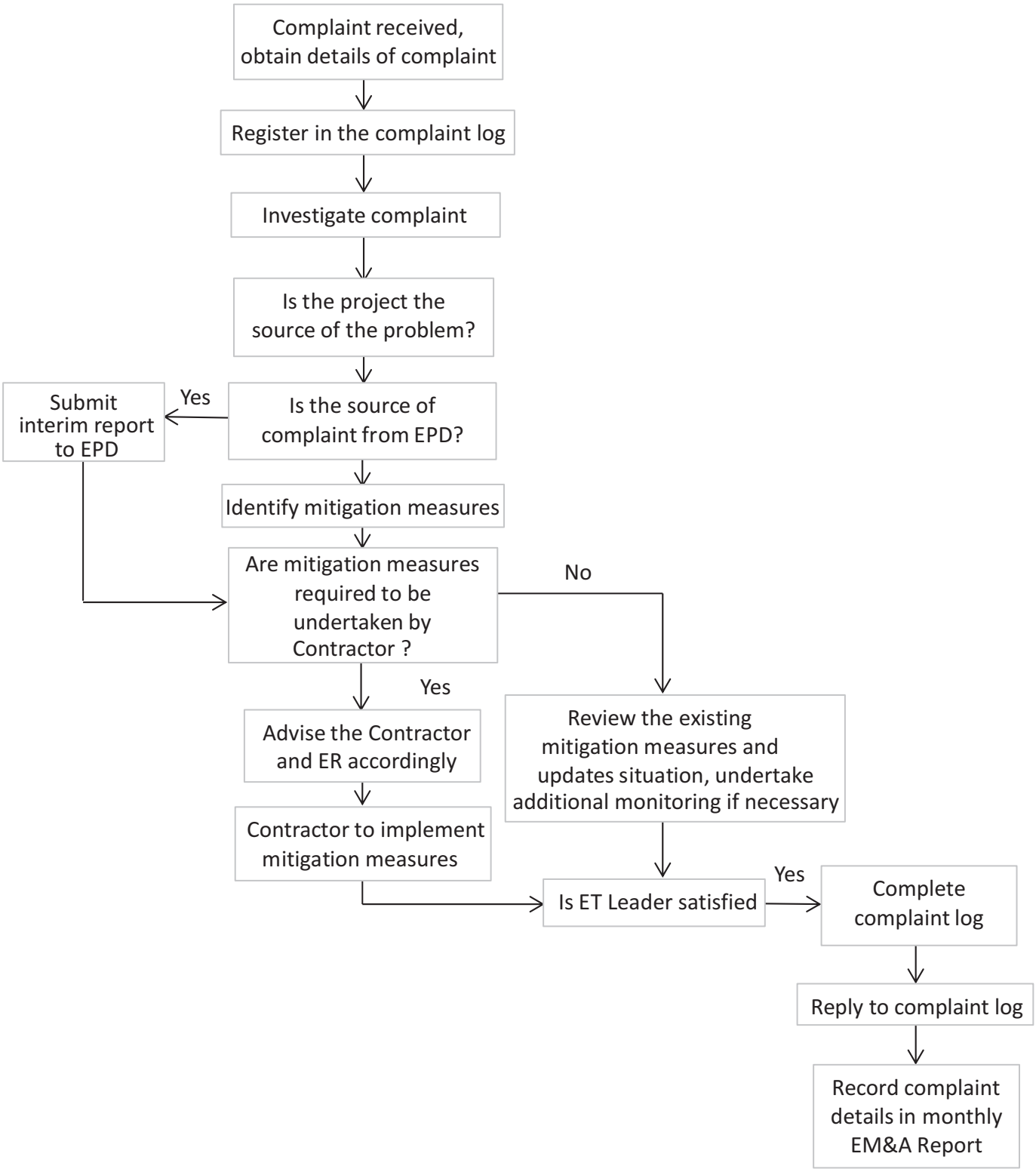

Figure 2.2 Environmental Complaint Handling Procedure

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DATE: 06/12/2013

Environmental Resources Management

ERM

3 CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

This Final EM&A Report presents the findings of the EM&A activities undertaken during the period from 7 June 2018 to 26 March 2021, in accordance with the Updated EM&A Manual and the requirements of EP-354/2009/D.

