中國建築工程(香港)有限公司
CHINA STATE CONSTRUCTION ENGINEERING (HONG KONG) LTD.

Contract No. HY/2013/04
Hong Kong–Zhuhai–Macao Bridge
Hong Kong Boundary Crossing Facilities –
Infrastructure Works Stage II (Southern Portion)

CONTRACTOR SUBMISSION FORM (CSF)

To	Engineer's Representative	Attn.	Mr. Peter Lee
Ref. No.	CDG/CSF/EN02.02/2019/9060	CSF No.	CSF/03133/A
Subject	Monthly EM&A Report for February 2019		

Item	Description
1	Pursuant to G.S. Clause 25.01A and Condition 5.4 of the Environmental Permit No. EP-353/2009/K, we would like to submit herewith a copy of EM&A Report certified by our ETL, Messrs. Mott MacDonald for your onward submission to Environmental Protection Department.

Remarks :

Purpose of Submission :

For Approval ☐ **For Information** ☐ **For Record Purposes** ☑

Expected Reply Date :

From : Contractor's Representative

Name : Jason Chung Date : 21 March 2019

Signature :

A409022

Prepared by: WHW

Contract No. HY/2013/04 HZMB HKBCF – Infrastructure Works Stage II (Southern Portion)

Monthly EM&A Report for February 2019

March 2019

China State Construction Engineering (Hong Kong) Limited

Information class: Standard

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Executive summary

This Monthly Environmental Monitoring and Audit (EM&A) Report is prepared for Contract No. HY/2013/04 "Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Infrastructure Works Stage II (Southern Portion)" (hereafter referred to as "the Contract") for the Highways Department of Hong Kong Special Administrative Region (HKSAR). The Contract was awarded to China State Construction Engineering (Hong Kong) Limited (hereafter referred to as "the Contractor") and Mott MacDonald Hong Kong Limited (MMHK) was appointed as the Environmental Team (ET) by the Contractor.

The Contract is part of the "Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities" (HZMB HKBCF) Project which is a "Designated Project" under Schedule 2 of the Environmental Impact Assessment (EIA) Ordinance (Cap. 499) and for which an EIA Report (Register No. AEIAR-145/2009) was prepared and approved. The current Environmental Permit (EP) for HKBCF, namely No. EP-353/2009/K, was issued on 11 April 2016. These documents are available through the EIA Ordinance Register. Commencement of the Contract took place on 13 March 2015 and the construction works commenced on 13 July 2015.

Mott MacDonald Hong Kong Limited has been appointed by the Contractor to implement the Environmental Monitoring & Audit (EM&A) programme for the Contract in accordance with the Updated EM&A Manual for HKBCF (Version 1.0) and will be providing environmental team services for the Contract.

This is the 44th Monthly EM&A Report for the Contract which summaries findings of the EM&A works during the reporting period from 1 to 28 February 2019 (the "reporting period").

Environmental Monitoring and Audit Progress

The monthly EM&A programme was undertaken in accordance with the Updated EM&A Manual for HKBCF (Version 1.0).

The remaining air quality, noise, water quality and dolphin monitoring works under Contract No. HY/2013/01 "HZMB HKBCF – Passenger Clearance Building" were temporarily suspended from 1 October 2018. The ET of Contract No. HY/2013/04 is required and continues the full implementation of environmental monitoring commencing on 1 October 2018.

Air quality monitoring stations AMS2, AMS3C and AMS7B are covered by this Contract. It should be noted that the air quality monitoring station AMS6 is covered by Contract No. HY/2011/03 "Hong Kong-Zhuhai-Macao Bridge Hong Kong Link Road (HZMB HKLR) – Section between Scenic Hill and HKBCF". If the impact air quality monitoring at AMS6 is no longer covered under Contract No. HY/2011/03, it is required to continue such monitoring at AMS6 as part of EM&A programme However, this is subject to ENPO's final decision on which ET should carry out the monitoring work at these stations.

Noise monitoring stations NMS2 and NMS3C, water quality monitoring works and dolphin monitoring works under HZMB HKBCF are covered by this Contract.

A summary of the monitoring activities during the reporting period are listed below:

- 1-hour TSP Monitoring: 1, 4, 8, 9, 13, 15, 19, 21, 25 and 27 February 2019

- 24-hour TSP Monitoring: 1, 2, 4, 8, 9, 12, 15, 18, 21, 22, 27 and 28 February 2019
- Noise Monitoring: 1, 4, 15, 21 and 27 February 2019
- Water Quality Monitoring: not conducted during the reporting period^
- Chinese White Dolphin Monitoring: 1, 14, 20, 25 and 26 February 2019
- Environmental Site Inspection: 8, 13, 20 and 25 February 2019

Remarks:
^ The water quality monitoring programme was temporarily suspended during the reporting period.

Breaches of Action and Limit Levels

A summary of environmental exceedances for the reporting period as recorded by the Environmental Team of this Contract are listed below:

Environmental Monitoring	Parameters	Action Level	Limit Level
Air Quality	1-hour TSP	-	-
	24-hour TSP	-	-
Noise	$L_{eq\ (30\ min)}$	-	-
Water Quality	Suspended Solids (SS)	-	-
	Turbidity	-	-
	Dissolved Oxygen (DO)	-	-

Complaint Log

There were no complaints received in relation to the environmental impact during the reporting period.

Notifications of Summons and Successful Prosecutions

There were no notifications of summons or prosecutions received during this reporting period.

Reporting Changes

There was no reporting change during the reporting period.

Future Key Issues

The future key issues to be undertaken in the upcoming month are:

- Erection of sign gantries (land-based)
- Construction of parapets for bridge structures (land-based)
- Construction of Retaining Wall RW16N and RW16S (land-based)
- Construction of Bridge Deck D16 in-situ deck (land-based)
- Construction of utilities cross-over frame under Bridge D9c (land-based)
- Backfilling of retaining walls and formation of fill slopes and road embankment (land-based)
- Drainage works and watermains laying (land-based)
- Roadworks and road furniture (land-based)
- Maintenance of temporary traffic arrangements (TTA) associated with the commissioning of HKBCF and Tuen Mun – Chek Lap Kok Link Southern Connection (TM-CLKL-SC) (land-based)

1 Introduction

1.1 Background

On 13 March 2015, Mott MacDonald Hong Kong Limited (MMHK) was commissioned by China State Construction Engineering (Hong Kong) Limited (also referred to as "the Contractor") to undertake the Environmental Team (ET) services (including environmental monitoring and audit (EM&A)) for Contract No. HY/2013/04 "Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Infrastructure Works Stage II (Southern Portion)" ("the Contract") for the Highways Department of Hong Kong Special Administrative Region (HKSAR).

The Contract is part of the "Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities" (HZMB HKBCF) Project which is a "Designated Project" under Schedule 2 of the Environmental Impact Assessment (EIA) Ordinance (Cap. 499) and for which an EIA Report (Register No. AEIAR-145/2009) was prepared and approved. The current Environmental Permit (EP) for HKBCF, namely No. EP-353/2009/K, was issued on 11 April 2016. These documents are available through the EIA Ordinance Register. Commencement of the Contract took place on 13 March 2015 and the construction works commenced on 13 July 2015. The works areas of the contract are shown in **Appendix A**.

This is the 44th Monthly EM&A Report summarising the findings of EM&A activities conducted under the Contract from 1 to 28 February 2019 (the "reporting period") and is submitted to fulfil Condition 5.4 of the EP.

1.2 Project Description

The Proposed works under this Contract comprise the following:

- Construction of vehicular bridge and at-grade roads at the southern portion of Hong Kong Boundary Crossing Facilities;
- Construction of associated street lighting, street furniture, road marking, road signage, box culverts and outfalls, drainage, sewerage, fresh water and flushing water supply, irrigation, landscape, electrical and mechanical (E&M), utilities and services works;
- Provisioning of civil engineering works and power supply for Traffic Control and Surveillance System (TCSS); and
- Other works in accordance with the Contract.

1.3 Project Organisation

The organisation chart and lines of communication with respect to the on-site environmental management structure together with the contact information of the key personnel are shown in **Appendix B**. The key personnel contact names and numbers are summarized in **Table 1.1**.

Table 1.1: Contact Information of Key Personnel

Party	Position	Name	Telephone	Fax
Engineer or Engineer's Representative (AECOM Asia Co. Ltd.)	Senior Resident Engineer	Peter Lee	3958 7465	3748 8900
Environmental Project Office / Independent Environmental Checker (Ramboll Hong Kong Limited)	Environmental Project Office Leader	Y H Hui	3465 2888	3465 2899
	Independent Environmental Checker	Ray Yan	3465 2836 / 5181 8401	3465 2899
	Environmental Site Supervisor	Harris Wong	3465 2805 / 5181 8709	3465 2899
Contractor (China State Construction Engineering (Hong Kong) Limited)	Site Agent	Jason Chung	9127 8369	2459 4336
	Environmental Officer	Xavier Lam	9493 2944	2459 4336
		K P Ng	9626 9961	2459 4336
Environmental Team (Mott MacDonald Hong Kong Limited)	Environmental Team Leader	Gary Chow	2828 5874	2827 1823
24-hour Complaint Hotline	-	-	5236 7111	-

1.4 Construction Programme

The Construction Works Programme of the Project is provided in **Appendix C**.

1.5 Construction Works undertaken during the Reporting Period

A summary of the construction activities undertaken during this reporting period is shown below:

- Erection of sign gantries
- Construction of parapets for bridge structures
- Construction of Retaining Wall RW16N and RW16S
- Construction of Bridge Deck D16 in-situ deck
- Construction of utilities cross-over frame under Bridge D9c
- Backfilling of retaining walls and formation of fill slopes and road embankment
- Drainage works and watermains laying
- Roadworks and road furniture
- Maintenance of temporary traffic arrangements (TTA) associated with the commissioning of HKBCF and TM-CLKL-SC
- No marine-based segment delivery (all segments stored at segment storage yard on HKBCF island site)
- No generation of excavated marine sediment

During this reporting period, temporary soft landscaping works were conducted and marine-based outfall works had not commenced.

2 Air Quality Monitoring

2.1 Introduction

In accordance with the Contract Specific EM&A Manual, baseline 1-hour and 24-hour Total Suspended Particulates (TSP) levels at air quality monitoring stations AMS6 and AMS7 were established. Also, baseline 1-hour and 24-hour Total Suspended Particulates (TSP) levels at air quality monitoring stations AMS2 and AMS3 were established under other HKBCF contracts. Impact 1-hour TSP monitoring was conducted for at least three times every 6 days, while impact 24-hour TSP monitoring was carried out for at least once every 6 days.

2.2 Monitoring Locations

Monitoring locations AMS2, AMS3, AMS6 and AMS7 were set up at the proposed locations in accordance with the relevant Contract Specific EM&A Manual. For monitoring location AMS3 (Ho Yu College), as proposed in the Contract Specific EM&A Manual, approval for carrying out impact monitoring could not be obtained from the principal of the school. Permission on setting up and carrying out impact monitoring works at nearby sensitive receivers, like Caribbean Coast and Coastal Skyline, was also sought. However, approvals for carrying out impact monitoring works within their premises were not obtained. Impact air quality monitoring was conducted at site boundary of the site office area in Works Area WA2 (AMS3B) before being relocated to Ying Tung Estate Market Rooftop (AMS3C) on 20 August 2018 under this Contract. The same baseline and Action Level for air quality, as derived from the baseline monitoring data recorded at Ho Yu College, was adopted for this alternative air quality location.

It should be noted that the air quality monitoring works for the Contract at AMS6 (Dragonair/CNAC (Group) Building) are covered by Contract No. HY/2011/03 “Hong Kong-Zhuhai-Macao Bridge Hong Kong Link Road (HZMB HKLR) – Section between Scenic Hill and HKBCF”.

The ET of the Contract or another ET of the HZMB project is required to conduct impact air quality monitoring at AMS6 as part of EM&A programme if this air quality monitoring station is no longer covered under Contract No. HY/2011/03.

Table 2.1 describes the details of the monitoring stations and **Figure 2.1** shows the locations of air monitoring stations.

Table 2.1: Construction Dust Monitoring Locations

Identification No.	Location Description
AMS2	Tung Chung Development Pier
AMS3C	Ying Tung Estate Market Rooftop
AMS6(1)	Dragonair/CNAC (Group) Building
AMS7B	3RS Site Offices

Remarks: (1) The ET of this Contract should conduct impact air quality monitoring at station AMS6 listed in the table as part of EM&A programme according to latest notification from ENPO when the monitoring station(s) is/are no longer covered by another ET of the HZMB project.

2.3 Monitoring Action and Limit Levels

The Action and Limit Levels for 1-hr TSP and 24-hr TSP are provided in **Table 2.2** and **Table 2.3** respectively. The same baseline and Action/Limit Levels for air quality, as derived from the baseline monitoring data recorded at and AMS3 and AMS7, apply with the abovementioned relocations to AMS3C and AMS7B respectively.

Table 2.2: Action and Limit Levels for 1-hour TSP

Monitoring Station	Action Level, µg/m^3	Limit Level, µg/m^3
AMS2 – Tung Chung Development Pier	374	500
AMS3C – Ying Tung Estate Market Rooftop	368	500
AMS6 – Dragonair / CNAC (Group) Building (HKIA)	360	500
AMS7B – 3RS Site Offices	370	500

Table 2.3: Action and Limit Levels for 24-hour TSP

Monitoring Station	Action Level, µg/m^3	Limit Level, µg/m^3
AMS2 – Tung Chung Development Pier	176	260
AMS3C – Ying Tung Estate Market Rooftop	167	260
AMS6 – Dragonair / CNAC (Group) Building (HKIA)	173	260
AMS7B – 3RS Site Offices	183	260

The event and action plan is provided in **Appendix D**.

If exceedance(s) at these stations is/are recorded by the ET of the Contract or referred by the other ET under the HZMB project to the Contract, the ET of the Contract will carry out an investigation and findings will be reported in the monthly EM&A Report.

2.4 Monitoring Station AMS6

The monitoring requirements, monitoring equipment, monitoring parameters, frequency and duration, monitoring methodology and monitoring schedule for air quality monitoring station AMS6 are detailed in the monthly EM&A Reports prepared for Contract No. HY/2011/03.

2.5 Monitoring Schedule for the Reporting Period

The schedule for air quality monitoring at AMS2, AMS3C and AMS7B in the reporting period is presented in **Appendix I**.

2.6 Monitoring Equipment

24-hour TSP air quality monitoring was performed using High Volume Sampler (HVS) located at each designated monitoring station. The HVS meets all the requirements of the Contract Specific EM&A Manual. Portable direct reading dust meters were used to carry out the 1-hour TSP monitoring. Brand and model of the equipment used for air quality monitoring stations AMS2, AMS3C and AMS7B under this Contract is given in **Table 2.4**.

Table 2.4: Air Quality Monitoring Equipment

Equipment	Brand	Model No.
Portable direct reading dust meter (1-hour TSP)	Sibata Digital Dust Monitor	LD-3B, LD-5R
High Volume Sampler (24-hour TSP)	Tisch Environmental Mass Flow Controlled Total Suspended Particulate (TSP) High Volume Sampler	TE-5170

2.7 Monitoring Methodology

24-hour TSP Monitoring

a. The HVS was installed in the vicinity of the air sensitive receivers. The following criteria were considered in the installation of the HVS.
   i. A horizontal platform with appropriate support to secure the sampler against gusty wind was provided.
   ii. The distance between the HVS and any obstacles, such as buildings, was at least twice the height that the obstacle protrudes above the HVS.
   iii. A minimum of 2 meters separation from walls, parapets and penthouse for rooftop sampler was provided.
   iv. No furnace or incinerator flues are nearby.
   v. Airflow around the sampler was unrestricted.
   vi. Permission was obtained to set up the samplers and access to the monitoring stations.
   vii. A secured supply of electricity was obtained to operate the samplers.
   viii. The sampler was located more than 20 meters from any dripline.
   ix. Any wire fence and gate, required to protect the sampler, did not obstruct the monitoring process.
   x. Flow control accuracy was kept within ±2.5% deviation over 24-hour sampling period.

b. Preparation of Filter Papers
   i. Glass fibre filters, G810 were labelled and sufficient filters that were clean and without pinholes were selected.
   ii. All filters were equilibrated in the conditioning environment for 24 hours before weighing. The conditioning environment temperature was around 25 °C and not variable by more than ±3 °C; the relative humidity (RH) was < 50% and not variable by more than ±5%. A convenient working RH was 40%.
   iii. All filter papers were prepared and analysed by ALS Technichem (HK) Pty Ltd., which is a HOKLAS accredited laboratory and has comprehensive quality assurance and quality control programmes.

c. Field Monitoring
   i. The power supply was checked to ensure the HVS works properly.
   ii. The filter holder and the area surrounding the filter were cleaned.
   iii. The filter holder was removed by loosening the four bolts and a new filter, with stamped number upward, on a supporting screen was aligned carefully.
   iv. The filter was properly aligned on the screen so that the gasket formed an airtight seal on the outer edges of the filter.
   v. The swing bolts were fastened to hold the filter holder down to the frame. The pressure applied was sufficient to avoid air leakage at the edges.
   vi. Then the shelter lid was closed and was secured with the aluminium strip.
   vii. The HVS was warmed-up for about 5 minutes to establish run-temperature conditions.
   viii. A new flow rate record sheet was set into the flow recorder.
   ix. On site temperature and atmospheric pressure readings were taken and the flow rate of the HVS was checked and adjusted at around 1.1 m^3/min, and complied with

the range specified in the Updated EM&A Manual for HKBCF (Version 1.0) (i.e. 0.6-1.7 m^3/min).

x. The programmable digital timer was set for a sampling period of 24 hours, and the starting time, weather condition and the filter number were recorded.

xi. The initial elapsed time was recorded.

xii. At the end of sampling, on site temperature and atmospheric pressure readings were taken and the final flow rate of the HVS was checked and recorded.

xiii. The final elapsed time was recorded.

xiv. The sampled filter was removed carefully and folded in half length so that only surfaces with collected particulate matter were in contact.

xv. It was then placed in a clean plastic envelope and sealed.

xvi. All monitoring information was recorded on a standard data sheet.

xvii. Filters were then sent to ALS Technichem (HK) Pty Ltd. for analysis.

d. Maintenance and Calibration

i. The HVS and its accessories were maintained in good working condition, such as replacing motor brushes routinely and checking electrical wiring to ensure a continuous power supply.

ii. 5-point calibration of the HVS was conducted using TE-5025A Calibration Kit prior to the commencement of baseline monitoring. Bi-monthly 5-point calibration of the HVS will be carried out during impact monitoring.

iii. Calibration certificate of the HVSs are provided in **Appendix J**.

1-hour TSP Monitoring

a. Measuring Procedures

The measuring procedures of the 1-hour dust meter were in accordance with the Manufacturer's Instruction Manual as follows:

i. Turn the power on.

ii. Close the air collecting opening cover.

iii. Push the "TIME SETTING" switch to [BG].

iv. Push "START/STOP" switch to perform background measurement for 6 seconds.

v. Turn the knob at SENSI ADJ position to insert the light scattering plate.

vi. Leave the equipment for 1 minute upon "SPAN CHECK" is indicated in the display.

vii. Push "START/STOP" switch to perform automatic sensitivity adjustment. This measurement takes 1 minute.

viii. Pull out the knob and return it to MEASURE position.

ix. Push the "TIME SETTING" switch the time set in the display to 3 hours.

x. Lower down the air collection opening cover.

xi. Push "START/STOP" switch to start measurement.

b. Maintenance and Calibration

i. The 1-hour TSP meter was calibrated at 1-year intervals against a Tisch Environmental Mass Flow Controlled Total Suspended Particulate (TSP) High Volume Air Sampler. Calibration certificates of the Laser Dust Monitors are provided in **Appendix J**.

2.8 Monitoring Results

The monitoring results for 1-hour and 24-hour TSP at AMS2, AMS3C and AMS7B are summarized in **Table 2.5 and Table 2.6** respectively. Detailed impact air quality monitoring results are presented in **Appendix K**.