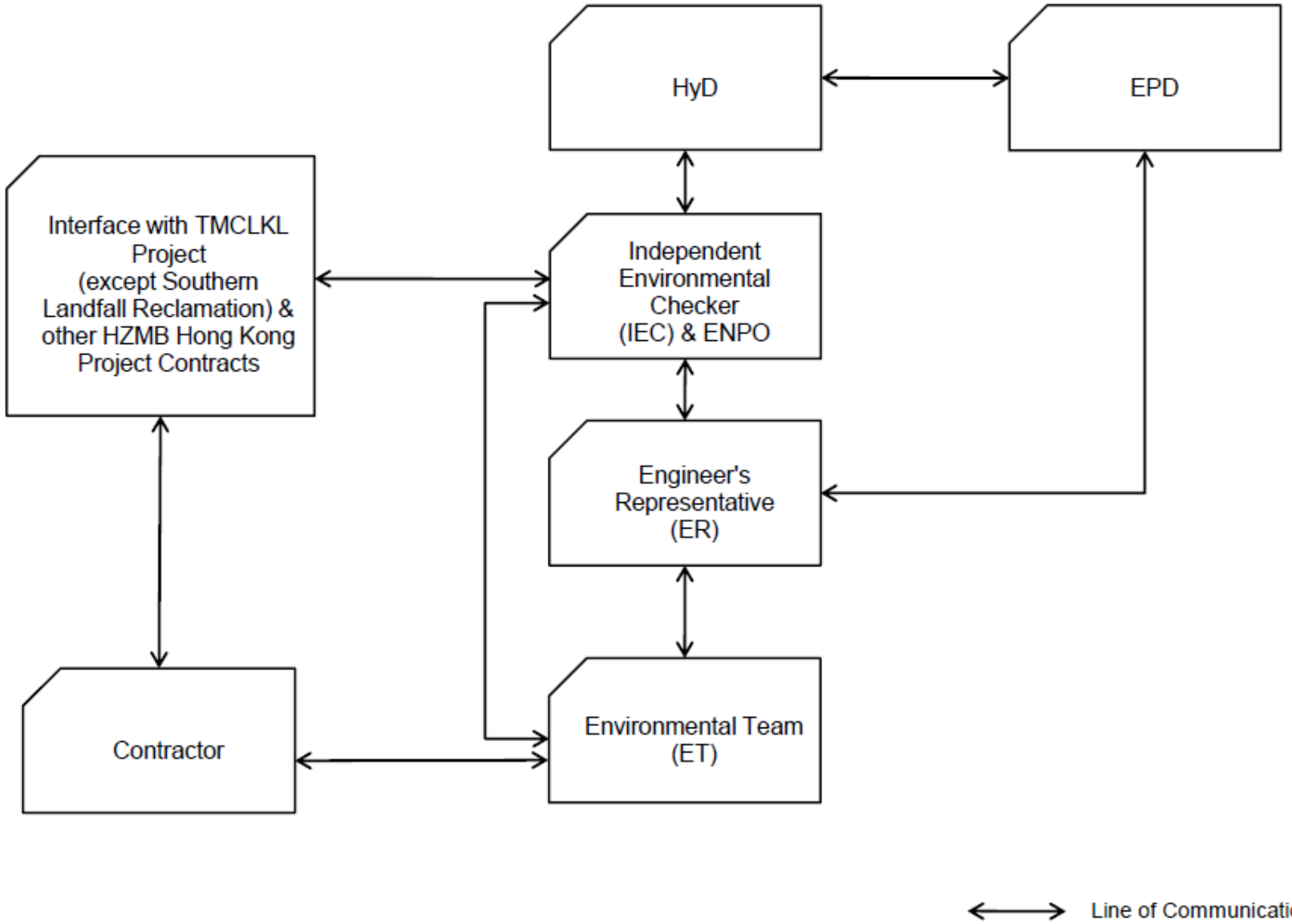
Termination proposal for construction EM&A programme was approved by EPD on 26 March 2021. The construction phase EM&A programme of the Contract has been terminated since 26 March 2021.

The review of monitoring data suggested that the construction works under this Contract have proceeded in an environmentally acceptable manner in the impact monitoring period. In general, the monitoring results were in line with EIA predictions.

The EM&A programme was considered as adequate and effective in monitoring impacts arising from the Contract.

Appendix A

Project Organization for Environmental Works



Appendix A1

DATE: 09/07/2018

Contract No. HY/2017/10 Northern Connection Tunnel Buildings, Electrical and Mechanical Works, Project Organization

Environmental Resources Management

ERM

Appendix B

Environmental Mitigation and Enhancement Measure Implementation Schedules

(In reference to CINOTECH (2011) Agreement No. CE35/2011 EP Baseline Environmental Monitoring for Hong Kong-Zhuhai-Macao Bridge Tuen Mun-Chep Lap Kok Link – Investigation. Updated EM&A Manual for Tuen Mun-Chek Lap Kok Link)

Contract No. HY/2017/10
Tuen Mun – Chek Lap Kok Link
Northern Connection Tunnel Buildings, Electrical and Mechancial Works
Environmental Mitigation and Enhancement Measure Implementation Schedule

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
Air Quality									
4.8.1	3.8	Watering of the construction sites in Lantau for 8 times/day and in Tuen Mun for 12 times/day to reduce dust emissions by 87.5% and 91.7% respectively and shall be undertaken.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		✓
4.8.1	3.8	The Contractor shall, to the satisfaction of the Engineer, install effective dust suppression measures and take such other measures as may be necessary to ensure that at the Site boundary and any nearby sensitive receiver, dust levels are kept to acceptable levels.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		✓
4.8.1	3.8	The Contractor shall not burn debris or other materials on the works areas.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		✓
4.8. 1	3.8	In hot, dry or windy weather, the watering programme shall maintain all exposed road surfaces and dust sources wet.	All unpaved haul roads / throughout construction period in hot, dry or windy weather	Contractor	TMEIA Avoid smoke impacts and disturbance		Y		✓
4.8.1	3.8	Where breaking of oversize rock/concrete is required, watering shall be implemented to control dust. Water spray shall be used during the handling of fill material at the site and at active cuts, excavation and fill sites where dust is likely to be created.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		✓
4.8. 1	3.8	Open dropping heights for excavated materials shall be controlled to a maximum height of 2m to minimise the fugitive dust arising from unloading.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		✓
4.8.1	3.8	During transportation by truck, materials shall not be loaded to a level higher than the side and tail boards, and shall be dampened or covered before transport.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		✓
4.8.1	3.8	Materials having the potential to create dust shall not be loaded to a level higher than the side and tail boards, and shall be covered by a clean tarpaulin. The tarpaulin shall be properly secured and shall extend at least 300mm over the edges of the side and tail boards.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		✓
4.8.1	3.8	No earth, mud, debris, dust and the like shall be deposited on public roads. Wheel washing facility shall be usable prior to any earthworks excavation activity on the site.	All site exits / throughout construction period	Contractor	TMEIA Avoid dust		Y		✓