Table 2.5: Summary of 1-hour TSP Monitoring Results During the Reporting Period

Monitoring Station	Average, µg/m^3	Range, µg/m^3	Action Level, µg/m^3	Limit Level, µg/m^3
AMS2	62	33 – 93	374	500
AMS3C	45	21 – 85	368	500
AMS7B	51	24 – 99	370	500

Table 2.6: Summary of 24-hour TSP Monitoring Results During the Reporting Period

Monitoring Station	Average, µg/m^3	Range, µg/m^3	Action Level, µg/m^3	Limit Level, µg/m^3
AMS2	59	35 – 87	176	260
AMS3C	59	45 – 84	167	260
AMS7B	77	58 – 109	183	260

There was no Action and Limit Level exceedance of 1-hr TSP level and 24-hr TSP level recorded at station AMS2, AMS3C and AMS7B by the Environmental Team of this Contract during the reporting period.

The monitoring results for AMS6 are reported in the monthly EM&A Reports prepared for Contract No. HY/2011/03 respectively.

Summary of Action and Limit Level exceedance of 1-hr TSP level and 24-hr TSP level at AMS6 shall be referred to the monthly EM&A report prepared by Contract No. HY/2011/03.

The wind data obtained from the on-site wind station (as shown in **Figure 2.1**) during the reporting period is provided in **Appendix M**.

3 Noise Monitoring

3.1 Introduction

In accordance with the Contract Specific EM&A Manual, impact noise monitoring was conducted at least once per week for each noise monitoring location during the construction phase of the Contract.

3.2 Monitoring Locations

Approval for carrying out impact monitoring at NMS3 (Ho Yu College), as proposed in the Contract Specific EM&A Manual, could not be obtained from the principal of school. Permission on setting up and carry out impact monitoring works at nearby sensitive receivers, like Caribbean Coast and Coastal Skyline, was also sought. However, approvals for carrying out impact monitoring works within their premises were not obtained. Impact noise monitoring was conducted at site boundary of the site office area in Works Area WA2 (NMS3B) before being relocated to Ying Tung Estate Market Rooftop (NMS3C) on 20 August 2018 under this Contract. The same baseline noise level (as derived from the baseline monitoring data recorded at Ho Yu College) and Limit Level were adopted for this alternative noise monitoring location.

Table 3.1 describes the details of the monitoring stations and **Figure 3.1** shows the locations of noise monitoring stations.

Table 3.1: Construction Noise Monitoring Locations

Identification No.	Location Description
NMS2	Seaview Crescent
NMS3C(1)	Ying Tung Estate Refuse Collection Point

Remarks: (1) The Action and Limit Levels for schools will be applied for this alternative monitoring location.

3.3 Monitoring Parameters, Frequency and Duration

Table 3.2 summarises the monitoring parameters, frequency and duration of impact TSP monitoring.

Table 3.2: Noise Monitoring Parameters, Frequency and Duration

Parameter	Frequency and Duration
30-minutes measurement at each monitoring station between 0700 and 1900 on normal weekdays (Monday to Saturday). L_{eq}, L_{10} and L_{90} would be recorded.	At least once per week

3.4 Action and Limit Levels

The Action and Limit Levels for construction noise are defined in **Table 3.3**.

Table 3.3: Action and Limit Level for Construction Noise

Monitoring Station	Time Period	Action Level	Limit Level
NMS2	07:00 – 19:00 hours on normal weekdays	When one documented complaint is received	70 dB(A)
NMS3C			70/65 dB(A)*

Remark: Limit Level for schools will be applied for NMS3C. Day time noise Limit Level of 70 dB(A) applies to education institutions, while 65 dB(A) applies during the school examination period.

The event and action plan is provided in **Appendix D**.

If exceedance(s) at these stations is/are recorded by the ET of the Contract or referred by the other ET under the HZMB project to the Contract, the ET of the Contract will carry out an investigation and findings will be reported in the monthly EM&A Report.

3.5 Monitoring Schedule for the Reporting Period

The schedule for noise monitoring in the reporting period is presented in **Appendix I**.

3.6 Monitoring Equipment

Noise monitoring was performed using sound level meters at each designed monitoring station. The sound level meters deployed comply with the International Electrotechnical Commission Publications (IEC) 651:1979 (Type 1) and 804:1985 (Type 1) specifications. Acoustic calibrator was deployed to check the sound level meters at a known sound pressure level. Brand and model of the equipment used for noise monitoring under this Contract is given in **Table 3.4**.

Table 3.4: Noise Monitoring Equipment

Equipment	Brand	Model No.
Integrated Sound Level Meter	Rion	NL-52
Acoustic Calibrator	Larson Davis	CAL200

3.7 Monitoring Methodology

1. Monitoring Procedure
   a. The measurement at NMS3C was free-field measurement and NMS2 was façade measurement. A correction of +3dB(A) shall be made to the free-field measurement.
   b. The battery condition was checked to ensure the correct functioning of the meter.
   c. Parameters such as frequency weighting, the time weighting and the measurement time were set as follows:
      i. frequency weighting: A
      ii. time weighting: Fast
      iii. time measurement: L_{eq} (30-minutes) during non-restricted hours i.e. 0700-1900 on normal workdays.
   d. Prior to and after each noise measurement, the meter was calibrated using the acoustic calibrator for 94dB(A) at 1000 Hz. If the difference in the calibration level before and after measurement was more than 1 dB(A), the measurement would be considered invalid and repeat of noise measurement would be required after re-calibration or repair of the equipment.
   e. During the monitoring period, the L_{eq}, L_{10} and L_{90} were recorded. In addition, site conditions and noise sources were recorded on a standard record sheet.

f. Noise measurement was paused during periods of high intrusive noise (e.g. dog barking, helicopter noise) if possible. Observations were recorded when intrusive noise was unavoidable.

g. Noise monitoring was cancelled in the presence of fog, rain, wind with a steady speed exceeding 5m/s, or wind with gusts exceeding 10m/s. The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m/s.

2. Maintenance and Calibration

a. The microphone head of the sound level meter was cleaned with soft cloth at regular intervals.

b. The meter and calibrator were sent to the supplier or HOKLAS laboratory to check and calibrate at yearly intervals.

c. Calibration certificates of the sound level meters and acoustic calibrators are provided in **Appendix J**.

3.8 Monitoring Results

The monitoring results for construction noise are summarized in **Table 3.5**. Detailed impact noise monitoring results and relevant graphical plots are presented in **Appendix K**.

Table 3.5: Summary of Construction Noise Monitoring Results During the Reporting Period

Monitoring Station	Average, dB(A) $L_{eq\ (30\ mins)}$	Range, dB(A) $L_{eq\ (30\ mins)}$	Limit Level, dB(A) $L_{eq\ (30\ mins)}$
NMS2	64	63 – 65	75
NMS3C	64	61 – 67	70/65*

Remark: (*) The Limit Level for schools will be applied for NMS3C. Daytime noise Limit Level of 70 dB(A) applies to education institutions, while 65 dB(A) applies during the school examination period.

No noise exceedances were recorded at stations NMS2 and NMS3C by the ET of this Contract during the reporting period.

4 Water Quality Monitoring

4.1 Introduction

Impact water quality monitoring was carried out to ensure that any deterioration of water quality was detected, and that timely action was taken to rectify the situation. For impact water quality monitoring, measurement were taken in accordance with the Contract Specific EM&A Manual.

4.2 Monitoring Locations

During the reporting period, the water quality monitoring works are covered by this Contract. A total of twenty-one stations (nine Impact Stations, seven Sensitive Receiver Stations and five Control/Far Field Stations) are covered by the current EM&A programme.

The nine Impact Stations (IS) were chosen on the basis of their proximity to the reclamation and thus the greatest potential for water quality impacts, the seven Sensitive Receiver Stations (SR) were chosen as they are close to the key sensitive receives and the five Control/ Far Field Stations (CS) were chosen to facilitate comparison of the water quality of the IS stations with less influence by the Project/ ambient water quality conditions.

The water quality monitoring stations at CS(Mf)3 (Coordinate: 809989E, 821117N), IS10 (Coordinate: 812577E, 820670N) and SR5 (811489E, 820455N) have been occupied by the marine work of a designated project – "Expansion of Hong Kong International Airport into a Three-Runway System" (3RS Project). The alternative water quality monitoring station at CS(Mf)3(N) (Coordinate: 808814E, 822355N), IS10(N) (Coordinate: 812942E, 820881N) and SR5(N) (812569E, 8201475N) were justified and verified by the ET Leader of Contract No. HY/2010/02 and the IEC respectively on 24 March 2017 and it was approved by EPD on 12 May 2017.

The water quality monitoring stations at SR3, SR10A and SR10B(N) were not available for water sampling due to safety reason, thus, monitoring stations were changed to SR3(N) (Coordinate: 810689E, 816591N); SR10A(N) (Coordinate: 823644E, 823484N) and SR10B(N2) (Coordinate: 823689E, 823159N) were justified by the ET Leader of Contract No. HY/2013/01 on 8 November 2017 and the IEC verified on 13 November 2017; and submitted to EPD on 29 November 2017 and it was approved by EPD on 22 December 2017.

Table 4.1 and **Figure 4.1** shows the locations of water quality monitoring stations.

Table 4.1: Impact Water Quality Monitoring Stations

Station	Description	East	North
IS5	Impact Station (Close to HKBCF construction site)	811579	817106
IS(Mf)6	Impact Station (Close to HKBCF construction site)	812101	817873
IS7	Impact Station (Close to HKBCF construction site)	812244	818777
IS8	Impact Station (Close to HKBCF construction site)	814251	818412
IS(Mf)9	Impact Station (Close to HKBCF construction site)	813273	818850
IS10(N)	Impact Station (Close to HKBCF construction site)	812942	820881
IS(Mf)11	Impact Station (Close to HKBCF construction site)	813562	820716
IS(Mf)16	Impact Station (Close to HKBCF construction site)	814328	819497

Station	Description	East	North
IS17	Impact Station (Close to HKBCF construction site)	814539	820391
SR3(N)	Sensitive receivers (San Tau SSSI)	810689	816591
SR4(N)	Sensitive receivers (Tai Ho)	814705	817859
SR5(N)	Sensitive receivers (Artificial Reef in NE Airport)	812569	821475
SR6	Sensitive receivers (Sha Chau and Lung Kwu Chau Marine Park)	805837	821818
SR7	Sensitive receivers (Tai Mo Do)	814293	821431
SR10A(N)	Sensitive receivers (Ma Wan FCZ) 1	823644	823484
SR10B(N2)	Sensitive receivers (Ma Wan FCZ) 2	823689	823159
CS(Mf)3(N)	Control Station	808814	822355
CS(Mf)5	Control Station	817990	821129
CS4	Control Station	810025	824004
CS6	Control Station	817028	823992
CSA	Control Station	818103	823064

If exceedance(s) at these stations is/are recorded by the ET of the Contract or referred by the other ET under the HZMB project to the Contract, the ET of the Contract will carry out an investigation and findings will be reported in the monthly EM&A Report.

4.3 Monitoring Parameters, Frequency and Duration

Table 4.2 summarizes the monitoring parameters, frequency and monitoring depths of impact water quality monitoring in the Contract Specific EM&A Manual.

Table 4.2: Impact Water Quality Monitoring Parameters and Frequency

Monitoring Stations	Parameter, Unit	Frequency	No. of Depths Measured
Impact Stations: IS5, IS(Mf)6, IS7, IS8, IS(Mf)9, IS10(N), IS(Mf)11, IS(Mf)16, IS17 **Control/Far Field Stations**: CS(Mf)3(N), CS(Mf)5, CS4, CS6, CSA **Sensitive Receiver Stations:** SR3(N), SR4(N), SR5(N), SR6, SR7, SR10A(N) & SR10B(N2)	• Depth, m • Temperature, °C • Salinity, ppt • Dissolved Oxygen (DO), mg/L • DO Saturation, % • Turbidity, NTU • pH • Suspended Solids (SS), mg/L	Three times per week during mid-ebb and mid-flood tides (within ±1.75 hour of the predicted time)	3 (1m below water surface, mid-depth and 1m above sea bed, except where the water depth is less than 6m, in which case the mid-depth station may be omitted. Should the water depth be less than 3m, only the mid-depth station will be monitored.)

4.4 Monitoring Action and Limit Levels

The Action and Limit Levels for water quality are provided in **Table 4.3**.

Table 4.3: Action and Limit Levels for Water Quality

Parameters	Action	Limit
DO in mg L^{-1} (Surface, Middle & Bottom)	Surface and Middle 5.0 Bottom 4.7	Surface and Middle 4.2 (except 5 mg/L for FCZ) Bottom 3.6
SS in mg L^{-1} (depth-averaged) at all monitoring stations and control stations	23.5 and 120% of upstream control station's SS at the same tide of the same day*	34.4 and 130% of upstream control station's SS at the same tide of the same day and 10mg/L for WSD Seawater intakes*

Parameters	Action	Limit
Turbidity in NTU (depth-averaged)	27.5 and 120% of upstream control station's turbidity at the same tide of the same day*	47.0 and 130% of upstream control station's

Remarks:
* Reference is made to EPD approval of adjustment of water quality assessment criteria issued and became effective on 18 February 2013.

Notes:
1. "depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.
2. For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
3. For turbidity, SS, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.
4. All the figures given in the table are used for reference only and the EPD may amend the figures whenever it is considered as necessary.
5. The 1%-ile of baseline data for dissolved oxygen (surface and middle) and dissolved oxygen (bottom) are 4.2 mg/L and 3.6 mg/L respectively.

The event and action plan is provided in **Appendix D**.

4.5 Monitoring Schedule for the Reporting Period

The water quality monitoring programme was temporarily suspended during the reporting period, therefore no water quality monitoring was conducted.

4.6 Monitoring Equipment

Table 4.4 summaries the equipment used in the impact water quality monitoring programme.

Table 4.4: Water Quality Monitoring Equipment

Equipment	Brand and Model	Serial Number
DO and Temperature Meter, Salinity Meter, Turbidity Meter & pH Meter	Not applicable since no water quality monitoring was conducted during the reporting period	Not applicable since no water quality monitoring was conducted during the reporting period

4.7 Monitoring Methodology

4.7.1 Instrumentation

a. The in-situ water quality parameters, viz. dissolved oxygen, temperature, salinity, turbidity and pH, were measured by multi-parameter meters and pH meter.

4.7.2 Operating/Analytical Procedures

a. Digital Differential Global Positioning Systems (DGPS) were used to ensure that the correct location was selected prior to sample collection.

b. Portable, battery-operated echo sounders were used for the determination of water depth at each designated monitoring station.

c. All in-situ measurements were taken at 3 water depths, 1m below water surface, mid-depth and 1m above sea bed, except where the water depth was less than 6m, in which case the mid-depth station was omitted. Should the water depth be less than 3m, only the mid-depth station was monitored.

d. At each measurement/sampling depth, two consecutive in-situ monitoring (DO concentration and saturation, temperature, turbidity, pH, salinity) and water sample for SS. The probes were retrieved out of the water after the first measurement and then re-deployed for the second measurement. Where the difference in the value between the

first and second readings of DO or turbidity parameters was more than 25% of the value of the first reading, the reading was discarded and further readings were taken.

e. Duplicate samples from each independent sampling event were collected for SS measurement. Water samples were collected using the water samplers and the samples were stored in high density polythene bottles. Water samples collected were well-mixed in the water sampler prior to pre-rinsing and transferring to sample bottles. Sample bottles were pre-rinsed with the same water samples. The sample bottles were then be packed in cool-boxes (cooled at 4°C without being frozen), and delivered to ALS Technichem (HK) Pty Ltd. for the analysis of suspended solids concentrations. The laboratory determination work would be started within 24 hours after collection of the water samples. ALS Technichem (HK) Pty Ltd. is a HOKLAS accredited laboratory and has comprehensive quality assurance and quality control programmes. For QA/QC procedures, one duplicate samples of every batch of 20 samples was analyzed.

f. The analysis method and reporting and detection limit for SS is shown in **Table 4.5**.

Table 4.5: Laboratory Analysis for Suspended Solids

Parameters	Instrumentation	Analytical Method	Reporting Limit	Detection Limit
Suspended Solids (SS)	Weighting	APHA 2540-D	0.5 mg/L	0.5 mg/L

g. Other relevant data were recorded, including monitoring location / position, time, water depth, tidal stages, weather conditions and any special phenomena or work underway at the construction site in the field log sheet for information.

4.7.3 Maintenance and Calibration

a. All in situ monitoring instruments would be calibrated and calibrated by ALS Technichem (HK) Pty Ltd. before use and at 3-monthly intervals throughout all stages of the water quality monitoring programme. Calibration details are provided in **Appendix J**.

b. The dissolved oxygen probe of YSI 6820 was calibrated by wet bulb method. Before the calibration routine, the sensor for dissolved oxygen was thermally equilibrated in water-saturated air. Calibration cup is served as a calibration chamber and it was loosened from airtight condition before it is used for the calibration. Calibration at ALS Technichem (HK) Pty Ltd. was carried out once every three months in a water sample with a known concentration of dissolved oxygen. The sensor was immersed in the water and after thermal equilibration, the known mg/L value was keyed in and the calibration was carried out automatically.

c. The turbidity probe of YSI 6820 is calibrated two times a month. A zero check in distilled water was performed with the turbidity probe of YSI 6820 once per monitoring day. The probe will be calibrated with a solution of known NTU at ALS Technichem (HK) Pty Ltd. once every three months.

4.8 Monitoring Results and Exceedance Investigations

The water quality monitoring programme was temporarily suspended during the reporting period, therefore no water quality monitoring results are presented in this report.

5 Dolphin Monitoring

5.1 Introduction

Vessel based surveys for the Chinese White Dolphin (CWD), *Sousa chinensis*, are to be conducted by a dedicated team comprising a qualified marine mammal ecologist and experienced marine mammal observers (MMOs). The purpose of the surveys is to evaluate the impact of the HKCBF reclamation and, if deemed detrimental, to take appropriate action as per the EM&A Manual.

5.2 Monitoring Locations

5.2.1 Vessel-based Line-transect Survey

According to the requirement of the updated EM&A Manual, the dolphin monitoring programme should adopt line-transect vessel survey method. The survey follows pre-set and fixed transect lines in the two areas defined by AFCD as: Northeast Lantau (NEL) survey area; and Northwest Lantau (NWL) survey area.

Table 5.1 shows the co-ordinates for the transect lines and layout map. The layout map showing the transect lines have been provided by AFCD and are shown in **Figure 5.1**.

Table 5.1: Impact Dolphin Monitoring Line Transect Co-ordinates (Provided by AFCD)

Transect	HK Grid System		Long Lat in WGS84	
	X	Y	Long	Lat
1#	804671	815456	113.870287	22.277678
	804671	831404	113.869975	22.421696
2#^	805476	820800	113.877995	22.325951
	805476	826654	113.877882	22.378815
3^	806464	821150	114.030267	22.196697
	806464	822911	114.047344	22.196712
4^	807518	821500	114.033651	22.206219
	807518	829230	114.108618	22.206267
5^	808504	821850	114.037037	22.215126
	808504	828602	114.102523	22.215169
6^	809490	822150	114.039938	22.224033
	809490	825352	114.070995	22.224056
7#^	810499	822000	114.038474	22.233143
	810499	824613	114.063820	22.233163
8#	811508	821123	113.936539	22.328966
	811508	824254	113.936486	22.357241
9#	812516	821303	113.946320	22.330606
	812516	824254	113.946279	22.357255
10*	813525	820827	113.956112	22.326321
	813525	824657	113.956066	22.360908
11#	814556	818853	113.966155	22.304858

Transect	HK Grid System		Long Lat in WGS84	
	814556	820992	113.966125	22.327820
12	815542	818807	113.975726	22.308109
	815542	824882	113.975647	22.362962
13	816506	819480	113.985072	22.314192
	816506	824859	113.985005	22.362771
14	817537	820220	113.995070	22.320883
	817537	824613	113.995018	22.360556
15	818568	820735	114.005071	22.325550
	818568	824433	114.005030	22.358947
16	819532	821420	114.014420	22.331747
	819532	824209	114.014390	22.356933
17	820451	822125	114.023333	22.338117
	820451	823671	114.023317	22.352084
18	821504	822371	114.033556	22.340353
	821504	823761	114.033544	22.352903
19	822513	823268	114.043340	22.348458
	822513	824321	114.043331	22.357971
20	823477	823402	114.052695	22.349680
	823477	824613	114.052686	22.360610
21	805476	827081	113.877878	22.382668
	805476	830562	113.877811	22.414103
22	806464	824033	113.887520	22.355164
	806464	829598	113.887416	22.405423
23	814559	821739	113.966142	22.334574
	814559	824768	113.966101	22.361920
24^	805476	815900	113.979368	22.187721
	805476	819100	114.010398	22.187756

Remarks:

(a) * Due to the presence of deployed silt curtain systems at the site boundaries of the Contract, some of the transect lines shown in Figure 5.1 could not be fully surveyed during the regular survey. Transect 10 is reduced from 6.4km to approximately 3.6km in length due to the HKBCF construction site. Therefore the total transect length for both NEL and NWL combined is reduced to approximately 108km.

(b) # Coordinates for transect lines 1, 2, 7, 8, 9 and 11 have been updated in respect to the Proposal for Alteration of Transect Line for Dolphin Monitoring approved by EPD on 19 August 2015.

(c) ^ Due to marine works of the Expansion of Hong Kong International Airport into a Three-Runway System (3RS Project), the change of transect lines 2, 3, 4, 5, 6 and 7 and new transect line 24 were justified and verified by the ET Leader for Contract No. HY/2010/02 and the IEC respectively on 24 March 2017 and it was approved by EPD on 12 May 2017.

The survey team used standard line-transect methods (Buckland *et al*., 2001) to conduct the systematic vessel surveys, and followed the same technique of data collection that has been adopted over the last 20 years of marine mammal monitoring surveys in Hong Kong developed by HKCRP (see Hung, 2017). For each monitoring vessel survey, a 15-m inboard vessel with an open upper deck (about 4.5 m above water surface) was used to make observations from the flying bridge area.

Two experienced observers (a data recorder and a primary observer) made up the on-effort survey team, and the survey vessel transited different transect lines at a constant speed of 13-15 km per hour. The data recorder searched with unaided eyes and filled out the datasheets,

while the primary observer searched for dolphins and porpoises continuously through 7 x 50 Fuinon marine binoculars.

Both observers searched the sea ahead of the vessel, between 270° and 90° (in relation to the bow, which is defined as 0°). One to two additional experienced observers were available on the boat to work in shift (i.e. rotate every 30 minutes) in order to minimize fatigue of the survey team members. All observers were experienced in small cetacean survey techniques and identifying local cetacean species.

During on-effort survey periods, the survey team recorded effort data including time, position (latitude and longitude), weather conditions (Beaufort sea state and visibility), and distance travelled in each series (a continuous period of search effort) with the assistance of a handheld GPS (Garmin eTrex Legend).

Data including time, position and vessel speed were also automatically and continuously logged by handheld GPS throughout the entire survey for subsequent review.

When dolphins were sighted, the survey team would end the survey effort, and immediately record the initial sighting distance and angle of the dolphin group from the survey vessel, as well as the sighting time and position. Then the research vessel was diverted from its course to approach the animals for species identification, group size estimation, assessment of group composition, and behavioural observations. The perpendicular distance (PSD) of the dolphin group to the transect line was later calculated from the initial sighting distance and angle.

Survey effort being conducted along the parallel transect lines that were perpendicular to the coastlines was labelled as “primary” survey effort, while the survey effort conducted along the connecting lines between parallel lines was labelled as “secondary” survey effort. According to HKCRP long-term dolphin monitoring data, encounter rates of Chinese white dolphins deduced from effort and sighting data collected along primary and secondary lines were similar in NEL and NWL survey areas. Therefore, both primary and secondary survey effort were presented as on-effort survey effort in this report.

Encounter rates of Chinese white dolphins (number of on-effort sightings per 100 km of survey effort and number of dolphins from all on-effort sightings per 100 km of survey effort) were calculated in NEL and NWL survey areas in relation to the amount of survey effort conducted during each month of monitoring survey. Only data collected under Beaufort 3 or below condition would be used for encounter rate analysis. Dolphin encounter rates were calculated using primary survey effort alone, as well as the combined survey effort from both primary and secondary lines.

5.2.2 Photo-identification Work

When a group of Chinese White Dolphins were sighted during the line-transect survey, the survey team would end effort and approach the group slowly from the side and behind to take photographs of them. Every attempt was made to photograph every dolphin in the group, and even photograph both sides of the dolphins, since the colouration and markings on both sides may not be symmetrical.

A professional digital camera (Canon EOS 7D or 60D model), equipped with long telephoto lenses (100-400 mm zoom), were available on board for researchers to take sharp, close-up photographs of dolphins as they surfaced. The images were shot at the highest available resolution and stored on Compact Flash memory cards for downloading onto a computer.

All digital images taken in the field were first examined, and those containing potentially identifiable individuals were sorted out. These photographs would then be examined in greater

detail, and were carefully compared to the existing Chinese White Dolphin photo-identification catalogue maintained by HKCRP since 1995.

Chinese White Dolphins can be identified by their natural markings, such as nicks, cuts, scars and deformities on their dorsal fin and body, and their unique spotting patterns were also used as secondary identifying features (Jefferson, 2000).

All photographs of each individual were then compiled and arranged in chronological order, with data including the date and location first identified (initial sighting), re-sightings, associated dolphins, distinctive features, and age classes entered into a computer database.

5.3 Action and Limit Levels for Dolphin Monitoring

The Action and Limit Levels for Chinese White Dolphin Monitoring are provided in **Table 5.2** and **Table 5.3**, respectively.

Table 5.2: Action and Limit Levels for Chinese White Dolphin Monitoring - Approach to Define Action Level (AL) and Limit Level (LL)

	North Lantau Social Cluster	
	NEL	NWL
Action Level	(STG < 70% of baseline) & (ANI < 70% of baseline)	(STG < 70% of baseline) & (ANI < 70% of baseline)
Limit Level	[(STG < 40% of baseline) & (ANI < 40% of baseline)] AND [(STG < 40% of baseline) & (ANI < 40% of baseline)]	

Table 5.3: Derived Value of Action Level (AL) and Limit Level (LL) for Chinese White Dolphin Monitoring

	North Lantau Social Cluster	
	NEL	NWL
Action Level	(STG < 4.2) & (ANI < 15.5)	(STG < 6.9) & (ANI < 31.3)
Limit Level	[(STG < 2.4) & (ANI <8.9)] AND [(STG < 3.9) & (ANI < 17.9)]	

The event and action plan is provided in **Appendix D**.

If exceedance(s) at these survey transect(s) is/are recorded by the ET of the Contract or referred by the other ET under the HZMB project to the Contract, the ET of the Contract will carry out an investigation and findings will be reported in the monthly EM&A Report.

5.4 Monitoring Schedule for the Reporting Period

The schedule for dolphin monitoring for the reporting period is provided in **Appendix I**.

5.5 Monitoring Results

5.5.1 Vessel-based Line-transect Survey

Two sets of systematic line-transect vessel surveys were conducted under the HKBCF dolphin monitoring programme on 1, 14, 20, 25 and 26 February 2019, to cover all transect lines in NWL and NEL survey areas twice. The survey routes of each survey day are presented in **Figures 2 to 6 of Appendix L.**

A total of 273.04 km of survey effort was collected, with 94.6% of the total survey effort being conducted under favourable weather conditions (i.e. Beaufort Sea State 3 or below with good visibility) during the reporting period's surveys (**Annex I of Appendix L**).

Among the two areas, 107.30 km and 165.74 km of survey effort were collected from NEL and NWL survey areas respectively. The total survey effort conducted on primary and secondary lines were 195.52 km and 77.52 km respectively (**Annex I of Appendix L**).

During the two sets of monitoring surveys in the reporting period, six groups of 18 Chinese White Dolphins were sighted (**Annex II of Appendix L**). All six dolphin groups were sighted in NWL, while no dolphin was sighted at all in NEL. Notably, all six groups were sighted during on-effort search, and four of them were made on primary lines (**Appendix II of Appendix L**). None of them was associated with any operating fishing vessel.

Distribution of the dolphin sightings made in the reporting period is shown in **Figure 7 of Appendix L**. The six dolphin groups were sparsely sighted in the western end of North Lantau region with apparent concentration, and their locations include the waters near Lung Kwu Chau, between Lung Kwu Chau and Sha Chau, near Pillar Point, and to the west and north of the third runway expansion work site. (**Figure 7 of Appendix L**). All sightings were also located far away from the HKBCF work site.

During the reporting period's surveys, the encounter rates of Chinese White Dolphins deduced from the survey effort and on-effort sighting data made under favourable conditions (Beaufort 3 or below) are shown in **Table 5.4** and **Table 5.5**.

Table 5.4: Dolphin encounter rates deduced from the two sets of HKBCF surveys (two surveys in each set) during the reporting period in Northeast (NEL) and Northwest Lantau (NWL)

		Encounter rate (STG) (no. of on-effort dolphin sightings per 100 km of survey effort)	Encounter rate (ANI) (no. of dolphins from all on-effort sightings per 100 km of survey effort)
		Primary Lines Only	Primary Lines Only
NEL	Set 1: February 1st / 14th	0.0	0.0
	Set 2: February 20th / 25th / 26th	0.0	0.0
NWL	Set 1: February 1st / 14th	3.9	7.7
	Set 2: February 20th / 25th / 26th	3.3	13.2

Table 5.5: Overall dolphin encounter rates (sightings per 100 km of survey effort) from all four HKBCF surveys conducted during the reporting period on primary lines only as well as both primary lines and secondary lines in NEL and NWL

	Encounter rate (STG) (no. of on-effort dolphin sightings per 100 km of survey effort)		Encounter rate (ANI) (no. of dolphins from all on-effort sightings per 100 km of survey effort)	
	Primary Lines Only	Both Primary and Secondary Lines	Primary Lines Only	Both Primary and Secondary Lines
NEL	0.0	0.0	0.0	0.0
NWL	3.6	3.8	10.7	11.5

The average dolphin group size recorded during the reporting period's surveys was 3.0 individuals per group, with four sightings composed of small groups of 1-3 animals only and two sighting with medium-sized group of 4-5 animals. Such average was similar to the ones recorded in previous monitoring months.

5.5.2 Photo-identification Work

During the two sets of surveys conducted during the reporting period, eleven known individual dolphins were sighted 16 times in total (**Annex III and IV of Appendix L**).

Most of these identified individuals were re-sighted only once, but three individuals (CH34, NL136 and NL202) were re-sighted twice, while NL123 were sighted thrice.

Notably, none of the identified individuals were sighted with their young calves during their re-sightings in the present monitoring month (**Annex III of Appendix L**).

6 Environmental Site and Audit

6.1 Site Inspection

Site Inspections were carried out on a weekly basis to monitor the implementation of proper environmental pollution control mitigation measures for the project. During the reporting period, site inspections were carried out on 8, 13, 20 and 25 February 2019.

When permanent soft landscaping works within the site boundaries of the Contract are commenced, construction phase landscape and visual mitigation measures would be implemented in accordance with the EP, EIA and EM&A Manual. Monitoring and audit of landscape and visual mitigation measures would be conducted bi-weekly in accordance with Section 14.2 of the Updated EM&A Manual for HKBCF (Version 1.0). Permanent soft landscaping works within the Contract site had not commenced during the reporting period.

Particular observations during the site inspections and corrective actions undertaken by the Contractor are described below.

30 January 2019

a. Some chemical containers near RW16S were place on the ground without suitable bund or drip tray. Subsequently, the chemical continaers were removed. The observation was closed on 8 February 2019.

b. Part of an access road near RW16N was observed as dry. Subsequently, water spraying was provided on the access road. The observation was closed on 8 February 2019.

8 February 2019

a. The excavator with faded out NRMM label was observed near P1202 area. Subsequently, NRMM label was observed on the excavator. The observation was closed on 13 February 2019.

13 February 2019

a. Oil stain and refuse were found near RW16S on the ground. Subsequently, the oil stain and refuse were cleared. The observation was closed on 20 February 2019.

20 February 2019

a. Loose general refuse was observed near RW16S. Subsequently, the general refuse was cleared. The observation was closed on 25 February 2019.

25 February 2019

a. No new observations were made.

6.2 Advice on the Solid and Liquid Waste Management Status

The Contractor registered as a chemical waste producer for the Contract. Sufficient numbers of receptacles were available for general refuse collection and sorting. As a practical means, the disposal operation is managed by a single HKBCF contractor who is also responsible for applying dumping permit and its subsequent extension applications from EPD. Contract No. HY/2013/03 has been assigned to coordinate and arrange for disposal of extracted marine sediment from this Contract.

There was no generation of excavated sediment for treatment during this reporting period. Any treatment of excavated marine sediment will be conducted using cement solidification/ stabilization (Cement S/S) techniques and the treated sediment will be reused onsite for either backfilling or landscaping (e.g. berm material).

The monthly summary of waste flow table is detailed in **Appendix E**.

The Contractor was reminded that chemical waste containers should be properly treated and stored temporarily in designated chemical waste storage area on site in accordance with the Code of Practice on the Packing, Labelling and Storage of Chemical Waste.

6.2.1 Disposal of Marine Sediment Extracted from Bored Piling Works

6.2.1.1 Background

After the acceptance of the review of the approved Sediment Quality Report (SQR) for this Project under EPD letter dated 19 August 2015, an approval to dispose the marine sediment extracted from bored piling for this Project was then approved under memo from Secretary, Marine Fill Committee of CEDD dated 20 August 2015 for the disposal of marine sediment extracted from bored piling works. The disposal sites allocated to this Project are the Mud Pit CMP2 of the Confined Marine Sediment Disposal Facility to the South of The Brothers (or at the East of Sha Chau). As advised by CEDD in the memo dated 19 February 2016, from 00:00 on 22 March 2016 onward, the disposal space at CMP2 of the South of The Brothers is closed and all disposal of contaminated sediment is to be carried out at CMP Vd to the East of Sha Chau (ESC).

As Contract No. HY/2013/01 has commenced treatment of the extracted marine sediment, treatment will continue and the treated marine sediment will be re-used within the HKBCF Island. On the other hand, Contract Nos. HY/2013/02, HY/2013/03 and HY/2013/04 have not commenced the treatment of extracted marine sediment. Therefore, the marine sediment extracted from these three Contracts will be disposed to the allocated disposal sites directly without treatment. As a practical means, the disposal operation is managed by one contractor who is also responsible for applying dumping permit and its subsequent extension applications from EPD. Contract No. HY/2013/03 has been assigned to coordinate and arrange for disposal of extracted marine sediment from all three Contracts.

The SQR was further reviewed in mid-2016. EPD has no comment to extend the validity of the SQR to August 2017 under letter dated 18 August 2016.

Based on the actual piling operation, the estimated quantity of marine sediment to be extracted has been revised from 85,000 m^3 to 126,000 m^3 (bulk volume). EPD has no comments on the request as in the letter dated 20 October 2016. The Secretary of Marine Fill Committee, CEDD approved the increasing quantity in the memo dated 10 November 2016.

During the course of reviewing the SQR, it was noted that the contamination level of the marine sediment extracted from the inner part of the HKBCF Island was not identified during the previous sampling and testing. As requested by EPD, sampling and testing are required. The Sediment Sampling and Testing Proposal (SSTP) for the inner area of the HKBCF Island was approved by EPD on 2 June 2016.

As in the agreed SSTP for the inner area of the HKBCF Island, samples were taken from the seventeen batches of stockpiled marine sediments and from five boreholes each in one of the five sampling grids. After conducting chemical tests on samples, six batches of stockpiled samples under Contract No. HY/2013/03 and all eight batches of stockpiled samples under

Contract No. HY/20013/04 are classified as Category L sediment. The Secretary of Marine Fill Committee of CEDD allocated disposal sites under memo dated 24 October 2016 and dated 22 November 2016 for disposal of a total of 9,500 m^3 in-situ volume of Category L sediment (using a bulk factor of 1.3). The Category L sediment was disposed in December 2016.

One sample from the batch of stockpiled marine sediment under Contract No. HY/2013/03 and samples from all five sampling grids had contamination levels exceeding the Lower Chemical Exceedance Levels (LCEL) and biological screenings were carried out. All samples passed the biological screenings and are classified as Category Mp sediment and to be disposed off site using Type II confined marine disposal method the same method used for marine sediment extracted from other part of the HKBCF Island.

6.2.1.2 Dumping Arrangements

The barge for disposal of marine sediment will morn at the temporary loading and unloading at the east shore of the HKBCF Island, which has been being used by reclamation contractor (Contract No. HY/2010/02) for reclamation activities. In terms of safety consideration, each dumping date will be allocated to one Contract. The quantity of marine sediment disposed on the date is from one Contract.

During dumping, each Contractor is responsible for transporting the marine sediment from his site area to the barge. The estimated quantity of marine sediment in each truck is confirmed by Resident Site Staff of each Contract. The trip tickets for transportation and disposal of marine sediment are collected and checked. Contract No. HY/2013/03 as the dumping permit holder is responsible for reporting to EPD the quantity disposed of as the condition stipulated in the dumping permit.

6.2.1.3 Reporting

AECOM has confirmed that the disposal of excavated marine sediments to allocated dumping site via Contract No. HY/2013/03 has been completed with the last batch disposal on 30 August 2017. The total quantities disposed are presented in the following table (**Table 6.1**):

Table 6.1: Summary of Marine Sediment disposed to Dumping Site via Contract No. HY/2013/03

	Type of Sediment and Quantity Disposed (m^3)	
	Cat. L (in Type I)	Type II
Total	3,570	39,814

Note: For monthly breakdown of these quantities, please refer to the waste flow table in **Appendix E**.

6.3 Environmental Licenses and Permits

The valid environmental licenses and permits during the reporting period are summarized in **Appendix F**.

6.4 Implementation Status of Environmental Mitigation Measures

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

A summary of the Implementation Schedule of Environmental Mitigation Measures (EMIS) is presented in **Appendix G**. Most of the necessary mitigation measures were implemented properly.

Implementation status of the Regular Marine Travel Route Plan (RMTRP) was checked by ET. Training of marine travel route for marine vessel operator was given to relevant staff and relevant records were kept properly.

According to the Contractor of HY/2013/04, all marine-based segment deliveries were completed in January 2018 and no marine-based works were conducted under the contract during the reporting period. The localised silt curtains under this Contract were removed on 4 January 2019.

6.5 Summary of Exceedance of the Environmental Quality Performance Limit

Air Quality

No Action and Limit Level exceedances of 1-hour and 24-hour TSP level were recorded at AMS2, AMS3C and AMS7B during the reporting period.

Summary of Action and Limit Level exceedance of 1-hour TSP level and 24-hour TSP level at AMS6 shall be referred to the monthly EM&A report prepared by Contract No. HY/2011/03.

Noise

No Action and Limit Level exceedances were recorded at NMS2 and NMS3C during the reporting period.

Water Quality

The water quality monitoring programme was temporarily suspended during the reporting period, therefore no water quality monitoring was conducted and no water quality monitoring results or exceedances are presented in this report.

Chinese White Dolphin

For dolphin monitoring, dolphin surveys were conducted on 1, 14, 20, 25 and 26 February 2019. A total of 273.04 km of survey effort was collected, with 94.6% of the total survey effort being conducted under favourable weather conditions. Six groups of 18 Chinese White Dolphins were sighted. All six dolphin groups were sighted in NWL, while no dolphin was sighted at all in NEL.

6.6 Summary of Complaints, Notification of Summons and Successful Prosecution

Complaints

There were no complaints received in relation to the environmental impact during the reporting period.

Notification of Summons and Successful Prosecution

No notification of summons or prosecutions was received during the reporting period.

Statistics on notifications of summons and successful prosecutions are summarized in **Appendix H**.

7 Future Key Issues

7.1 Construction Programme for the Coming Months

As informed by the Contractor, the major construction activities for March 2019 are summarized in **Table 7.1**.