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
4.8.1	3.8	Areas of exposed soil shall be minimised to areas in which works have been completed shall be restored as soon as is practicable.	All exposed surfaces / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		✓
4.8.1	3.8	All stockpiles of aggregate or spoil shall be enclosed or covered and water applied in dry or windy condition.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		✓
4.11	Section 3	EM&A in the form of 1 hour and 24 hour dust monitoring and site audit.	All representative existing ASRs/ throughout construction periood	Contractor	EM&A Manual		Y		N/A (Results adopted from published EM&A data of Contract No. HY.2012/08)
WATER QUALITY (LAND WORKS)									
6.10	-	Wastewater from temporary site facilities should be controlled to prevent direct discharge to surface or marine waters.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	Sewage effluent and discharges from on- site kitchen facilities shall be directed to Government sewer in accordance with the requirements of the WPCO or collected for disposal offsite. The use of soakaways shall be avoided.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	Storm drainage shall be directed to storm drains via adequately designed sand/silt removal facilities such as sand traps, silt traps and sediment basins. Channels, earth bunds or sand bag barriers should be provided on site to properly direct stormwater to such silt removal facilities. Catchpits and perimeter channels should be constructed in advance of site formation works and earthworks.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	Silt removal facilities, channels and manholes shall be maintained and any deposited silt and grit shall be removed regularly, including specifically at the onset of and after each rainstorm.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	Temporary access roads should be surfaced with crushed stone or gravel.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	Rainwater pumped out from trenches or foundation excavations should be discharged into storm drains via silt removal facilities.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	Measures should be taken to prevent the washout of construction materials, soil, silt or debris into any drainage system.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓

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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
6.10	-	Open stockpiles of construction materials (e.g. aggregates and sand) on site should be covered with tarpaulin or similar fabric during rainstorms.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	5.8	Manholes (including any newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris from getting into the drainage system, and to prevent storm run-off from getting into foul sewers.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	Discharges of surface run-off into foul sewers must always be prevented in order not to unduly overload the foul sewerage system.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	All vehicles and plant should be cleaned before they leave the construction site to ensure that no earth, mud or debris is deposited by them on roads. A wheel washing bay should be provided at every site exit.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	Wheel wash overflow shall be directed to silt removal facilities before being discharged to the storm drain.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	Section of construction road between the wheel washing bay and the public road should be surfaced with crushed stone or coarse gravel.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	Wastewater generated from concreting, plastering, internal decoration, cleaning work and other similar activities, shall be screened to remove large objects.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	Vehicle and plant servicing areas, vehicle wash bays and lubrication facilities shall be located under roofed areas. The drainage in these covered areas shall be connected to foul sewers via a petrol interceptor in accordance with the requirements of the WPCO or collected for off site disposal.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		N/A
6.10	-	The Contractor shall prepare an oil / chemical cleanup plan and ensure that leakages or spillages are contained and cleaned up immediately.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	Waste oil should be collected and stored for recycling or disposal, in accordance with the Waste Disposal Ordinance.	All areas/ throughout construction period	Contractor	TM-EIAO Waste Disposal Ordinance		Y		✓

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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
6.10	-	All fuel tanks and chemical storage areas should be provided with locks and be sited on sealed areas. The storage areas should be surrounded by bunds with a capacity equal to 110% of the storage capacity of the largest tank.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	Surface run-off from bunded areas should pass through oil/grease traps prior to discharge to the stormwater system.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		✓
6.10	-	Roadside gullies to trap silt and grit shall be provided prior to discharging the stormwater into the marine environment. The sumps will be maintained and cleaned at regular intervals.	Roadside/design and operation	Design Consultant/ Contractor	TM-EIAO	Y		Y	✓
6.10	Section 11	All construction works shall be subject to routine audit to ensure implementation of all EIA recommendations and good working practice.	All areas/ throughout construction period	Contractor	EM&A Manual		Y		✓
WASTE									
12.6		The Contractor shall identify a coordinator for the management of waste.	Contract mobilisation	Contractor	TMEIA		Y		✓
12.6		The Contractor shall prepare and implement a Waste Management Plan which specifies procedures such as a ticketing system, to facilitate tracking of loads and to ensure that illegal disposal of wastes does not occur, and protocols for the maintenance of records of the quantities of wastes generated, recycled and disposed. A recording system for the amount of waste generated, recycled and disposed (locations) should be established.	Contract mobilisation	Contractor	TMEIA, Works Branch Technical Circular No. 5/99 for the Trip-ticket System for Disposal of Construction and Demolition Material		Y		✓
12.6		The Contractor shall apply for and obtain the appropriate licenses for the disposal of public fill, chemical waste and effluent discharges.	Contract mobilisation	Contractor	TMEIA, Land (Miscellaneous Provisions) Ordinance (Cap 28); Waste Disposal Ordinance (Cap 354); Dumping at Sea Ordinance (Cap 466); Water Pollution Control Ordinance.		Y		✓
12.6	8.1	Training shall be provided to workers about the concepts of site cleanliness and appropriate waste management procedures including waste reduction, reuse and recycling.	Contract Mobilisation	Contractor	TMEIA		Y		✓

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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
12.6	8.1	The extent of cutting operation should be optimised where possible. Earth retaining structures and bored pile walls should be proposed to minimise the extent of cutting.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	The site and surroundings shall be kept tidy and litter free.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	No waste shall be burnt on site.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	The Contractor shall be prohibited from disposing of C&D materials at any sensitive locations. The Contractor should propose the final disposal sites in the EMP and WMP for approval before implementation.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Stockpiled material shall be covered by tarpaulin and /or watered as appropriate to prevent windblown dust/ surface run off.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Excavated material in trucks shall be covered by tarpaulins to reduce the potential for spillage and dust generation.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Wheel washing facilities shall be used by all trucks leaving the site to prevent transfer of mud onto public roads.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	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/plastic facing for construction works should be considered. The use of wooden hoardings should be avoided and metal hoarding should be used to facilitate recycling. Purchasing of construction materials should avoid over-ordering and wastage.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	The Contractor should recycle as many C&D materials (this is a waste section) 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.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	All falsework will be steel instead of wood.	All areas / throughout construction period	Contractor	TMEIA		Y		✓