Table 7.1: Construction Activities for March 2019

Site Area	Description of Activities
HKBCF	• Erection of sign gantries (land-based) • Construction of parapets for bridge structures (land-based) • Construction of Retaining Wall RW16N and RW16S (land-based) • Construction of Bridge Deck D16 in-situ deck (land-based) • Construction of utilities cross-over frame under Bridge D9c (land-based) • Backfilling of retaining walls and formation of fill slopes and road embankment (land-based) • Drainage works and watermains laying (land-based) • Roadworks and road furniture (land-based) • Maintenance of temporary traffic arrangements (TTA) associated with the commissioning of HKBCF and Tuen Mun – Chek Lap Kok Link Southern Connection (TM-CLKL-SC) (land-based)

7.2 Environmental Site Inspection and Monitoring Schedule for the Coming Month

The tentative schedule for weekly site inspection and monitoring for air quality, noise, water quality and Chinese White Dolphin for March 2019 is provided in **Appendix I**.

8 Conclusions

8.1 Conclusions

General

Commencement of the Contract took place on 13 March 2015 and the construction works of the Contract commenced on 13 July 2015.

The air quality, noise, water quality and dolphin monitoring works under Contract No. HY/2013/01 were suspended on 1 October 2018. From 1 October 2018 onwards, the ET of Contract No. HY/2013/04 has continued the same implementation of air quality, noise and water quality environmental monitoring (including air quality and noise monitoring already under its implementation) while the ET of Contract No. HY/2011/03 has continued the same implementation of dolphin monitoring, with the reporting of all environmental monitoring continued by the ET of Contract No. HY/2013/04.

The water quality monitoring programme was temporarily suspended during the reporting period, therefore no water quality monitoring was conducted and no water quality monitoring results or exceedances are presented in this report.

Breaches of Action and Limit Levels

Air Quality

No Action and Limit Level exceedances of 1-hour and 24-hour TSP level were recorded at AMS2, AMS3C and AMS7B during the reporting period.

Summary of Action and Limit Level exceedance of 1-hour TSP level and 24-hour TSP level at AMS6 shall be referred to the monthly EM&A report prepared by Contract No. HY/2011/03.

Noise

No Action and Limit Level exceedances were recorded at the NMS2 and NMS3C during the reporting period.

Water Quality

The water quality monitoring programme was temporarily suspended during the reporting period, therefore no water quality monitoring was conducted and no water quality monitoring results or exceedances are presented in this report.

Chinese White Dolphin

For dolphin monitoring, dolphin surveys were conducted on 1, 14, 20, 25 and 26 February 2019. A total of 273.04 km of survey effort was collected, with 94.6% of the total survey effort being conducted under favourable weather conditions. Six groups of 18 Chinese White Dolphins were sighted. All six dolphin groups were sighted in NWL, while no dolphin was sighted at all in NEL.

Environmental Site Inspections

Environmental site inspections were carried out on 8, 13, 20 and 25 February 2019. Recommendations on remedial actions were given to the Contractor for the deficiencies identified during the site inspections.

Complaints

There were no complaints received in relation to the environmental impact during the reporting period.

Notifications of Summons and Successful Prosecutions

There were no notifications of summons or prosecutions received during the reporting period.

Figures

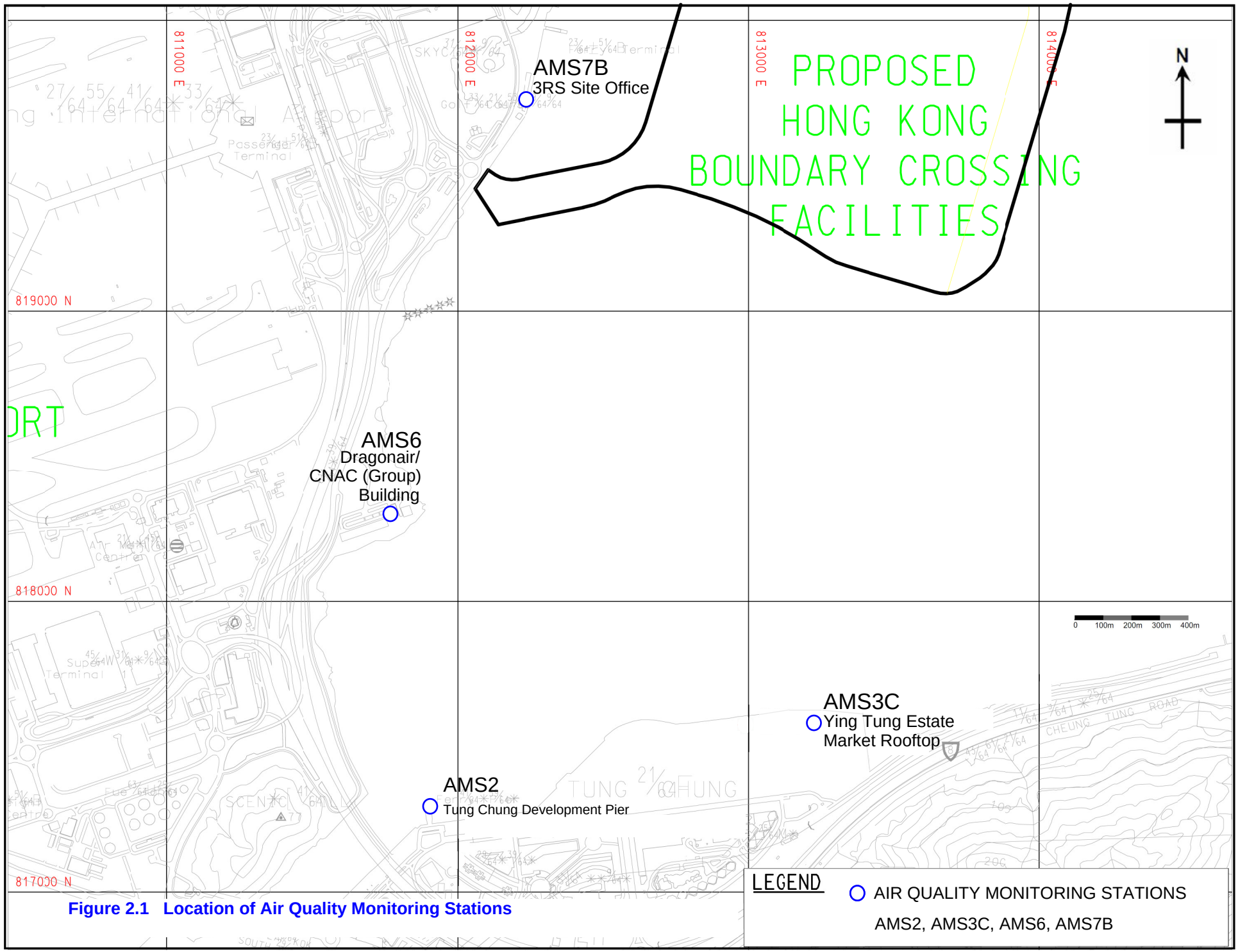


Figure 2.1 Location of Air Quality Monitoring Stations

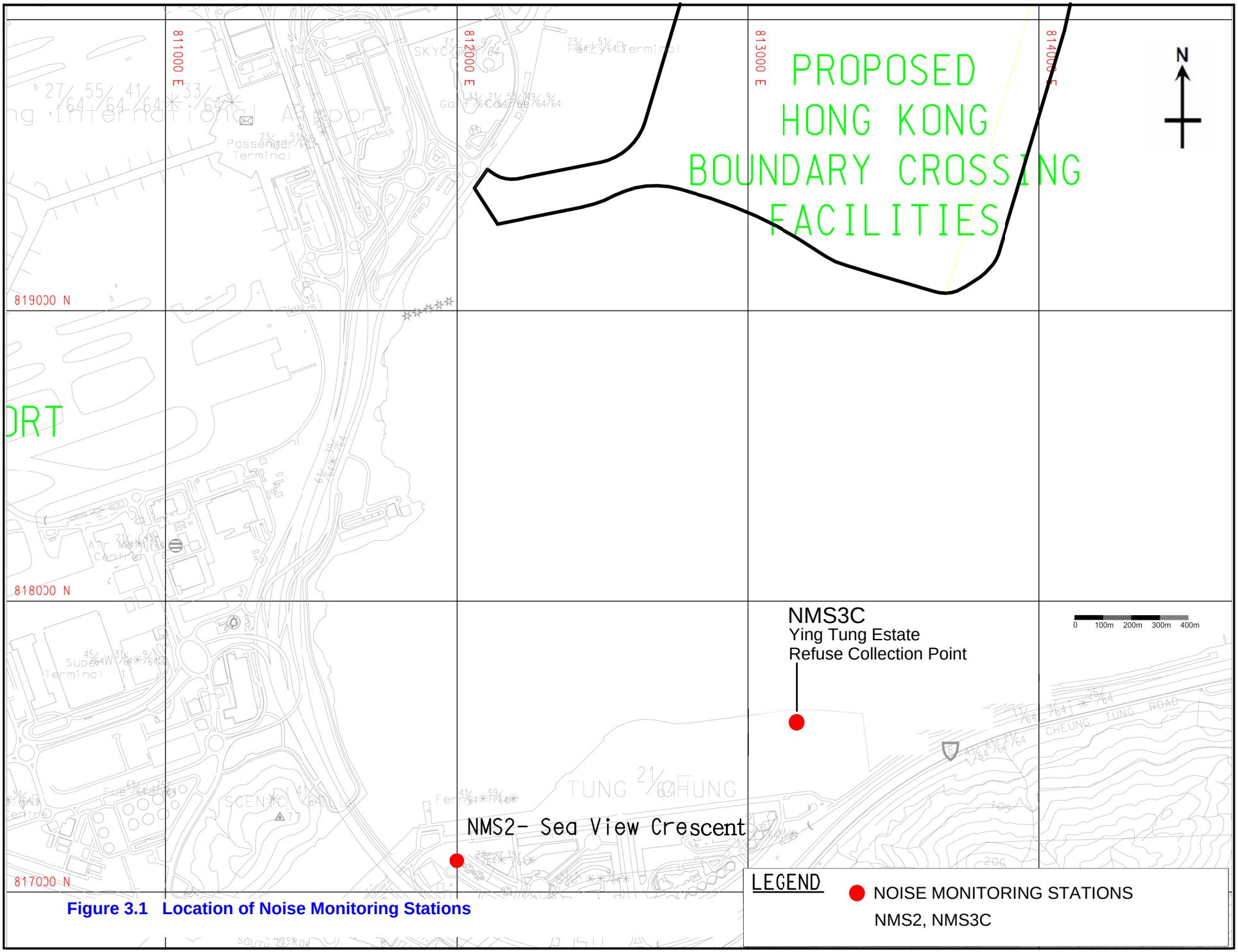


Figure 3.1 Location of Noise Monitoring Stations

Station	East	North
IS5	811579	817106
IS(Mf)6	812101	817873
IS7	812244	818777
IS8	814251	818412
IS(Mf)9	813273	818850
IS10(N)	812942	820881
IS(Mf)11	813562	820716
IS(Mf)16	814328	819497
IS17	814539	820391
SR3(N)	810689	816591
SR4(N)	814705	817859
SR5(N)	812569	821475
SR6	805837	821818
SR7	814293	821431
SR10A(N)	823644	823484
SR10B(N2)	823689	823159
CS(Mf)3(N)	808814	822355
CS(Mf)5	817990	821129
CS4	810025	824004
CS6	817028	823992
CSA	818103	823064

FIGURE 4.1– LOCATION OF WATER QUALITY MONITORING STATIONS

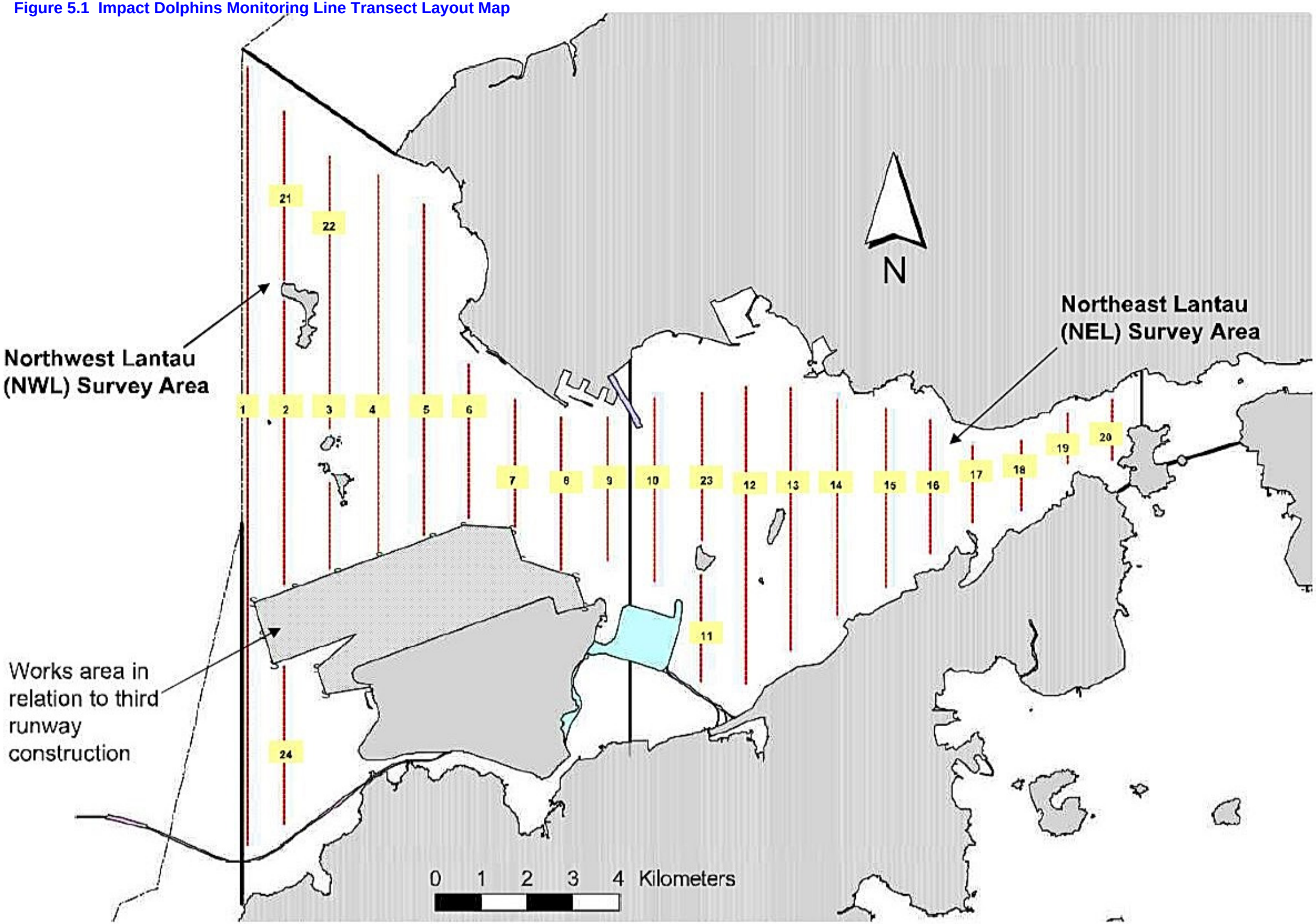
LEGEND

IS — IMPACT STATIONS

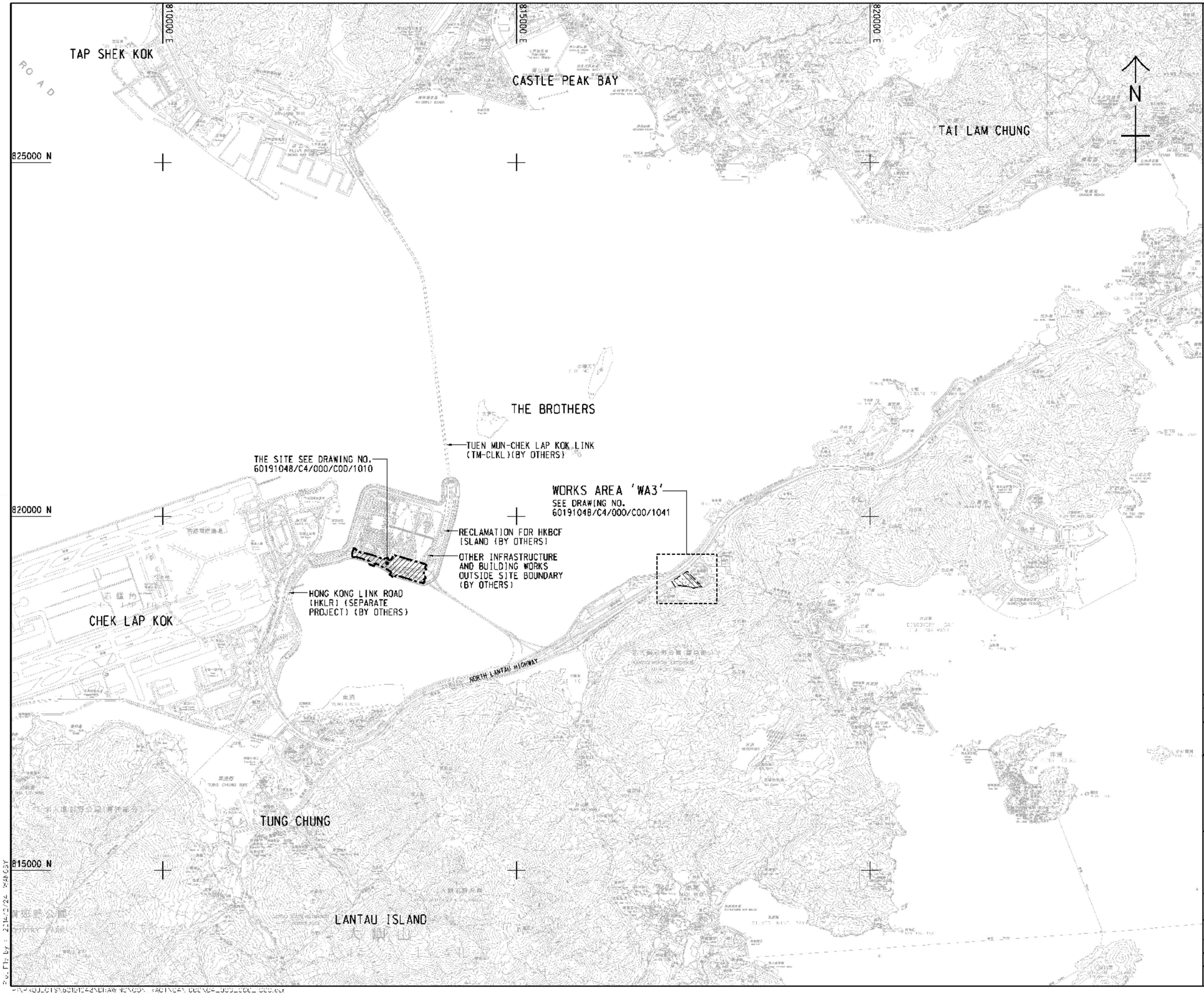
CS — CONTROL / FAR FIELD STATIONS

SR — SENSITIVE RECEIVERS STATIONS

Figure 5.1 Impact Dolphins Monitoring Line Transect Layout Map



Appendix A. Location of Works Areas



NOTES:

1. COORDINATES ARE RELATED TO HONG KONG METRIC GRID (1980).
2. DIMENSIONS ARE IN MILLIMETER AND CHAINAGE ARE IN METRES UNLESS OTHERWISE SHOWN.

LEGEND:

SITE BOUNDARY

WORKS AREA

-	TENDER DRAWING	BWCW	SCI	FEB.14
REV.	DESCRIPTION	O.S. CHECKED	P.S. APPROVED	DATE

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

HONG KONG-ZHUHAI-MACAO BRIDGE
HONG KONG BOUNDARY CROSSING FACILITIES
- INFRASTRUCTURE WORKS STAGE II (SOUTHERN PORTION)

SITE LOCATION PLAN

AECOM
Rogers Stirk Harbour + Partners
BURO HAPPOLD ATKINS ADI
Aedas

DRG.NO. 圖紙編號 60191048/C4/000/C00/1000

DESIGNED BY 設計 BWCW	CONTRACT NO. 合約編號 HY/2013/04	P. DIR. APPROVED 署長 TKH
DRAWN BY 繪圖 WSY	STATUS 狀況	
SCALE 比例 A1 1 : 25000		
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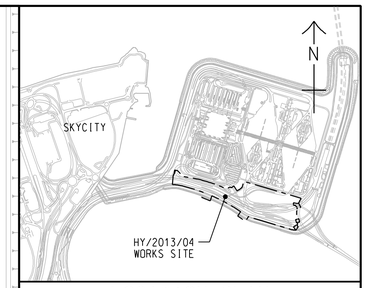
Plotted by : 2014/2/24 WSYCSY

P:\PROJECTS\60191048\DRAWINGS\ACTIVE\C00\C04_000_C00_1000.dgn

812800 E
813200 E
813600 E
820000 N
819600 N
819400 N

BRIDGE D1
BRIDGE D8
BOX CULVERT C
DEPRESSED ROAD DRAINAGE
PUMP HOUSE CUM SWITCH ROOM
BRIDGE D9a
BRIDGE D14a
BRIDGE D10
BRIDGE D14b
BRIDGE D9b
BRIDGE D11
BRIDGE D9c
BRIDGE D16N
BRIDGE D16S
BRIDGE D15
BRIDGE D13
BRIDGE D12a
BRIDGE D12b
BOX CULVERT D
M.J.

A



LOCATION PLAN
SCALE 1 : 25000

LEGEND:

- SITE BOUNDARY
- AT-GRADE WORKS LIMIT
- M.J. — MOVEMENT JOINT
- BRIDGE
- BUILDING/FACILITIES
- AT-GRADE ROAD
- BOX CULVERT

REV. 修訂	DESCRIPTION 內容摘要	CHECKED 複核	DATE 日期
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A	TENDER ADDENDUM NO. 3	BWCW SCI	MAY.14
–	TENDER DRAWING	BWCW SCI	FEB.14

D.C. P.D.

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HONG KONG-ZHUHAI-MACAO BRIDGE
HONG KONG BOUNDARY CROSSING FACILITIES
- INFRASTRUCTURE WORKS STAGE II (SOUTHERN PORTION)

GENERAL ARRANGEMENT

AECOM
Rogers Stirk Harbour + Partners
BURO HAPPOLD ATKINS ADI
Aedas

DRG.NO. 圖紙編號 60191048/C4/000/C00/1002B

DESIGNED BY 設計	BWCW	CONTRACT NO. 合約編號	HY/2013/04
DRAWN BY 繪圖	WSY	P. Dir. APPROVED 批准人	TKH
SCALE 比例	A1 1 : 2000	STATUS 階段	WORKING DRAWING
DIMENSIONS ARE IN 尺寸單位	METRES		

Plot File by : 2014/5/7 WANGSY

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SETTING OUT POINT

POINT	EASTING	NORTHING
301	817467.265	819162.683
302	817314.741	819069.828
303	817327.338	819049.295
304	817440.865	819117.811
305	817340.825	819027.314
306	817387.350	819023.403
307	817387.861	819043.396
308	817466.133	819091.047
309	817469.783	819087.181
310	817513.449	819113.764
311	817347.717	819016.082
312	817620.269	819000.620
313	817445.362	819013.131
314	817450.595	819032.307
315	817495.828	819059.595
316	817522.110	819075.388
317	817566.404	819028.472
318	817568.506	819008.526
319	817531.155	819001.066
320	817533.346	818991.306

A

817200 E

817400 E

817600 E

819200 N

819000 N

NORTH LANTAU HIGHWAY

CHEUNG TUNG ROAD

小濛灣污水處理廠
Siu Ho Wan Sewage Treatment Works

WORKS AREA OCCUPIED BY CONTRACT NO. HY/2011/03

WORKS AREA OCCUPIED BY CONTRACT NO. HY/2011/09

WORKS AREA OCCUPIED BY CONTRACT NO. HY/2013/02

WORKS AREA OCCUPIED BY CONTRACT NO. HY/2013/01

WORKS AREA OCCUPIED BY CONTRACT NO. HY/2013/03

10m WIDE COMMON ACCESS TO BE MAINTAINED BY CONTRACT NO. HY/2010/02

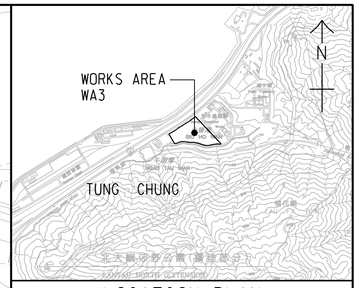
301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320

WORKS AREA OCCUPIED BY CONTRACT NO. HY/2010/02

10m WIDE COMMON ACCESS TO BE CONSTRUCTED AND INITIALLY MAINTAINED BY CONTRACT NO. HY/2013/01. UPON COMMENCEMENT OF CONTRACT NO. HY/2013/03. THE MAINTENANCE RESPONSIBILITY SHALL BE TRANSFERRED FROM CONTRACT NO. HY/2013/01 TO CONTRACT NO. HY/2013/03.

WORKS AREA OCCUPIED BY CONTRACT NO. HY/2013/04

WORKS AREA OCCUPIED BY CONTRACT NO. HY/2014/05



LOCATION PLAN
SCALE 1 : 25000

NOTES:

1. COORDINATES ARE RELATED TO HONG KONG METRIC GRID (1980).
2. DIMENSIONS ARE IN MILLIMETER AND CHAINAGE ARE IN METRES UNLESS OTHERWISE SHOWN.

LEGEND:

- WORKS AREA BOUNDARY
- PORTION 3.1
- PORTION 3.2
- PORTION 3.3
- PORTION 3.4
- PORTION 3.5
- PORTION 3.6
- PORTION 3.7
- PORTION 3.8
- PORTION 3.9
- PORTION 3.10 (A)

REV. 修訂	DESCRIPTION 內容摘要	D.E. P.E. CHECKED 查核	DATE 日期
B	WORKING DRAWING	BWCW SCI	APR.15
A	TENDER ADDENDUM NO. 2	BWCW SCI	APR.14
-	TENDER DRAWING	BWCW SCI	FEB.14

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

HONG KONG-ZHUHAI-MACAO BRIDGE
HONG KONG BOUNDARY CROSSING FACILITIES
- INFRASTRUCTURE WORKS STAGE II (SOUTHERN PORTION)

WORKS AREA WA3

AECOM
Rogers Stirk Harbour + Partners
BURO HAPPOLD ATKINS ADI
Aedas

DRG.NO. 圖紙編號 60191048/C4/000/C00/1041B

DESIGNED BY 設計 BWCW	CONTRACT NO. 合約編號 HY/2013/04	P. Dir. APPROVED 負責人 TKH
DRAWN BY 繪圖 WSY	STATUS 階段 **WORKING DRAWING**	
SCALE 比例 A1 1 : 1000		
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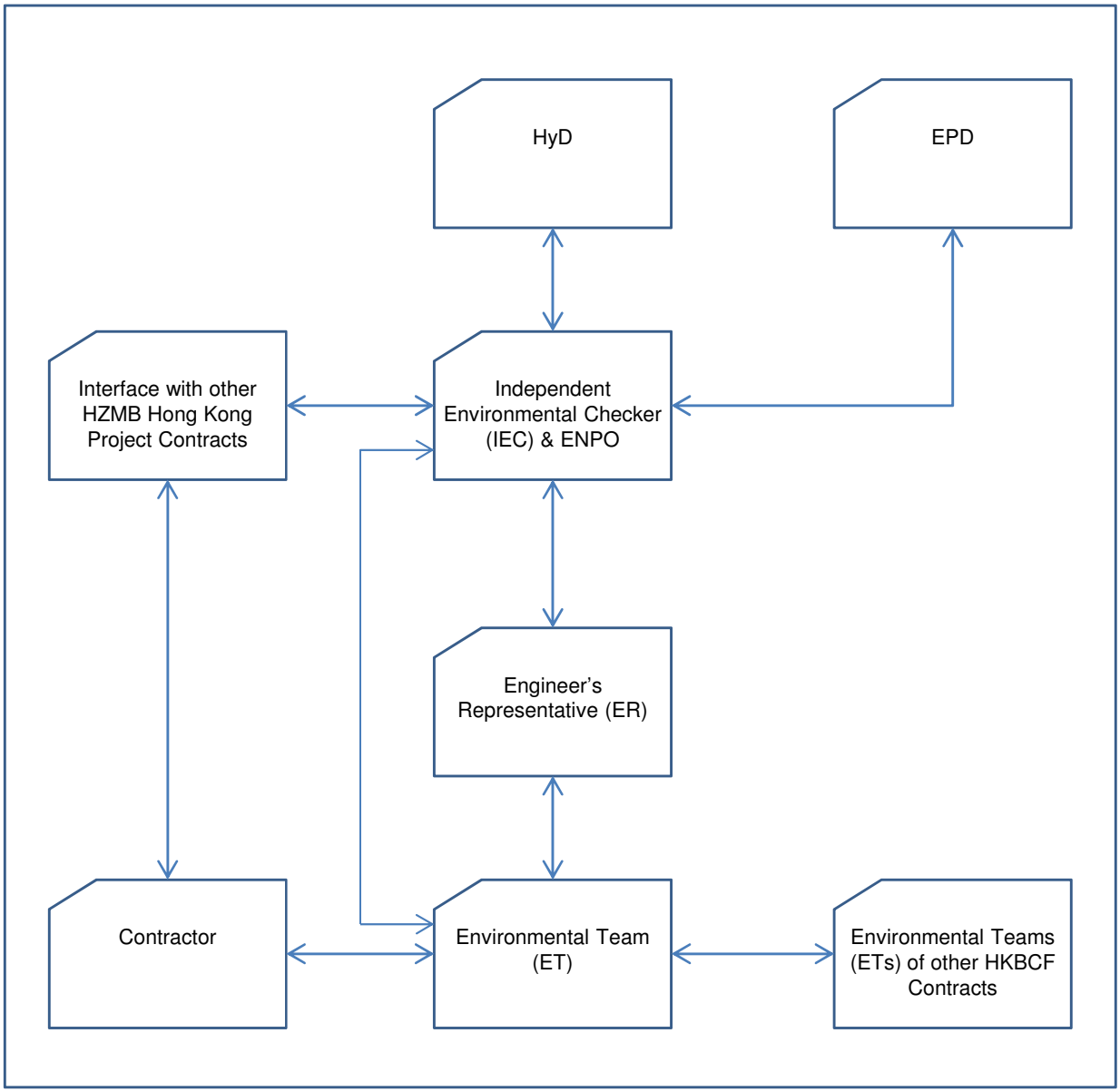
Appendix B. Project Organization for Environmental Works

Project Organisation for Environmental Works



Appendix C. Construction Programme

HY/2013/04 - Hong Kong Boundary Crossing Facilities Infrastructure Works Stage II (Southern Portion)

Activity ID	Activity Name	Milestone
Essential Works Updates - Tier 1 - 26 C		
Contract Key Dates		
CON.KD.0005	Letter of Acceptance (LOA)	Letter of Acceptance (LOA)
CON.KD.0010	Commencement Date	Commencement Date
CON.KD.0020	Completion of the whole of the Works (1520)	11-May-19, Completion of the whole of the Works (1520)
Possession Dates		
CON.PD.1010	Site Possession of Portion A1 (61) - 8	Site Possession of Portion A1 (61) - 8
CON.PD.1020	Site Possession of Portion A2 (61)	Site Possession of Portion A2 (61)
CON.PD.1050	Site Possession of Portion A5 (61)	Site Possession of Portion A5 (61)
CON.PD.1060	Site Possession of Portion A6 (61)	Site Possession of Portion A6 (61)
CON.PD.1070	Site Possession of Portion B1-5 (92)	Site Possession of Portion B1-5 (92)
CON.PD.1080	Site Possession of Portion B2 (123)	Site Possession of Portion B2 (123)
CON.PD.1130	Site Possession of Portion B5 (123)	Site Possession of Portion B5 (123)
CON.PD.1140	Site Possession of Portion C1 (184)	06-Oct-16 Site Possession of Portion C1 (184)
CON.PD.1150	Site Possession of Portion C2 (184)	Site Possession of Portion C2 (184)
CON.PD.1160	Site Possession of Portion D1 (183)	Site Possession of Portion D1 (183)
CON.PD.1180	Site Possession of Portion D3 (183)	Site Possession of Portion D3 (183)
CON.PD.1190	Site Possession of Portion A1 (61) - 2	Site Possession of Portion A1 (61) - 2
CON.PD.1200	Site Possession of Portion A1 (61) - 5	Site Possession of Portion A1 (61) - 5
CON.PD.1210	Site Possession of Portion A1 (61) - 1	Site Possession of Portion A1 (61) - 1
CON.PD.1220	Site Possession of Portion C1 -1 (184)	Site Possession of Portion C1 -1 (184)
CON.PD.1230	Site Possession of Portion C1 -2 (184)	Site Possession of Portion C1 -2 (184)
CON.PD.1240	Site Possession of Portion B1 -1 (92)	Site Possession of Portion B1 -1 (92)
CON.PD.1250	Site Possession of Portion B1 -2 (92)	Site Possession of Portion B1 -2 (92)
CON.PD.1260	Site Possession of Portion A1 (61) - 7	Site Possession of Portion A1 (61) - 7
CON.PD.1270	Site Possession of Portion B1-3 (92)	Site Possession of Portion B1-3 (92)
CON.PD.1280	Site Possession of Portion B1-4 (92)	Site Possession of Portion B1-4 (92)
CON.PD.1290	Site Possession of Portion C1 -3 (184)	Site Possession of Portion C1 -3 (184)
Site Access Dates		
CON.PD.1030	Site Access of Portion A3 (476)	06-Oct-16 Site Access of Portion A3 (476)
CON.PD.1040	Site Access of Portion A4 (627)	29-Nov-16 Site Access of Portion A4 (627)
CON.PD.1090	Site Access of Portion B3 (476)	06-Oct-16 Site Access of Portion B3 (476)
CON.PD.1100	Site Access of Portion B4 (627)	29-Nov-16 Site Access of Portion B4 (627)
CON.PD.1170	Site Access of Portion D2 (488)	06-Oct-16 Site Access of Portion D2 (488)
Contractual Key Dates - Stage / Section (		
CON.FOT.KD01	KD01 - Achievement of Stage 1A (525)	06-Oct-16, KD01 - Achievement of Stage 1A (525)
CON.FOT.KD02	KD02 - Achievement of Stage 1B (650)	22-Dec-16, KD02 - Achievement of Stage 1B (650)
CON.FOT.KD03	KD03 - Achievement of Stage 2 (525)	06-Oct-16, KD03 - Achievement of Stage 2 (525)
CON.FOT.KD04	KD04 - Achievement of Stage 3 (465)	06-Oct-16, KD04 - Achievement of Stage 3 (465)
CON.FOT.KD05	KD05 - Achievement of Stage 4 (615)	17-Nov-16, KD05 - Achievement of Stage 4 (615)
CON.FOT.KD06	KD06 - Achievement of Stage 5 (615)	17-Nov-16, KD06 - Achievement of Stage 5 (615)
CON.FOT.KD07	KD07 - Achievement of Stage 6 (270)	06-Oct-16, KD07 - Achievement of Stage 6 (270)
CON.FOT.KD08	KD08 - Completion of Section I of the Works (795)	16-May-17, KD08 - Completion of Section I of the Works (795)
CON.FOT.KD09	KD09 - Completion of Section II of the Works (803)	24-May-17, KD09 - Completion of Section II of the Works (803)
CON.FOT.KD10	KD10 - Completion of Section III of the Works (803)	24-May-17, KD10 - Completion of Section III of the Works (803)
CON.FOT.KD11	KD11 - Completion of Section IV of the Works (565)	06-Oct-16, KD11 - Completion of Section IV of the Works (565)
CON.FOT.KD12	KD12 - Completion of Section V of the Works (803)	24-May-17, KD12 - Completion of Section V of the Works (803)
CON.FOT.KD13	KD13 - Completion of Section VI of the Works (465)	06-Oct-16, KD13 - Completion of Section VI of the Works (465)
CON.FOT.KD14	KD14 - Completion of Section VII of the Works (1155)	11-May-18, KD14 - Completion of Section VII of the Works (1155)
CON.FOT.KD15	KD15 - Completion of Section VIIIA of the Works (795)	16-May-17, KD15 - Completion of Section VIIIA of the Works (795)
CON.FOT.KD16	KD16 - Completion of Section VIIIB of the Works (1155)	11-May-18, KD16 - Completion of Section VIIIB of the Works (1155)
CON.FOT.KD17	KD17 - Achievement of Stage 7 (718)	28-Feb-17, KD17 - Achievement of Stage 7 (718)
CON.FOT.KD17A	KD17A - Completion of Section VIIIC of the Works (795)	16-May-17, KD17A - Completion of Section VIIIC of the Works (795)
CON.FOT.KD18	KD18 - Completion of Section VIIID of the Works (1155)	11-May-18, KD18 - Completion of Section VIIID of the Works (1155)
CON.FOT.KD19	KD19 - Completion of Section IXA of the Works (1160)	16-May-18, KD19 - Completion of Section IXA of the Works (1160)
CON.FOT.KD20	KD20 - Completion of Section IXB of the Works (1520)	11-May-19, KD20 - Completion of Section IXB of the Works (1520)
Contractual Handover Dates to Employer		
CON.HD.1190	Handover of Portion A1 (KD8+28 days)	13-Jun-17, Handover of Portion A1 (KD8+28 days)
CON.HD.1200	Handover of Portion A2 (KD8+28 days)	13-Jun-17, Handover of Portion A2 (KD8+28 days)
CON.HD.1210	Handover of Portion A3 (KD9+28 days)	21-Jun-17, Handover of Portion A3 (KD9+28 days)
CON.HD.1220	Handover of Portion A4 (KD10+28 days)	21-Jun-17, Handover of Portion A4 (KD10+28 days)
CON.HD.1240	Handover of Portion A5 (KD13+0 days)	06-Oct-16, Handover of Portion A5 (KD13+0 days)

2015 2016 2017 2018 2019 2020 2021

中國建築工程(香港)有限公司
CHINA STATE CONSTRUCTION ENGINEERING (HONG KONG) LTD.