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
12.6	8.1	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 as follows: *f* suitable for the substance to be held, resistant to corrosion, maintained in good conditions and securely closed; *f* Having a capacity of <450L unless the specifications have been approved by the EPD; and w Chinese according to the instructions prescribed in Schedule 2 of the Regulations. *f* Clearly labelled and used solely for the storage of chemical wastes; *f* Enclosed with at least 3 sides; *f* Impermeable floor and bund with capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in the area, whichever is greatest; *f* Adequate ventilation; *f* Sufficiently covered to prevent rainfall entering (water collected within the bund must be tested and disposed of as chemical waste, if necessary); and *f* Incompatible materials are adequately separated.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Waste oils, chemicals or solvents shall not be disposed of to drain,	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	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.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	Night soil should be regularly collected by licensed collectors.	All areas / throughout construction period	Contractor	TMEIA		Y		N/A

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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
12.6	8.1	General refuse arising on-site should be stored in enclosed bins or compaction units separately from C&D and chemical wastes. 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 daily and shall be disposed of to the nearest licensed landfill or refuse transfer station. Burning of refuse on construction sites is prohibited.	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	All waste containers shall be in a secure area on hardstanding;	All areas / throughout construction period	Contractor	TMEIA		Y		✓
12.6	8.1	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.	Site Offices/ throughout construction period	Contractor	TMEIA		Y		✓
12.6	Section 8	EM&A of waste handling, storage, transportation, disposal procedures and documentation through the site audit programme shall be undertaken.	All areas / throughout construction period	Contractor	EM&A Manual		Y		✓
LANDSCAPE AND VISUAL									
10.9	7.6	Existing trees on boundary of the Project Area shall be carefully protected during construction. Detailed Tree Protection Specification shall be provided in the Contract Specification. Under this specification, the Contractor shall be required to submit, for approval, a detailed working method statement for the protection of trees prior to undertaking any works adjacent to all retained trees, including trees in contractor's works areas (Tree protection measures will be detailed at Tree Removal Application Stage) (CM1)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		N/A
10.9	7.6	Trees unavoidably affected by the works shall be transplanted where practical. Trees will be transplanted straight to their final receptor site and not held in a temporary nursery. A detailed Tree Transplanting Specification shall be provided in the Contract Specification. Sufficient time for necessary tree root and crown preparation periods shall be allowed in the project programme (CM2)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		N/A
10.9	7.6	Hillside and roadside screen planting to proposed roads, associated structures and slope works (CM3)	All areas/detailed design/ during construction/post construction	Design Consultant/ Contractor	TMEIA	Y	Y		N/A
10.9	7.6	Hydroseeding or sheeting of soil stockpiles with visually unobstrusive material (in earth tone) (CM4)	All areas/detailed design/ during construction/post construction	Design Consultant/ Contractor	TMEIA	Y	Y		✓

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Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Status *
						D	C	O	
10.9	7.6	Screening of construction works by hoardings around works area in visually unobtrusive colours, to screen works (CM5)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		N/A
10.9	7.6	Control night-time lighting and glare by hooding all lights (CM6)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		N/A
10.9	7.6	Ensure no run-off into water body adjacent to the Project Area (CM7)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		✓
10.9	7.6	Avoidance of excessive height and bulk of buildings and structures (CM8)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		✓
10.9	7.6	Recycle/ Reuse all felled trees and vegetation, e.g. mulching (CM9)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		N/A
10.9	7.6	Compensatory tree planting shall be provided to the satisfaction of relevant Government departments. Required numbers and locations of compensatory trees shall be determined and agreed separately with Government during the Tree Felling Application process under ETWBTC 3/2006 (CM10)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		N/A
10.9	7.6	Re-vegetation of affected woodland/shrubland with native species (OM1)	All areas/detailed design/ during construction/ during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	n/a. To be implemented by AFCD/HyD/L CSD
10.9	7.6	Tall buffer screen tree / shrub / climber planting should be incorporated to soften hard engineering structures and facilities (OM2)	All areas/detailed design/ during construction/ during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	n/a. To be implemented by AFCD/HyD/L CSD
10.9	7.6	Streetscape elements (e.g. paving, signage, street furniture, lighting etc.) shall be sensitively designed in a manner that responds to the local context, and minimises potential negative landscape and visual impacts. Lighting units should be directional and minimise unnecessary light spill (OM3)	All areas/detailed design/ during construction / during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	n/a. To be implemented by HyD/LCSD
10.9	7.6	Structure, ornamental tree / shrub / climber planting should be provided along roadside amenity strips, central dividers and newly formed slopes to enhance the townscape quality and further greenery enhancement (OM4)	All areas/detailed design/ during construction / during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	n/a. To be implemented by HyD/LCSD
10.9	7.6	Aesthetically pleasing design (visually unobtrusive and non-reflective) as regard to the form, material and finishes	All areas/detailed design/ during construction / during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	n/a. To be implemented by HyD

* **Remarks:**

✓	Compliance of Mitigation Measures
<>	Compliance of Mitigation but need improvement
x	Non-compliance of Mitigation Measures
▲	Non-compliance of Mitigation Measures but rectified by Contractor
Δ	Deficiency of Mitigation Measures but rectified by Contractor
N/A	Not Applicable in Reporting Period

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government

Appendix C

Summary of Action and Limit Levels

Table C1 *Action and Limit Levels for 1-hour and 24-hour TSP*

Parameters	Action	Limit
24 Hour TSP Level in μg/m³	ASR1 = 213 ASR5 = 238 AQMS1 = 213 ASR6 = 238 ASR10 = 214	260
1 Hour TSP Level in μg /m³	ASR1 = 331 ASR5 = 340 AQMS1 = 335 ASR6 = 338 ASR10 = 337	500

Table C2 *Actions in the Event of Landfill Gas being Detected in Excavation / Confined Area*