Current Milestone
Late Bar
Actual Work

HY/2013/04 - Detailed Works Programme

Detailed Works Programme (IWP) Rev. 04

Date	Revision	Chec...	Approved
09-Sep-15	Detailed Works Programme ...	WN/WC	ET
17-Oct-15	Detailed Works Programme ...	WN/WC	ET
29-Oct-15	Detailed Works Programme ...	WN/WC	ET
25-Nov-15	Detailed Works Programme ...	WN/WC	ET

HY/2013/04 - Hong Kong Boundary Crossing Facilities Infrastructure Works Stage II (Southern Portion)

Activity ID	Activity Name	Gantt
CON.HD.1250	Handover of Portion A6 (KD14+28 days)	08-Jun-18, Handover of Portion A6 (KD14+28 days)
CON.HD.1260	Handover of Portion B1 (KD8+28 days)	13-Jun-17, Handover of Portion B1 (KD8+28 days)
CON.HD.1270	Handover of Portion B2 (KD8+28 days)	13-Jun-17, Handover of Portion B2 (KD8+28 days)
CON.HD.1280	Handover of Portion B3 (KD11+28 days)	02-Nov-16, Handover of Portion B3 (KD11+28 days)
CON.HD.1290	Handover of Portion B4 (KD12+28 days)	21-Jun-17, Handover of Portion B4 (KD12+28 days)
CON.HD.1300	Handover of Portion B5 (KD14+28days)	08-Jun-18, Handover of Portion B5 (KD14+28days)
CON.HD.1310	Handover of Portion C1 (KD8+28 days)	13-Jun-17, Handover of Portion C1 (KD8+28 days)
CON.HD.1320	Handover of Portion C2 (KD13+0 days)	06-Oct-16, Handover of Portion C2 (KD13+0 days)
CON.HD.1330	Handover of Portion D1 (KD8+28 days)	13-Jun-17, Handover of Portion D1 (KD8+28 days)
CON.HD.1340	Handover of Portion D2 (KD8+28 days)	13-Jun-17, Handover of Portion D2 (KD8+28 days)
CON.HD.1350	Handover of Portion D3 (KD8+28 days)	13-Jun-17, Handover of Portion D3 (KD8+28 days)
Contractor Planned Completion: Key Dat		
CON.SC.KD01	KD01 - Achievement of Stage 1A (525)	19-Jun-18, KD01 - Achievement of Stage 1A (525)
CON.SC.KD02	KD02 - Achievement of Stage 1B (650)	03-May-18, KD02 - Achievement of Stage 1B (650)
CON.SC.KD03	KD03 - Achievement of Stage 2 (525)	19-Jun-18, KD03 - Achievement of Stage 2 (525)
CON.SC.KD04	KD04 - Achievement of Stage 3 (465)	12-Jun-17, KD04 - Achievement of Stage 3 (465)
CON.SC.KD05	KD05 - Achievement of Stage 4 (615)	20-Aug-18, KD05 - Achievement of Stage 4 (615)
CON.SC.KD06	KD06 - Achievement of Stage 5 (615)	03-Aug-17, KD06 - Achievement of Stage 5 (615)
CON.SC.KD07	KD07 - Achievement of Stage 6 (270)	14-Nov-17, KD07 - Achievement of Stage 6 (270)
CON.SC.KD08	KD08 - Completion of Section I of the Works (795)	04-Jul-18, KD08 - Completion of Section I of the Works (795)
CON.SC.KD09	KD09 - Completion of Section II of the Works (803)	21-Aug-18, KD09 - Completion of Section II of the Works (803)
CON.SC.KD10	KD10 - Completion of Section III of the Works (803)	21-Aug-18, KD10 - Completion of Section III of the Works (803)
CON.SC.KD11	KD11 - Completion of Section IV of the Works (565)	10-Apr-18, KD11 - Completion of Section IV of the Works (565)
CON.SC.KD12	KD12 - Completion of Section V of the Works (803)	21-Aug-18, KD12 - Completion of Section V of the Works (803)
CON.SC.KD13	KD13 - Completion of Section VI of the Works (465)	29-Jun-17, KD13 - Completion of Section VI of the Works (465)
CON.SC.KD14	KD14 - Completion of Section VII of the Works (1155)	28-Aug-19, KD14 - Completion of Section VII of the Works (
CON.SC.KD15	KD15 - Completion of Section VIIIA of the Works (795)	03-Aug-18, KD15 - Completion of Section VIIIA of the Works (795)
CON.SC.KD16	KD16 - Completion of Section VIIIB of the Works (1155)	28-Aug-19, KD16 - Completion of Section VIIIB of the Work
CON.SC.KD17	KD17 - Achievement of Stage 7 (718)	03-Jul-18, KD17 - Achievement of Stage 7 (718)
CON.SC.KD17A	KD17A - Completion of Section VIIIC of the Works (795)	03-Aug-18, KD17A - Completion of Section VIIIC of the Works (795)
CON.SC.KD18	KD18 - Completion of Section VIIID of the Works (1155)	28-Aug-19, KD18 - Completion of Section VIIID of the Work
CON.SC.KD19	KD19 - Completion of Section IXA of the Works (1160)	03-Aug-19, KD19 - Completion of Section IXA of the Works (11
CON.SC.KD20	KD20 - Completion of Section IXB of the Works (1520)	27-Aug-20, KD20
Preliminaries and General Requiremer		
Insurance		
CON.PR.1010	Arrange and Secure Professional Indemnity Insurances and submit copy to Engineer	Arrange and Secure Professional Indemnity Insurances and submit copy to Engineer
Programme		
Initial Works Programme		
CON.PR.1020.10	Prepare & Submit Initial Works Programme (IWP)	Prepare & Submit Initial Works Programme (IWP)
CON.PR.1020.20	Engineer's Approval	Engineer's Approval
Provisional Programme for Piling Works		
CON.PR.1030.10	Prepare Detailed Piling Schedule (refer to IWP)	Prepare Detailed Piling Schedule (refer to IWP)
CON.PR.1030.20	Engineer's Approval	Engineer's Approval
3 Months Rolling Programme		
CON.PR.1040.10	Prepare 3 Months Rolling Programme	Prepare 3 Months Rolling Programme
CON.PR.1040.20	Engineer's Approval	Engineer's Approval
Detailed Works Programme		
CON.PR.1050.10	Prepare Detailed Works Programme (DWP)	Prepare Detailed Works Programme (DWP)
CON.PR.1050.20	Engineer's Approval	Engineer's Approval
Safety & Health		
CON.PR.1060.10	Draft Safety Plan	Draft Safety Plan
CON.PR.1060.20	Finalized Safety Plan	Finalized Safety Plan
Environmental Management Plan		
CON.PR.1080.10	Draft Envirionmental Management Plan	Draft Environmental Management Plan
CON.PR.1080.20	Finalized EMP	Finalized EMP
Sub-Contractor Management Plan		
CON.PR.1080.50	Draft Subcontractor Management Plan	Draft Subcontractor Management Plan
CON.PR.1080.60	Engineer's Approval	Engineer's Approval
Temporary Facilities		
CON.PR.0130	Site Possession / Access to Works Area WA3	Site Possession / Access to Works Area WA3
CON.PR.0140	Survey / Setting Out	Survey / Setting Out
CON.PR.0150.10	Site Formation / Site Clearing	Site Formation / Site Clearing
CON.PR.0160	Contractor's Site Office	Contractor's Site Office
CON.PR.0170	External Works - Paving, Drainage and Fencing	External Works - Paving, Drainage and Fencing
Contractors Design & Procurement		
Bridge Bearings		

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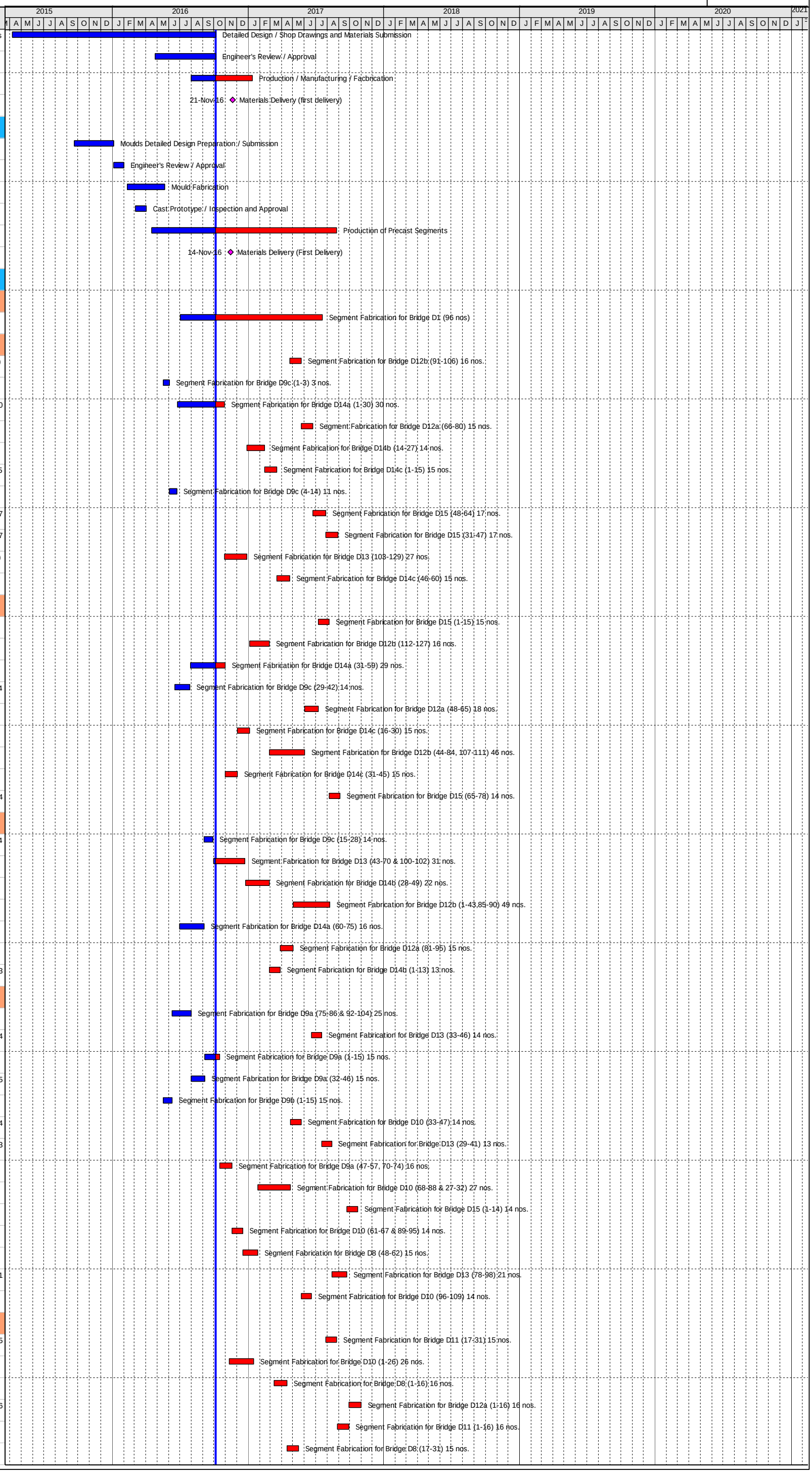
Activity ID	Activity Name
PROC.MA.1610	Detailed Design / Shop Drawings and Materials Submission
PROC.MA.1615	Engineer's Review / Approval
PROC.MA.1650	Production / Manufacturing / Facbrication
PROC.MA.1670	Materials Delivery (first delivery)
Precast Concrete - Segments	
PROC.MA.1760	Moulds Detailed Design Preparation / Submission
PROC.MA.1765	Engineer's Review / Approval
PROC.MA.1770	Mould Fabrication
PROC.MA.1780	Cast Prototype / Inspection and Approval
PROC.MA.2570	Production of Precast Segments
PROC.MA.2590	Materials Delivery (First Delivery)
Segment Fabrication and Post Pouring	
Segment Fabrication Type A	
Fab.A1.001	Segment Fabrication for Bridge D1 (96 nos)
Segment Fabrication Type C1	
Fab.TC1.0010	Segment Fabrication for Bridge D12b (91-106) 16 nos.
Fab.TC1.0020	Segment Fabrication for Bridge D9c (1-3) 3 nos.
Fab.TC1.0030	Segment Fabrication for Bridge D14a (1-30) 30 nos.
Fab.TC1.0040	Segment Fabrication for Bridge D12a (66-80) 15 nos.
Fab.TC1.0050	Segment Fabrication for Bridge D14b (14-27) 14 nos.
Fab.TC1.0060	Segment Fabrication for Bridge D14c (1-15) 15 nos.
Fab.TC1.0080	Segment Fabrication for Bridge D9c (4-14) 11 nos.
Fab.TC2.00060	Segment Fabrication for Bridge D15 (48-64) 17 nos.
Fab.TC3.0060	Segment Fabrication for Bridge D15 (31-47) 17 nos.
Fab.TC4.0030	Segment Fabrication for Bridge D13 (103-129) 27 nos.
Fab.TC4.0060	Segment Fabrication for Bridge D14c (46-60) 15 nos.
Segment Fabrication Type C2	
Fab.TC1.0070	Segment Fabrication for Bridge D15 (1-15) 15 nos.
Fab.TC2.00010	Segment Fabrication for Bridge D12b (112-127) 16 nos.
Fab.TC2.00020	Segment Fabrication for Bridge D14a (31-59) 29 nos.
Fab.TC2.00030	Segment Fabrication for Bridge D9c (29-42) 14 nos.
Fab.TC2.00040	Segment Fabrication for Bridge D12a (48-65) 18 nos.
Fab.TC2.00050	Segment Fabrication for Bridge D14c (16-30) 15 nos.
Fab.TC3.0010	Segment Fabrication for Bridge D12b (44-84, 107-111) 46 nos.
Fab.TC3.0050	Segment Fabrication for Bridge D14c (31-45) 15 nos.
Fab.TC4.0070	Segment Fabrication for Bridge D15 (65-78) 14 nos.
Segment Fabrication Type C3	
Fab.TC3.0020	Segment Fabrication for Bridge D9c (15-28) 14 nos.
Fab.TC3.0030	Segment Fabrication for Bridge D13 (43-70 & 100-102) 31 nos.
Fab.TC3.0040	Segment Fabrication for Bridge D14b (28-49) 22 nos.
Fab.TC4.0010	Segment Fabrication for Bridge D12b (1-43,85-90) 49 nos.
Fab.TC4.0020	Segment Fabrication for Bridge D14a (60-75) 16 nos.
Fab.TC4.0040	Segment Fabrication for Bridge D12a (81-95) 15 nos.
Fab.TC4.0050	Segment Fabrication for Bridge D14b (1-13) 13 nos.
Segment Fabrication Type D2	
Fab.T1.0020	Segment Fabrication for Bridge D9a (75-86 & 92-104) 25 nos.
Fab.T1.0040	Segment Fabrication for Bridge D13 (33-46) 14 nos.
Fab.T1.0050	Segment Fabrication for Bridge D9a (1-15) 15 nos.
Fab.T2.0010	Segment Fabrication for Bridge D9a (32-46) 15 nos.
Fab.T2.0030	Segment Fabrication for Bridge D9b (1-15) 15 nos.
Fab.T2.0040	Segment Fabrication for Bridge D10 (33-47) 14 nos.
Fab.T2.0050	Segment Fabrication for Bridge D13 (29-41) 13 nos.
Fab.T3.0030	Segment Fabrication for Bridge D9a (47-57, 70-74) 16 nos.
Fab.T3.0040	Segment Fabrication for Bridge D10 (68-88 & 27-32) 27 nos.
Fab.T3.0070	Segment Fabrication for Bridge D15 (1-14) 14 nos.
Fab.T4.0020	Segment Fabrication for Bridge D10 (61-67 & 89-95) 14 nos.
Fab.T4.0040	Segment Fabrication for Bridge D8 (48-62) 15 nos.
Fab.T4.0050	Segment Fabrication for Bridge D13 (78-98) 21 nos.
Fab.T4.0060	Segment Fabrication for Bridge D10 (96-109) 14 nos.
Segment Fabrication Type D3	
Fab.T1.0010	Segment Fabrication for Bridge D11 (17-31) 15 nos.
Fab.T1.0030	Segment Fabrication for Bridge D10 (1-26) 26 nos.
Fab.T1.0060	Segment Fabrication for Bridge D8 (1-16) 16 nos.
Fab.T1.0070	Segment Fabrication for Bridge D12a (1-16) 16 nos.
Fab.T2.0020	Segment Fabrication for Bridge D11 (1-16) 16 nos.
Fab.T2.0060	Segment Fabrication for Bridge D8 (17-31) 15 nos.