Parameter	Measurement	Action
Oxygen	< 19%	- Ventilate to restore oxygen to > 19%
	< 18%	- Stop work - Evacuate personnel / prohibit entry - Increase ventilation to restore to > 19%
Methane	> 10% LEL (> 0.5% v/v)	- Prohibit hot work - Ventilate to restore methane to < 10% LEL
	> 20% LEL (>1% v/v)	- Stop work - Evacuate personnel / prohibit entry - Increase ventilation to restore to < 10%
Carbon Dioxide	> 0.5%	- Ventilate to restore oxygen to < 0.5%
	> 1.5%	- Stop work - Evacuate personnel / prohibit entry - Increase ventilation to restore to < 0.5%

Appendix D

Event Action Plan

Appendix D1 Event/ Action Plan for Air Quality

	ACTION			
EVENT	**ET** [(1)]	**IEC** [(1)]	**ER** [(1)]	**Contractor**
Action Level				
1. Exceedance for one sample	1. Identify the source. 2. Inform the IEC and the ER. 3. Repeat measurement to confirm finding. 4. Increase monitoring frequency to daily.	1. Check monitoring data submitted by the ET. 2. Check Contractor's working method.	1. Notify Contractor.	1. Rectify any unacceptable practice 2. Amend working methods if appropriate
2. Exceedance for two or more consecutive samples	1. Identify the source. 2. Inform the IEC and the ER. 3. Repeat measurements to confirm findings. 4. Increase monitoring frequency to daily. 5. Discuss with the IEC and the Contractor on remedial actions required. 6. If exceedance continues, arrange meeting with the IEC and the ER. 7. If exceedance stops, cease additional monitoring.	1. Check monitoring data submitted by the ET. 2. Check the Contractor's working method. 3. Discuss with the ET and the Contractor on possible remedial measures. 4. Advise the ER on the effectiveness of the proposed remedial measures. 5. Supervise implementation of remedial measures.	1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. Ensure remedial measures properly implemented.	1. Submit proposals for remedial actions to IEC within 3 working days of notification 2. Implement the agreed proposals 3. Amend proposal if appropriate

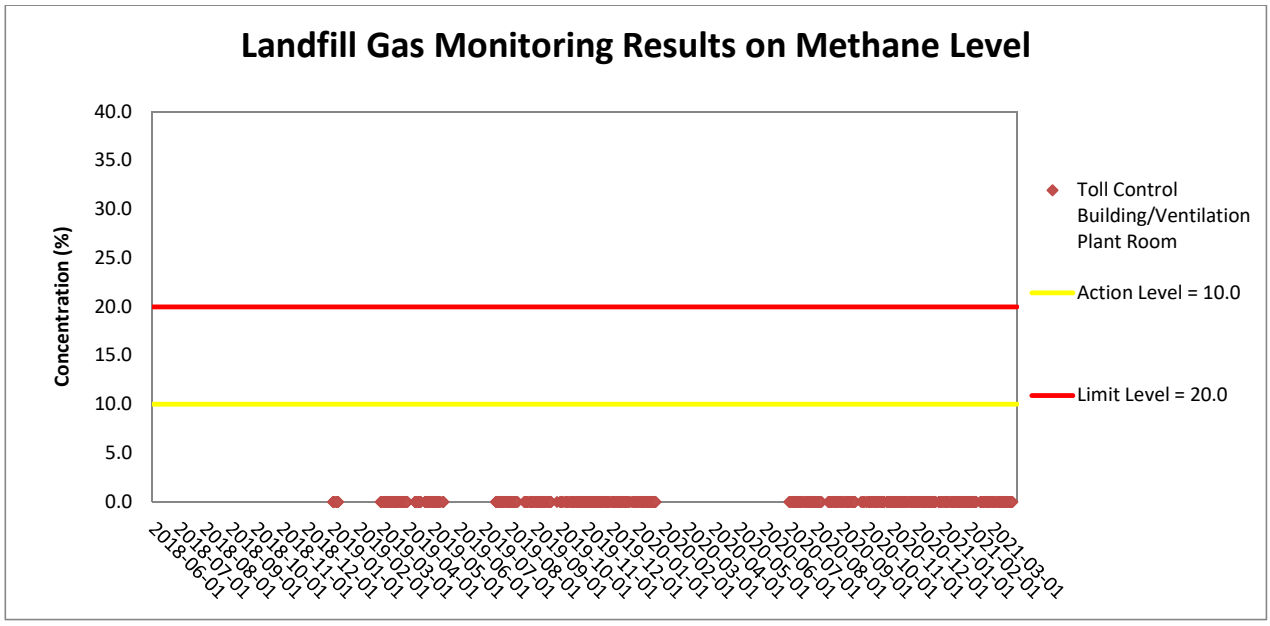
	ACTION			
EVENT	**ET** [(1)]	**IEC** [(1)]	**ER** [(1)]	**Contractor**
Limit Level				
1. Exceedance for one sample	1. Identify the source. 2. Inform the ER and the DEP. 3. Repeat measurement to confirm finding. 4. Increase monitoring frequency to daily. 5. Assess effectiveness of Contractor's remedial actions and keep the IEC, the DEP and the ER informed of the results.	1. Check monitoring data submitted by the ET. 2. Check Contractor's working method. 3. Discuss with the ET and the Contractor on possible remedial measures. 4. Advise the ER on the effectiveness of the proposed remedial measures. 5. Supervise implementation of remedial measures.	1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. Ensure remedial measures are properly implemented.	1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to IEC within 3 working days of notification 3. Implement the agreed proposals 4. Amend proposal if appropriate
2. Exceedance for two or more consecutive samples	1. Notify the IEC, the ER, the DEP and the Contractor. 2. Identify the source. 3. Repeat measurements to confirm findings. 4. Increase monitoring frequency to daily. 5. Carry out analysis of the Contractor's working procedures to determine possible mitigation to be implemented. 6. Arrange meeting with the IEC and the ER to discuss the remedial actions to be taken. 7. Assess effectiveness of the Contractor's remedial actions	1. Discuss amongst the ER, ET and the Contractor on the potential remedial actions. 2. Review the Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly. 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. In consultation with the IEC, agree with the Contractor on the remedial measures to be implemented. 4. Ensure remedial measures are properly implemented. 5. If exceedance continues, consider what activity of the work is responsible and instruct the Contractor to stop that activity of work until the exceedance is abated.	1. Take immediate action to avoid further exceedance. 2. Submit proposals for remedial actions to IEC within 3 working days of notification. 3. Implement the agreed proposals. 4. Resubmit proposals if problem still not under control. 5. Stop the relevant activity of works as determined by the ER until the exceedance is abated.

	and keep the IEC, the DEP and the ER informed of the results. 8. If the exceedance stops, cease additional monitoring.	