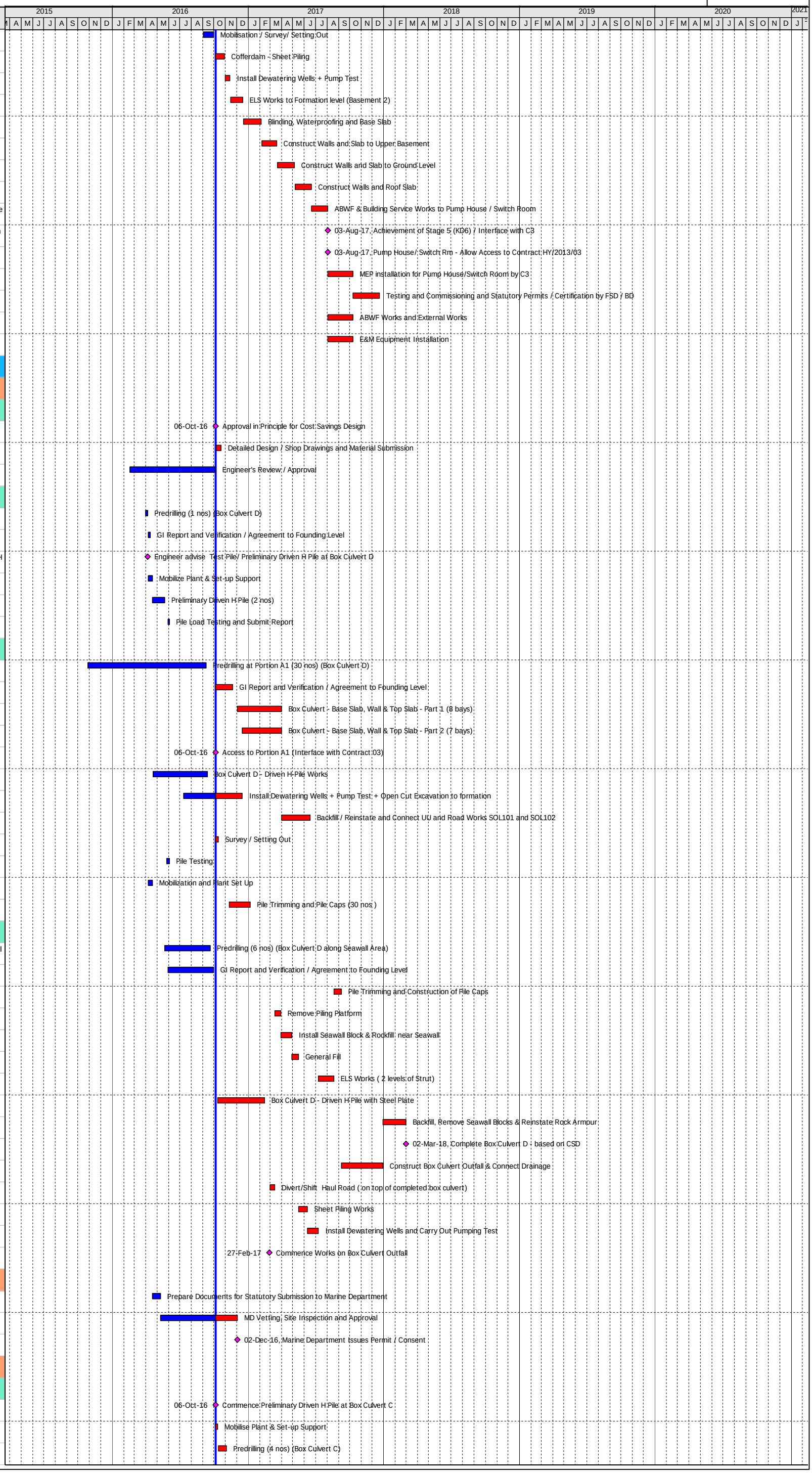


Activity ID	Activity Name
Fab.T2.0080	Segment Fabrication for Bridge D10 (47-60) 14 nos.
Fab.T3.0005	Segment Fabrication for Bridge D9a (16-31) 16 nos.
Fab.T3.0010	Segment Fabrication for Bridge D9b (38-44) 7 nos.
Fab.T3.0020	Segment Fabrication for Bridge D9b (16-30) 15 nos.
Fab.T3.0050	Segment Fabrication for Bridge D8 (32-47) 16 nos.
Fab.T3.0080	Segment Fabrication for Bridge D9b (31-37) 7 nos.
Fab.T4.0010	Segment Fabrication for Bridge D9a (58-69, 87-91) 17 nos
Fab.T4.0030	Segment Fabrication for Bridge D13 (15-28 & 71-77) 22 nos.
Pier Segment - Type C -1	
Fab.T3.00120	Pier Segment for Bridge D9c - 3 Nos
Fab.T3.00130	Pier Segment for Bridge D13 - 4 Nos
Fab.T3.00140	Pier Segment for Bridge D14b - 4 Nos
Fab.T3.00150	Pier Segment for Bridge D12a - 4 Nos
Fab.T3.00160	Pier Segment for Bridge D14c - 4 Nos
Fab.T3.00170	Pier Segment for Bridge D12b - 4 Nos
Fab.T3.00180	Pier Segment for Bridge D15 - 4 Nos
Fab.T3.00260	Pier Segment for Bridge D15 - 4 Nos
Fab.T3.0090	Pier Segment for Bridge D14a - 6 Nos
Pier Segment - Type D- 1	
Fab.T2.0070	Segment Fabrication for Bridge D12a (18-31) 14 nos.
Fab.T3.00100	Pier Segment for Bridge D9b - 4 Nos
Fab.T3.00190	Pier Segment for Bridge D9a - 5 Nos
Fab.T3.00200	Pier Segment for Bridge D11 - 3 Nos
Fab.T3.00210	Pier Segment for Bridge D10 - 5 Nos
Fab.T3.00220	Pier Segment for Bridge D8 - 5 Nos
Fab.T3.00230	Pier Segment for Bridge D13 - 6 Nos
Fab.T3.00240	Pier Segment for Bridge D12a - 4 Nos
Fab.T3.00250	Pier Segment for Bridge D15 - 1 Nos
Fab.T3.00280	Pier Segment for Bridge D10 - 5 Nos
Fab.T3.00290	Pier Segment for Bridge D9a - 5 Nos
Fab.T3.0060	Segment Fabrication for Bridge D12a (33-46) 14 nos.
E&M Works and Building Services for Pu	
PROC.SC.1285	Detailed Design and Material/ Equipment Submisison & Statutory Approval (FSD/EMSD)
PROC.SC.1287	Engineer's Review / Approval
PROC.SC.1290	Procurement and Manufacturing of Materials
PROC.SC.1300	Materials Delivery (first delivery)
PROC.SC.1310	Draft Operation and Maintenance (O&M) Manual
PROC.SC.1320	Engineer's Review on Draft O&M Manual
PROC.SC.1330	Draft Testing and Commissioning (T&C) Procedure
PROC.SC.1340	Final T&C Procedure
PROC.SC.1350	Engineer's Review on Draft T&C Procedure
PROC.SC.1360	Engineer's Approval on Final T&C Procedure
PROC.SC.2840	Final O&M Manual with as-fitted drawings
PROC.SC.2850	Engineer's Approval on Final O&M Manual with as-fitted drawings
Steel Structures for Sign Gantry / High M	
PROC.MA.1990	Detailed Design / Material Submission
PROC.MA.1995	Engineer's Review / Approval
PROC.MA.2010	Manufacture of Steel Structures
PROC.MA.2020	Material Delivery (first delivery)
Roads and Bridge Lighting	
PROC.MA.2840	Lighting Arrangement Detailed Design / Material Submission and Approval (within 12
PROC.MA.2845	Engineer's Review / Approval
PROC.MA.2850	Manufacture of Road and Bridge Lighting
PROC.MA.2860	Material Delivery (first delivery)
Irrigation System	
PROC.SC.1178	The Engineer confirm Landscape Works/ Irrigation Work (31 Dec 2015)
PROC.SC.1180	Detailed Design / Material Submission
PROC.SC.1185	Engineer's Review / Approval
PROC.SC.1190	Procurement and Shipment of Irrigation Materials/Equipment
Soft Landscaping	
PROC.SC.2760	Propose Nursery for Landscape Materials
PROC.SC.2780	Joint Inspection and Engineer's approval
PROC.SC.2790	Landscape Materials Growing
PROC.SC.2810	Materials Delivery (first delivery)
Construction / Installation	
Initial Works / Site Establishment & Mai	

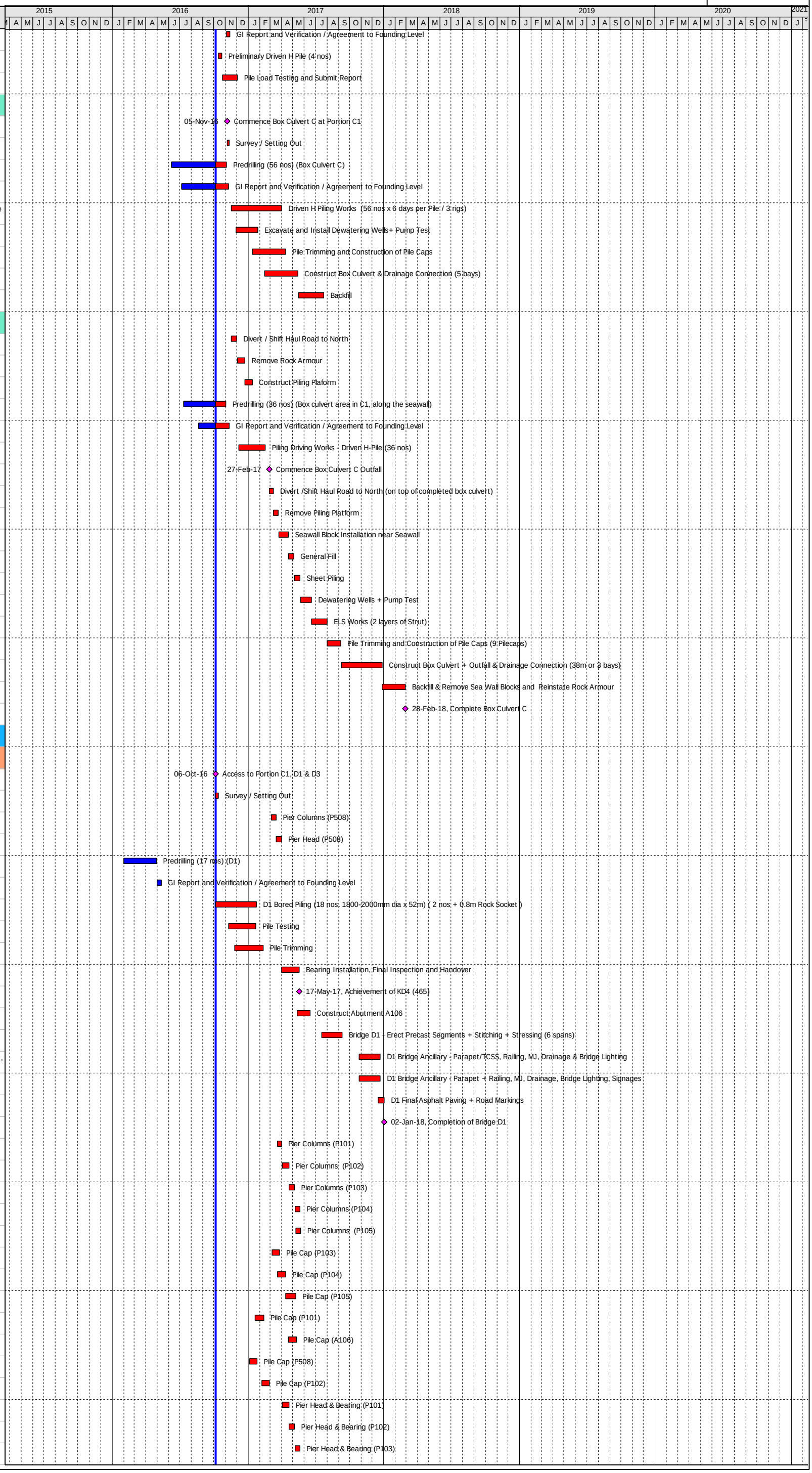
HY/2013/04 - Hong Kong Boundary Crossing Facilities Infrastructure Works Stage II (Southern Portion)

Activity ID	Activity Name
Mobilisation and Site Establlishment	
CONS.A1.0100	Site Possession / Access to Portion A1, A2, A5 & A6
CONS.A1.0110	Mobilisation, Site Clearing and Site Set-up
CONS.A1.0120	Install Temporary Facilities / Hygiene Facilities
Gates and Haul Road Construction (as per Dw	
CONS.A1.1010	Site Possession / Access to Portion A1
CONS.A1.1020	Survey/ Setting Out
CONS.A1.1030	Construct Gate 1 at Haul Road
CONS.B1.1010	Site Possession / Access to Portion B1
CONS.B1.1020	Mobilisation, Site Survey and Setting Out
CONS.B1.1030	Construct Gate 3 and Temporary Haul Road
CONS.B2.1010	Site Possession / Access to Portion B2 & B5
CONS.B2.1020	Site Survey / Setting out
CONS.B2.1030	Construct Temporary Haul Road
Preliminary Bored Pile with Additional Instrum	
CONS.A1.0180	Commence Preliminary Bored Pile at Abutment A1101
CONS.A1.0190	Mobilise Plant & Set-up Support
CONS.A1.0195.1	Predrilling to Preliminary Bored Pile (D11)
CONS.A1.0195.2	GI Report and Verification / Agreement to Founding Level
CONS.A1.0200	Preliminary Bored Piling with Additional Instrumentation at Abutment A1101 (1 no.
CONS.A1.0210	Pile Curing
CONS.A1.0220	Pile Load Testing & Submit Report
Replacement Preliminary Bored Pile and Load	
CONS.A1.0195.6	GI Report and Verification / Agreement to Founding Level
CONS.A1.0195.7	Engineer's Representative confirmed the replacement bored pile at Pier P908-P1
CONS.A1.0280	Commence Replacement Preliminary Bored Pile at Abutment A1004
CONS.A1.0290	Mobilise Plant & Set-up Support
CONS.A1.0300	Replacement Preliminary Bored Piling - Pier P908
CONS.A1.0310	Pile Curing
CONS.A1.0320	Pile Load Testing & Submit Report
Preliminary Bored Pile and Load Testing at Abu	
CONS.C1.0400	Commence Preliminary Bored Pile at Abutment A106
CONS.C1.0410	Mobilise Plant & Set-up Support
CONS.C1.0415.1	Predrilling to Preliminary Bored Pile (D1)
CONS.C1.0415.2	GI Report and Verification / Agreement to Founding Level
CONS.C1.0420	Preliminary Bored Piling - Abutment A106 (1 no. 2000mm dia x 52m)
CONS.C1.0430	Pile Curing
CONS.C1.0440	Pile Load Testing and Submit Report
Prelimnary Driven H Piles and Load Testing	
CONS.A1.4360	Test Pile approved, commence permanent driven h-pile
CONS.C1.0510	Engineer select Preliminary Test Pile (Driven H Pile)
CONS.C1.0520	Mobilise Plant & Set-up Support
CONS.C1.0530.1	Pre-drilling (2 nos) (Sign Gantry - Preliminary Pile)
CONS.C1.0530.2	GI Report and Verification / Agreement to Founding Level
CONS.C1.0540	Preliminary Driven H Pile (2 nos)
CONS.C1.0550	Pile Load Testing and Submit Report
Preliminary Pre-Bored H-Pile and Load Testing	
CONS.A1.0195.3	Predrilling to Preliminary Pre-Bored H-Pile - 1 no.
CONS.A1.0195.4	GI Report and Verification / Agreement to Founding Level
CONS.A1.0230	Engineer select Preliminary Test Pile (Pre-Bored H-Pile)
CONS.A1.0240	Mobilise Plant & Set-up Support
CONS.A1.0250	Preliminary Pre-Bored H-Piling - 1 no.
CONS.A1.0270	Pile Load Testing & Submit Report
Treatment for Bored Piling Excavated Materials	
CONS.EX.1010	Set-up Stockpile for Excavated Marine Mud
CONS.EX.1020	Pilot Test for Marine Mud Treatment
CONS.EX.1030	Solidification / Stabilisation / Approval Method
CONS.EX.1040	Set-up Treatment Facilities and Storage Yard
CONS.EX.1050	Full Scale Solidification / Stabilization Treatment and Verification Testing
CONS.EX.1060	Decommissioning of Treatment Facilities
Site Set Up at Portion C1	
CONS.C1.1010	Site Possession / Access to Portion C1 and C2
CONS.C1.1020	Site Possession / Access to Portion D1 and D3
CONS.C1.1030	Site Set-Up
Pump House cum Switch Room	
CONS.C1.5110	Commence Pump House Cum Switch Room (2B+ GF)

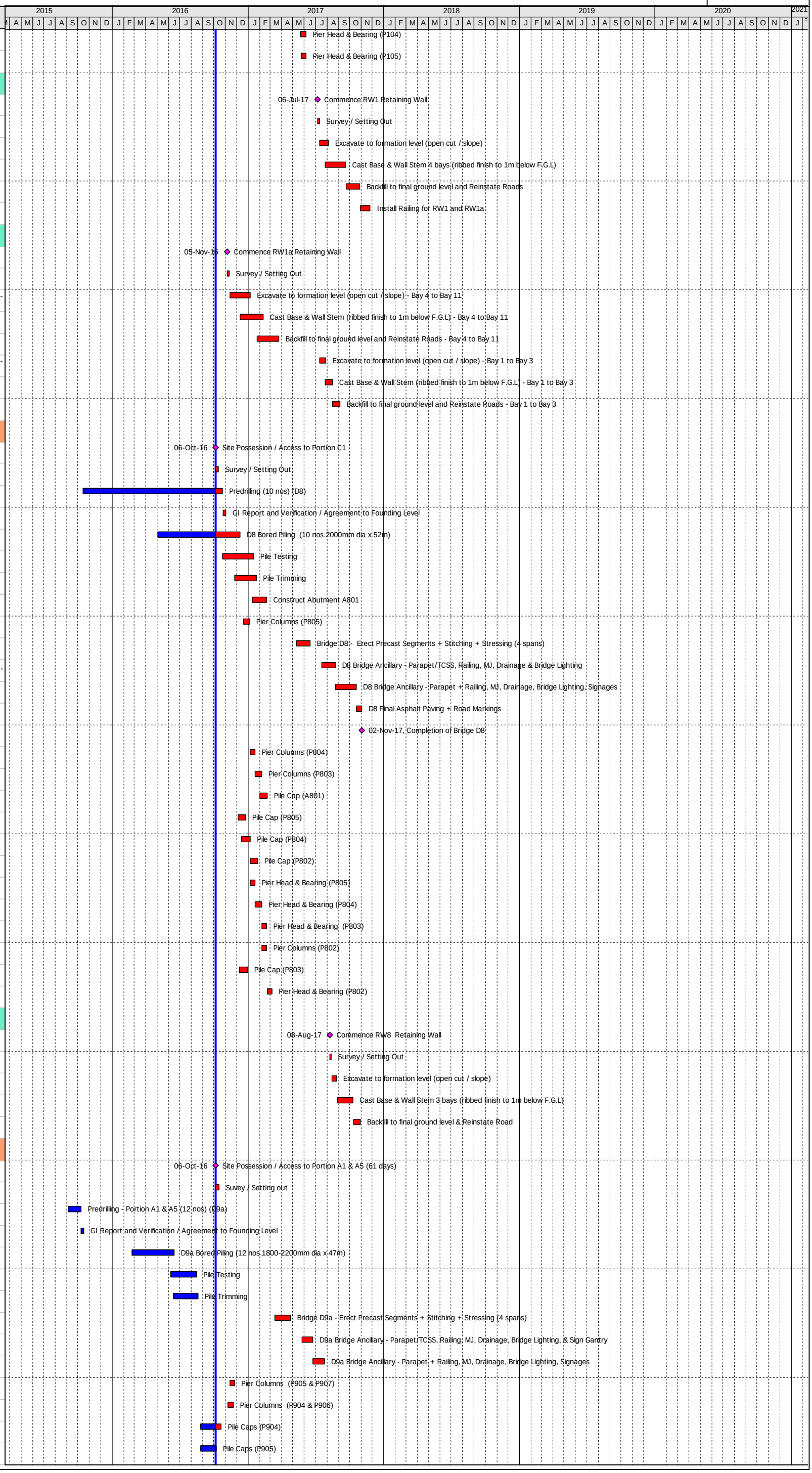
Activity ID	Activity Name
CONS.C1.5120	Mobilisation / Survey/ Setting Out
CONS.C1.5125	Cofferdam - Sheet Piling
CONS.C1.5130	Install Dewatering Wells + Pump Test
CONS.C1.5140	ELS Works to Formation level (Basement 2)
CONS.C1.5150	Blinding, Waterproofing and Base Slab
CONS.C1.5160	Construct Walls and Slab to Upper Basement
CONS.C1.5170	Construct Walls and Slab to Ground Level
CONS.C1.5200	Construct Walls and Roof Slab
CONS.C1.5205	ABWF & Building Service Works to Pump House / Switch Room
CONS.C1.5210	Achievement of Stage 5 (KD6) / Interface with C3
CONS.C1.5215	Pump House/ Switch Rm - Allow Access to Contract HY/2013/03
CONS.C1.5225	MEP installation for Pump House/Switch Room by C3
CONS.C1.5235	Testing and Commissioning and Statutory Permits / Certification by FSD / BD
CONS.C1.5245	ABWF Works and External Works
CONS.C1.5255	E&M Equipment Installation
Box Culverts	
Box Culvert D - Cost Savings Design	
Contractors Design	
AD.A1.0001	Approval in Principle for Cost Savings Design
AD.A1.0100	Detailed Design / Shop Drawings and Material Submission
AD.A1.0110	Engineer's Review / Approval
Preliminary Driven Pile and Load Test	
AD.A1.0470.30	Predrilling (1 nos) (Box Culvert D)
AD.A1.0470.40	GI Report and Verification / Agreement to Founding Level
AD.A1.0510	Engineer advise Test Pile/ Preliminary Driven H Pile at Box Culvert D
AD.A1.0520	Mobilize Plant & Set-up Support
AD.A1.0530	Preliminary Driven H Pile (2 nos)
AD.A1.0540	Pile Load Testing and Submit Report
Box Culvert D - 15 Bays	
AD.A1.1055.30	Predrilling at Portion A1 (30 nos) (Box Culvert D)
AD.A1.1055.40	GI Report and Verification / Agreement to Founding Level
AD.A1.1095.30	Box Culvert - Base Slab, Wall & Top Slab - Part 1 (8 bays)
AD.A1.1095.40	Box Culvert - Base Slab, Wall & Top Slab - Part 2 (7 bays)
AD.A1.1110	Access to Portion A1 (Interface with Contract 03)
AD.A1.1120	Box Culvert D - Driven H-Pile Works
AD.A1.1130	Install Dewatering Wells + Pump Test + Open Cut Excavation to formation
AD.A1.1150	Backfill / Reinstate and Connect UU and Road Works SOL101 and SOL102
AD.A1.1160	Survey / Setting Out
AD.A1.1170	Pile Testing
AD.A1.1180	Mobilization and Plant Set Up
AD.A1.2250	Pile Trimming and Pile Caps (30 nos)
Box Culvert D - 3 Bays and Outfall	
AD.B1.1180.30	Predrilling (6 nos) (Box Culvert D along Seawall Area)
AD.B1.1180.40	GI Report and Verification / Agreement to Founding Level
AD.B1.2235	Pile Trimming and Construction of Pile Caps
AD.B1.2250	Remove Piling Platform
AD.B1.2260	Install Seawall Block & Rockfill near Seawall
AD.B1.2270	General Fill
AD.B1.2280	ELS Works (2 levels of Strut)
AD.B1.2330	Box Culvert D - Driven H Pile with Steel Plate
AD.B1.2350	Backfill, Remove Seawall Blocks & Reinstate Rock Armour
AD.B1.2360	Complete Box Culvert D - based on CSD
AD.B1.2370	Construct Box Culvert Outfall & Connect Drainage
AD.B1.2380	Divert/Shift Haul Road (on top of completed box culvert)
AD.B1.2390	Sheet Piling Works
AD.B1.2400	Install Dewatering Wells and Carry Out Pumping Test
AD.B1.2410	Commence Works on Box Culvert Outfall
MDN Application for Marine Plants	
CONS.OF.1010	Prepare Documents for Statutory Submission to Marine Department
CONS.OF.1020	MD Vetting, Site Inspection and Approval
CONS.OF.1030	Marine Department Issues Permit / Consent
Box Culvert C (Portion C1)	
Preliminary Driven Piles and Load Testing	
CONS.C1.0450	Commence Preliminary Driven H Pile at Box Culvert C
CONS.C1.0460	Mobilise Plant & Set-up Support
CONS.C1.0470.	Predrilling (4 nos) (Box Culvert C)