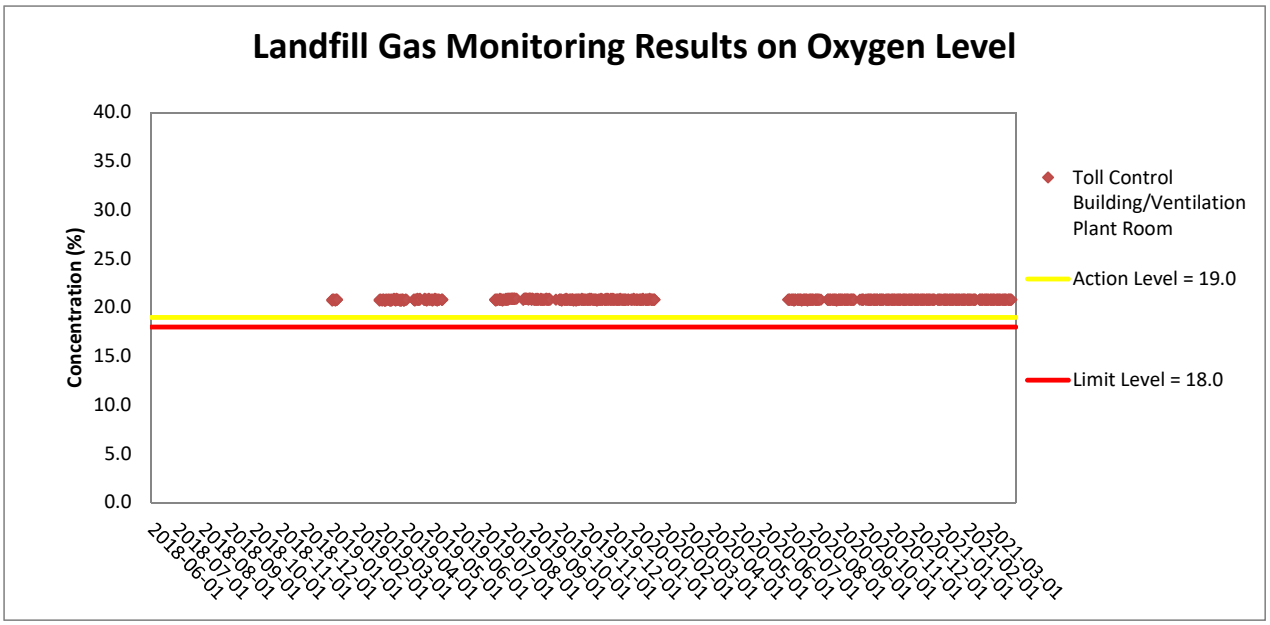
Abbreviations: ET – Environmental Team, IEC – Independent Environmental Checker, SO – Supervising Office, DEP – Director of Environmental Protection

Appendix E

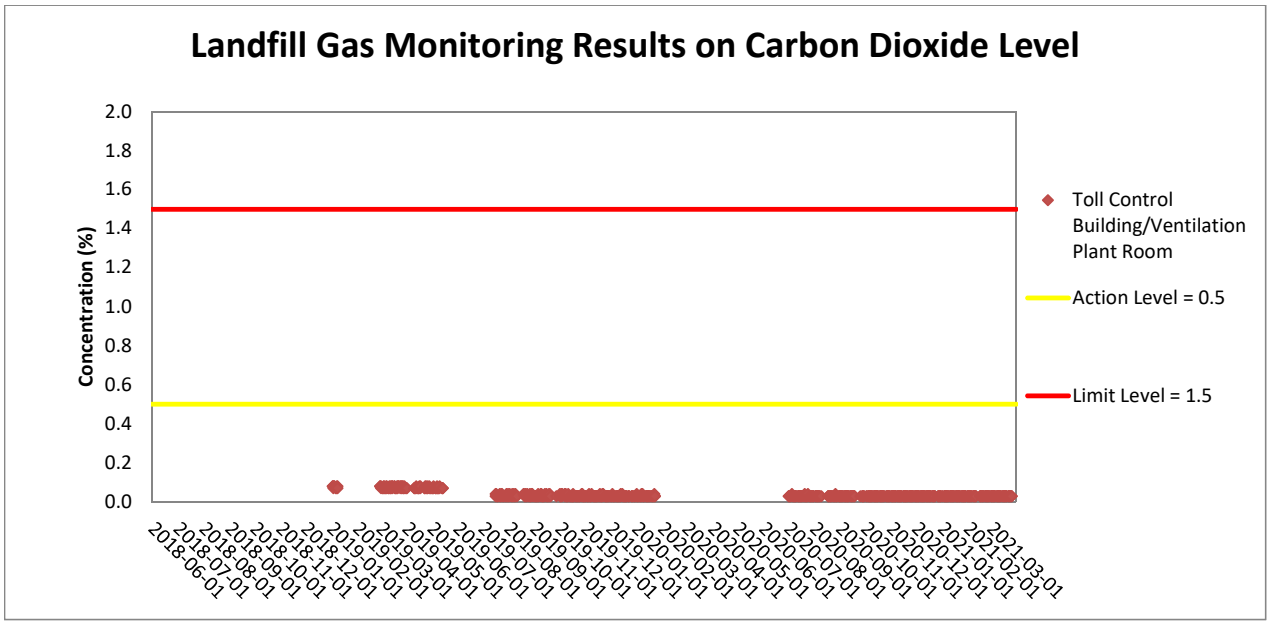
Landfill Gas Monitoring Graphical Presentation



Weather condition within the reporting period was sunny to cloudy.



Weather condition within the reporting period was sunny to cloudy.



Weather condition within the reporting period was sunny to cloudy.

Appendix F

Summary of Waste Flow Table

Contract No. : HY/2017/10

Tuen Mun Chek Lap Kok Link – Northern Connection Tunnel Buildings, Electrical and Mechanical Works

Monthly Summary Waste Flow Table for 2018 (Year)

Month\Material	Actual Quantities of Inert C&D Materials Generation						Actual Quantities of C&D wastes Generation		Actual Quantities of Recyclables Generation			
	Total Quantity Generated	Hard Rock and Large Broken Concrete	Reused in the Contract	Reused in other Projects	Disposed as Public Fills	Imported Fill	Chemical Waste	General Refuse	Metals	Felled trees	Paper/ cardboard packaging	Plastics
Unit	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000Kg)	('000Kg)	('000Kg)	('000Kg)	('000Kg)	('000Kg)
Jan	-	-	-	-	-	-	-	-	-	-	-	-
Feb	-	-	-	-	-	-	-	-	-	-	-	-
Mar	-	-	-	-	-	-	-	-	-	-	-	-
Apr	-	-	-	-	-	-	-	-	-	-	-	-
May	0.397	-	-	0.397	-	-	-	-	-	-	-	-
Jun	2.085	0.008	-	-	2.085	-	-	3.750	-	-	-	-
SUB-TOTAL	**2.482**	**0.008**	**0.000**	**0.397**	**2.085**	**0.000**	**0.000**	**3.750**	**0.000**	**0.000**	**0.000**	**0.000**
Jul	0.830	0.050	-	-	0.830	-	-	15.190	-	-	-	-
Aug	0.825	0.046	-	-	0.825	-	-	103.420	-	-	-	-
Sep	0.205	-	-	-	0.205	-	-	22.150	-	-	-	-
Oct	0.720	-	-	-	0.720	-	-	26.280	-	-	0.063	-
Nov	3.660	0.019	0.010	-	3.650	-	-	26.530	-	-	-	-
Dec	7.592	-	0.602	-	6.990	-	-	33.280	-	-	-	-
TOTAL	**16.314**	**0.123**	**0.612**	**0.397**	**15.305**	**-**	**-**	**230.600**	**-**	**-**	**0.063**	**-**

Notes :

1 - The waste flow table shall also include C&D materials that are specified in the Contract to be imported for use at the Site.

2 - Plastics refer to plastic bottles/containers, plastic sheets/foam from packaging material.

3 - Broken concrete for recycling into aggregates.

4 - Assumed 5 kg per damaged water-filled barrier.

5 - Disposed as Public Fills includes Hard Rock and Large Broken Concrete.

Contract No. : HY/2017/10

Tuen Mun Chek Lap Kok Link – Northern Connection Tunnel Buildings, Electrical and Mechanical Works

Monthly Summary Waste Flow Table for 2019 (Year)

Month\Material	Actual Quantities of Inert C&D Materials Generation						Actual Quantities of C&D wastes Generation		Actual Quantities of Recyclables Generation			
	Total Quantity Generated	Hard Rock and Large Broken Concrete	Reused in the Contract	Reused in other Projects	Disposed as Public Fills	Imported Fill	Chemical Waste	General Refuse	Metals	Felled trees	Paper/ cardboard packaging	Plastics
Unit	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000Kg)	('000Kg)	('000Kg)	('000Kg)	('000Kg)	('000Kg)
Jan	2.089	-	0.150	-	1.939	-	-	74.680	47.620	-	0.077	-
Feb	2.474	0.008	0.345	-	2.129	-	-	67.230	-	-	0.056	-
Mar	0.079	0.060	-	-	0.079	-	-	73.690	23.310	-	-	-
Apr	0.013	-	-	-	0.013	-	-	56.730	18.020	-	0.056	-
May	-	-	-	-	-	-	-	62.240	-	-	0.056	-
Jun	0.011	0.004	-	-	0.011	-	-	118.070	-	-	0.077	-
SUB-TOTAL	**4.666**	**0.072**	**0.495**	**0.000**	**4.171**	**0.000**	**0.000**	**452.640**	**88.950**	**0.000**	**0.322**	**0.000**
Jul	0.058	0.019	-	-	0.058	-	-	148.880	-	-	0.070	-
Aug	0.192	0.073	-	-	0.192	-	-	177.240	-	-	-	-
Sep	0.177	0.015	-	-	0.177	-	-	196.740	-	-	0.063	-
Oct	0.200	-	-	-	0.200	-	-	265.560	-	-	0.056	-
Nov	0.510	0.119	-	-	0.510	-	-	305.880	-	-	0.063	-
Dec	0.489	0.042	-	-	0.489	-	-	276.850	-	-	-	-
TOTAL	**6.292**	**0.340**	**0.495**	**0.000**	**5.797**	**0.000**	**0.000**	**1,823.790**	**88.950**	**0.000**	**0.574**	**0.000**

Notes :

1 - The waste flow table shall also include C&D materials that are specified in the Contract to be imported for use at the Site.

2 - Plastics refer to plastic bottles/containers, plastic sheets/foam from packaging material.

3 - Broken concrete for recycling into aggregates.

4 - Assumed 5 kg per damaged water-filled barrier.

5 - Disposed as Public Fills includes Hard Rock and Large Broken Concrete.

Contract No. : HY/2017/10

Tuen Mun Chek Lap Kok Link – Northern Connection Tunnel Buildings, Electrical and Mechanical Works

Monthly Summary Waste Flow Table for 2020 (Year)

Month\Material	Actual Quantities of Inert C&D Materials Generation								Actual Quantities of C&D wastes Generation		Actual Quantities of Recyclables Generation			
	Total Quantity Generated	Hard Rock and Large Broken Concrete			Reused in the Contract	Reused in other Projects	Disposed as Public Fills	Imported Fill	Chemical Waste	General Refuse	Metals	Felled trees	Paper/ cardboard packaging	Plastics
	sub-total	Broken Concrete	Milled Asphalt	sub-total	sub-total	sub-total	sub-total	sub-total						
Unit	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000Kg)	('000Kg)	('000Kg)	('000Kg)	('000Kg)	('000Kg)
Jan	0.025			0.000	-	-	0.025	-	-	187.500	-	-	0.070	-
Feb	0.074	0.026		0.026	-	-	0.074	-	-	176.100	-	-	0.084	-
Mar	0.650	0.117		0.117	-	-	0.366	0.284	-	237.850	-	-	0.042	-
Apr	0.139			0.000	-	-	0.139	-	-	167.820	-	-	-	-
May	6.431			0.000	-	1.975	0.023	4.433	-	255.300	-	-	0.056	-
Jun	17.433	0.053		0.053	-	0.421	0.087	16.925	-	200.740	-	-	-	-
SUB-TOTAL	**24.752**	**0.196**	**0.000**	**0.196**	**0.000**	**2.396**	**0.714**	**21.642**	**0.000**	**1225.310**	**0.000**	**0.000**	**0.252**	**0.000**
Jul	41.112	0.008		0.008	-	6.284	0.103	34.725	-	231.480	-	-	0.056	-
Aug	21.401	0.007		0.007	-	-	0.163	21.238	-	132.420	-	-	0.035	-
Sep	30.658	0.005		0.005	-	-	0.033	30.625	-	89.120	-	-	0.028	-
Oct	1.129	0.011		0.011	-	-	0.210	0.919	-	188.690	-	-	0.028	-
Nov	0.114			-	-	-	0.114	-	-	150.600	-	-	0.014	-
Dec	0.020			-	-	-	0.020	-	-	69.780	-	-	-	-
TOTAL	**119.185**	**0.227**	**-**	**0.227**	**0.000**	**8.680**	**1.356**	**109.149**	**0.000**	**2,087.400**	**0.000**	**0.000**	**0.413**	**0.000**

Notes :

1 - The waste flow table shall also include C&D materials that are specified in the Contract to be imported for use at the Site.

2 - Plastics refer to plastic bottles/containers, plastic sheets/foam from packaging material.

3 - Broken concrete for recycling into aggregates.

4 - Assumed 5 kg per damaged water-filled barrier.

5 - Disposed as Public Fills includes Hard Rock and Large Broken Concrete.

Contract No. : HY/2017/10

Tuen Mun Chek Lap Kok Link – Northern Connection Tunnel Buildings, Electrical and Mechanical Works

Monthly Summary Waste Flow Table for 2021 (Year)

Month\Material	Actual Quantities of Inert C&D Materials Generation										Actual Quantities of C&D wastes Generation		Actual Quantities of Recyclables Generation			
	Total Quantity Generated	Hard Rock and Large Broken Concrete			Reused in the Contract	Reused in other Projects	Disposed as Public Fills			Imported Fill	Chemical Waste	General Refuse	Metals	Felled trees	Paper/ cardboard packaging	Plastics
	sub-total	Broken Concrete	Milled Asphalt	sub-total	sub-total	sub-total	TM38	TKO137	sub-total	sub-total						
Unit	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000m^3)	('000Kg)	('000Kg)	('000Kg)	('000Kg)	('000Kg)	('000Kg)
Jan	-	-	-	0.000	-	-	-	-	-	-	-	46.750	-	-	-	-
Feb	7.720	-	-	0.000	-	-	7.720	-	7.720	-	-	18.910	-	-	-	-
Mar	-	-	-	0.000	-	-	-	-	-	-	-	31.050	-	-	-	-
Apr																
May																
Jun																
SUB-TOTAL	**7.720**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**7.720**	**0.000**	**7.720**	**0.000**	**0.000**	**96.710**	**0.000**	**0.000**	**0.000**	**0.000**
Jul																
Aug																
Sep																
Oct																
Nov																
Dec																
TOTAL	**7.720**	**-**	**-**	**0.000**	**0.000**	**0.000**	**7.720**	**-**	**7.720**	**0.000**	**0.000**	**96.710**	**0.000**	**0.000**	**0.000**	**0.000**

Notes :

1 - The waste flow table shall also include C&D materials that are specified in the Contract to be imported for use at the Site.

2 - Plastics refer to plastic bottles/containers, plastic sheets/foam from packaging material.

3 - Broken concrete for recycling into aggregates.

4 - Assumed 5 kg per damaged water-filled barrier.

5 - Disposed as Public Fills includes Hard Rock and Large Broken Concrete.

Appendix G

Cumulative Statistics on Exceedances, Complaints, Notifications of Summons and Successful Prosecutions

Appendix G1 Cumulative Statistics on Exceedances

		Total No. recorded since contract commencement
1-Hr TSP	Action	56
	Limit	11
24-Hr TSP	Action	4
	Limit	0
Landfill gas hazard monitoring		
• Methane	Action	0
	Limit	0
• Oxygen	Action	0
	Limit	0
• Carbon Dioxide	Action	0
	Limit	0

Appendix G2 Cumulative Statistics on Complaints, Notifications of Summons and Successful Prosecutions

Reporting Period	Cumulative Statistics		
	Complaints	Notifications of Summons	Successful Prosecutions
Total No. received since contract commencement	1	0	0