Activity ID	Activity Name
CONS.C1.0470..	GI Report and Verification / Agreement to Founding Level
CONS.C1.0480	Preliminary Driven H Pile (4 nos)
CONS.C1.0500	Pile Load Testing and Submit Report
Box Culvert C - Bay 4-8	
CONS.C1.1040	Commence Box Culvert C at Portion C1
CONS.C1.1045	Survey / Setting Out
CONS.C1.1055..	Predrilling (56 nos) (Box Culvert C)
CONS.C1.1055..	GI Report and Verification / Agreement to Founding Level
CONS.C1.1060	Driven H Piling Works (56 nos x 6 days per Pile / 3 rigs)
CONS.C1.1070	Excavate and Install Dewatering Wells+ Pump Test
CONS.C1.1090	Pile Trimming and Construction of Pile Caps
CONS.C1.1100	Construct Box Culvert & Drainage Connection (5 bays)
CONS.C1.1110	Backfill
Box Culvert C - Bay 1-3 and Outfall	
CONS.C1.1120	Divert / Shift Haul Road to North
CONS.C1.1150	Remove Rock Armour
CONS.C1.1160	Construct Piling Plaform
CONS.C1.1170..	Predrilling (36 nos) (Box culvert area in C1, along the seawall)
CONS.C1.1170..	GI Report and Verification / Agreement to Founding Level
CONS.C1.1180	Piling Driving Works - Driven H-Pile (36 nos)
CONS.C1.8480	Commence Box Culvert C Outfall
CONS.C1.8485	Divert /Shift Haul Road to North (on top of completed box culvert)
CONS.C1.8490	Remove Piling Platform
CONS.C1.8500	Seawall Block Installation near Seawall
CONS.C1.8510	General Fill
CONS.C1.8530	Sheet Piling
CONS.C1.8540	Dewatering Wells + Pump Test
CONS.C1.8550	ELS Works (2 layers of Strut)
CONS.C1.8560	Pile Trimming and Construction of Pile Caps (9 Pilecaps)
CONS.C1.8570	Construct Box Culvert + Outfall & Drainage Connection (38m or 3 bays)
CONS.C1.8580	Backfill & Remove Sea Wall Blocks and Reinstate Rock Armour
CONS.C1.8590	Complete Box Culvert C
Bridge Works	
Bridge D1 in Portion C1, D1 and D3 (Interface	
CONS.C1.1130	Access to Portion C1, D1 & D3
CONS.C1.1140	Survey / Setting Out
CONS.C1.2100	Pier Columns (P508)
CONS.C1.2200	Pier Head (P508)
CONS.C1.2200.1	Predrilling (17 nos) (D1)
CONS.C1.2200.2	GI Report and Verification / Agreement to Founding Level
CONS.C1.2210	D1 Bored Piling (18 nos. 1800-2000mm dia x 52m) (2 nos + 0.8m Rock Socket)
CONS.C1.2215	Pile Testing
CONS.C1.2220	Pile Trimming
CONS.C1.2225.3	Bearing Installation, Final Inspection and Handover
CONS.C1.2226	Achievement of KD4 (465)
CONS.C1.2230	Construct Abutment A106
CONS.C1.2250	Bridge D1 - Erect Precast Segments + Stitching + Stressing (6 spans)
CONS.C1.2260	D1 Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage & Bridge Lighting
CONS.C1.2265	D1 Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages
CONS.C1.2270	D1 Final Asphalt Paving + Road Markings
CONS.C1.2280	Completion of Bridge D1
CONS.C1.2299	Pier Columns (P101)
CONS.C1.8850	Pier Columns (P102)
CONS.C1.8860	Pier Columns (P103)
CONS.C1.8870	Pier Columns (P104)
CONS.C1.8880	Pier Columns (P105)
CONS.C1.8950	Pile Cap (P103)
CONS.C1.8960	Pile Cap (P104)
CONS.C1.8970	Pile Cap (P105)
CONS.C1.8980	Pile Cap (P101)
CONS.C1.8990	Pile Cap (A106)
CONS.C1.9000	Pile Cap (P508)
CONS.C1.9010	Pile Cap (P102)
CONS.C1.9020	Pier Head & Bearing (P101)
CONS.C1.9030	Pier Head & Bearing (P102)
CONS.C1.9040	Pier Head & Bearing (P103)



Activity ID	Activity Name
CONS.C1.9050	Pier Head & Bearing (P104)
CONS.C1.9060	Pier Head & Bearing (P105)
RW1 (51m / 4 bays)	
CONS.C2.3140	Commence RW1 Retaining Wall
CONS.C2.3150	Survey / Setting Out
CONS.C2.3160	Excavate to formation level (open cut / slope)
CONS.C2.3170	Cast Base & Wall Stem 4 bays (ribbed finish to 1m below F.G.L)
CONS.C2.3180	Backfill to final ground level and Reinstate Roads
CONS.C2.3250	Install Railing for RW1 and RW1a
RW1a (176m / 11 bays)	
CONS.C2.3200	Commence RW1a Retaining Wall
CONS.C2.3210	Survey / Setting Out
CONS.C2.3220	Excavate to formation level (open cut / slope) - Bay 4 to Bay 11
CONS.C2.3230	Cast Base & Wall Stem (ribbed finish to 1m below F.G.L) - Bay 4 to Bay 11
CONS.C2.3240	Backfill to final ground level and Reinstate Roads - Bay 4 to Bay 11
CONS.C2.3370	Excavate to formation level (open cut / slope) - Bay 1 to Bay 3
CONS.C2.3380	Cast Base & Wall Stem (ribbed finish to 1m below F.G.L) - Bay 1 to Bay 3
CONS.C2.3390	Backfill to final ground level and Reinstate Roads - Bay 1 to Bay 3
Bridge D8	
CONS.C1.2285	Site Possession / Access to Portion C1
CONS.C1.2288	Survey / Setting Out
CONS.C1.2290.1	Predrilling (10 nos) (D8)
CONS.C1.2290.2	GI Report and Verification / Agreement to Founding Level
CONS.C1.2300	D8 Bored Piling (10 nos.2000mm dia x 52m)
CONS.C1.2305	Pile Testing
CONS.C1.2310	Pile Trimming
CONS.C1.2320	Construct Abutment A801
CONS.C1.2322	Pier Columns (P805)
CONS.C1.2340	Bridge D8 - Erect Precast Segments + Stitching + Stressing (4 spans)
CONS.C1.2350	D8 Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage & Bridge Lighting
CONS.C1.2355	D8 Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages
CONS.C1.2360	D8 Final Asphalt Paving + Road Markings
CONS.C1.2370	Completion of Bridge D8
CONS.C1.8820	Pier Columns (P804)
CONS.C1.8830	Pier Columns (P803)
CONS.C1.8900	Pile Cap (A801)
CONS.C1.8910	Pile Cap (P805)
CONS.C1.8920	Pile Cap (P804)
CONS.C1.8930	Pile Cap (P802)
CONS.C1.9070	Pier Head & Bearing (P805)
CONS.C1.9080	Pier Head & Bearing (P804)
CONS.C1.9090	Pier Head & Bearing (P803)
CONS.C2.3420	Pier Columns (P802)
CONS.C2.3460	Pile Cap (P803)
CONS.C2.3490	Pier Head & Bearing (P802)
RW8 (35m / 3 bays)	
CONS.C2.3320	Commence RW8 Retaining Wall
CONS.C2.3330	Survey / Setting Out
CONS.C2.3340	Excavate to formation level (open cut / slope)
CONS.C2.3350	Cast Base & Wall Stem 3 bays (ribbed finish to 1m below F.G.L)
CONS.C2.3360	Backfill to final ground level & Reinstate Road
Bridge D9a in Portion A1 & A5	
CONS.A5.2010	Site Possession / Access to Portion A1 & A5 (61 days)
CONS.A5.2015	Suvey / Setting out
CONS.A5.2020.1	Predrilling - Portion A1 & A5 (12 nos) (D9a)
CONS.A5.2020.2	GI Report and Verification / Agreement to Founding Level
CONS.A5.2030	D9a Bored Piling (12 nos.1800-2200mm dia x 47m)
CONS.A5.2035	Pile Testing
CONS.A5.2040	Pile Trimming
CONS.A5.2065	Bridge D9a - Erect Precast Segments + Stitching + Stressing (4 spans)
CONS.A5.2070	D9a Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage, Bridge Lighting, & Sign Gantry
CONS.A5.2080	D9a Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages
CONS.A5.2090	Pier Columns (P905 & P907)
CONS.A5.2110	Pier Columns (P904 & P906)
CONS.A5.2140	Pile Caps (P904)
CONS.A5.2150	Pile Caps (P905)



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Activity ID	Activity Name
CONS.A5.2160	Pier Head & Bearing (P905 & P907)
CONS.A5.2180	Pier Head & Bearing (P904 & P906)
Bridge D9a in Portion C1 & C2	
CONS.C2.3010	Site Possession / Access to Portion C1 & C2 (184 days)
CONS.C2.3015	Survey / Setting Out
CONS.C2.3020.	Predrilling - Portion C1 & C2 (8 nos) (D9a)
CONS.C2.3020.	GI Report and Verification / Agreement to Founding Level
CONS.C2.3030	D9a in Portion C1 & C2 Bored Piling (8 nos.1800-2200mm dia x 47m)
CONS.C2.3035	Pile Testing
CONS.C2.3040	Pile Trimming
CONS.C2.3070	Construct Abutment A901
CONS.C2.3080	Bridge D9a (C1 & C2) - Erect Precast Segments + Stitching + Stressing (2 spans)
CONS.C2.3085	D9a (C1 & C2) Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage, Bridge Lighting, & Sign
CONS.C2.3095	Completion of Works in Section VI (KD13)
CONS.C2.3100	Bridge D9a (C1 & C2) - Erect Precast Segments + Stitching + Stressing (1 span)
CONS.C2.3110	D9a Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage, Bridge Lighting, & Sign Gantry
CONS.C2.3115	D9a Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages
CONS.C2.3120	D9a Final Asphalt Paving + Road Markings
CONS.C2.3130	Completion of Bridge D9a
CONS.C2.3400	Pier Columns (P902)
CONS.C2.3410	Pier Columns (P903)
CONS.C2.3440	Pile Caps (P902)
CONS.C2.3450	Pile Caps (P903)
CONS.C2.3470	Pier Head & Bearing (P902)
CONS.C2.3480	Pier Head & Bearing (P903)
CONS.C2.3560	Pile Caps (A901)
Bridge D9b	
CONS.A1.1105	Access to Portion A1
CONS.A1.1108	Survey / Setting Out
CONS.A1.1110.1	Predrilling (8 nos incl. 4 nos for P910) (D9b)
CONS.A1.1110.2	GI Report and Verification / Agreement to Founding Level
CONS.A1.1120	D9b Bored Piling (8 nos. 2000mm dia x 49m) including 4 for P910
CONS.A1.1125	Pile Testing
CONS.A1.1130	Pile Trimming
CONS.A1.1160	Bridge D9b - Erect Precast Segments + Stitching + Stressing (3 spans)
CONS.A1.1170	D9b Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage & Bridge Lighting
CONS.A1.1175	D9b Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages
CONS.A1.1180	D9b Final Asphalt Paving + Road Markings
CONS.A1.1190	Bridge D9b complete
CONS.A1.8750	Pier Columns (P908)
CONS.A1.8760	Pier Columns (P909)
CONS.A1.8770	Pier Columns (P910) - A (Portal)
CONS.A1.8780	Pier Columns (P910) - B (Portal)
CONS.A1.9230	Pile Caps (P908)
CONS.A1.9240	Pile Caps (P909)
CONS.A1.9250	Pile Caps (P910 - A)
CONS.A1.9260	Pile Caps (P910 - B)
CONS.A1.9270	Pier Head & Bearing (P908)
CONS.A1.9280	Pier Head & Bearing (P909)
Bridge D9c	
CONS.A1.1192	Site Possession / Access to Portion A1 & A2
CONS.A1.1194	Survey / Setting Out
CONS.A1.1200.1	Predrilling (8 nos) (D9c)
CONS.A1.1200.2	GI Report and Verification / Agreement to Founding Level
CONS.A1.1210	D9c Bored Piling (8 nos. 2000mm dia x 62m)
CONS.A1.1215	Pile Testing
CONS.A1.1220	Pile Trimming
CONS.A1.1240	Bridge D9c - Construct Deck (Cast in Situ) (1 span, P910 to P911)
CONS.A1.1250	Bridge D9c - Erect Precast Segments Pier P911 to Pier P913 + Stitching + Stressing (2 spans)
CONS.A1.1260	D9c Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage & Bridge Lighting
CONS.A1.1270	D9c Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages
CONS.A1.8790	Pier Columns (P913)
CONS.A1.8800	Pier Columns (P912)
CONS.A1.8810	Pier Columns (P911)
CONS.A1.9190	Pile Cap (P913)
CONS.A1.9200	Pile Cap (P912)

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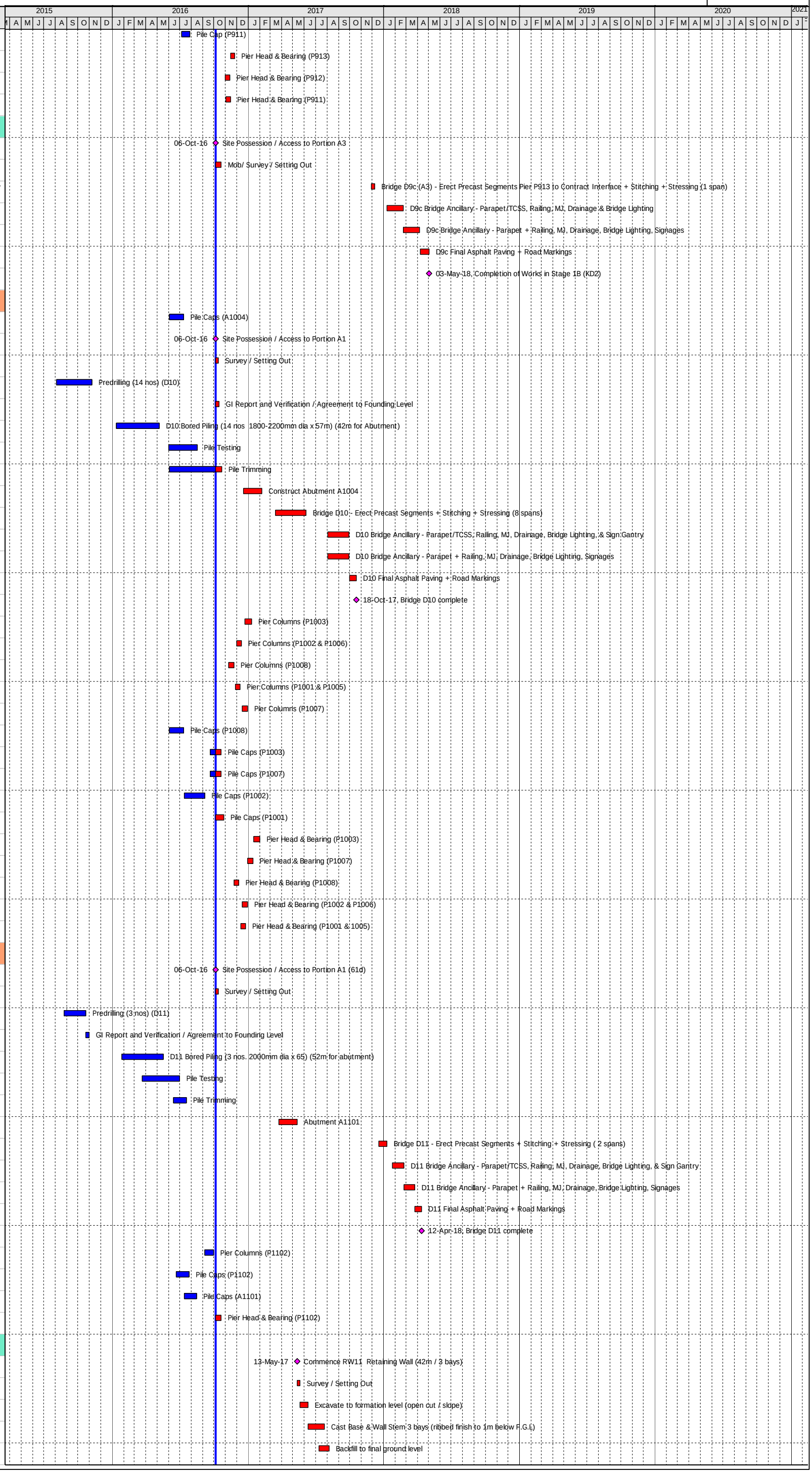
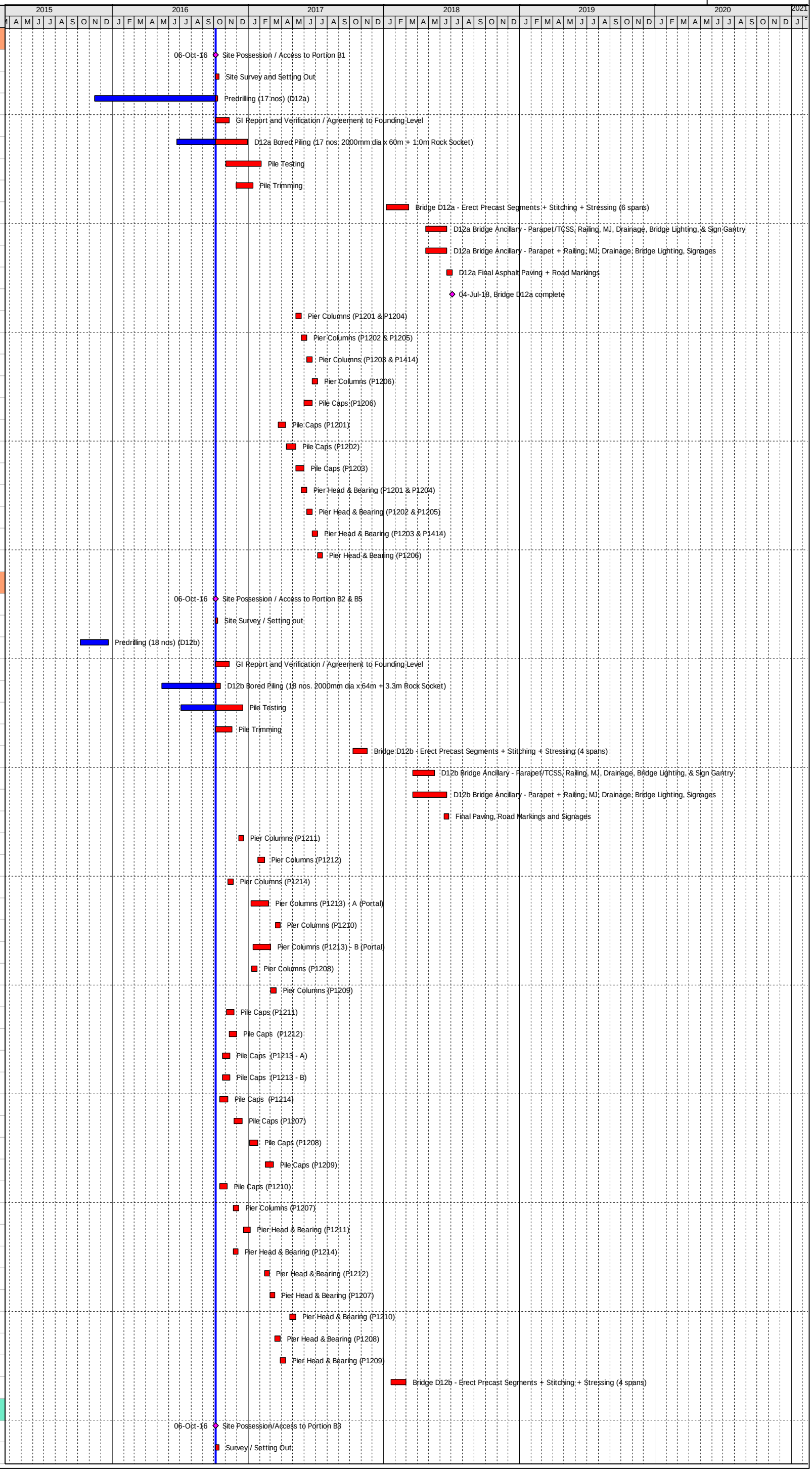
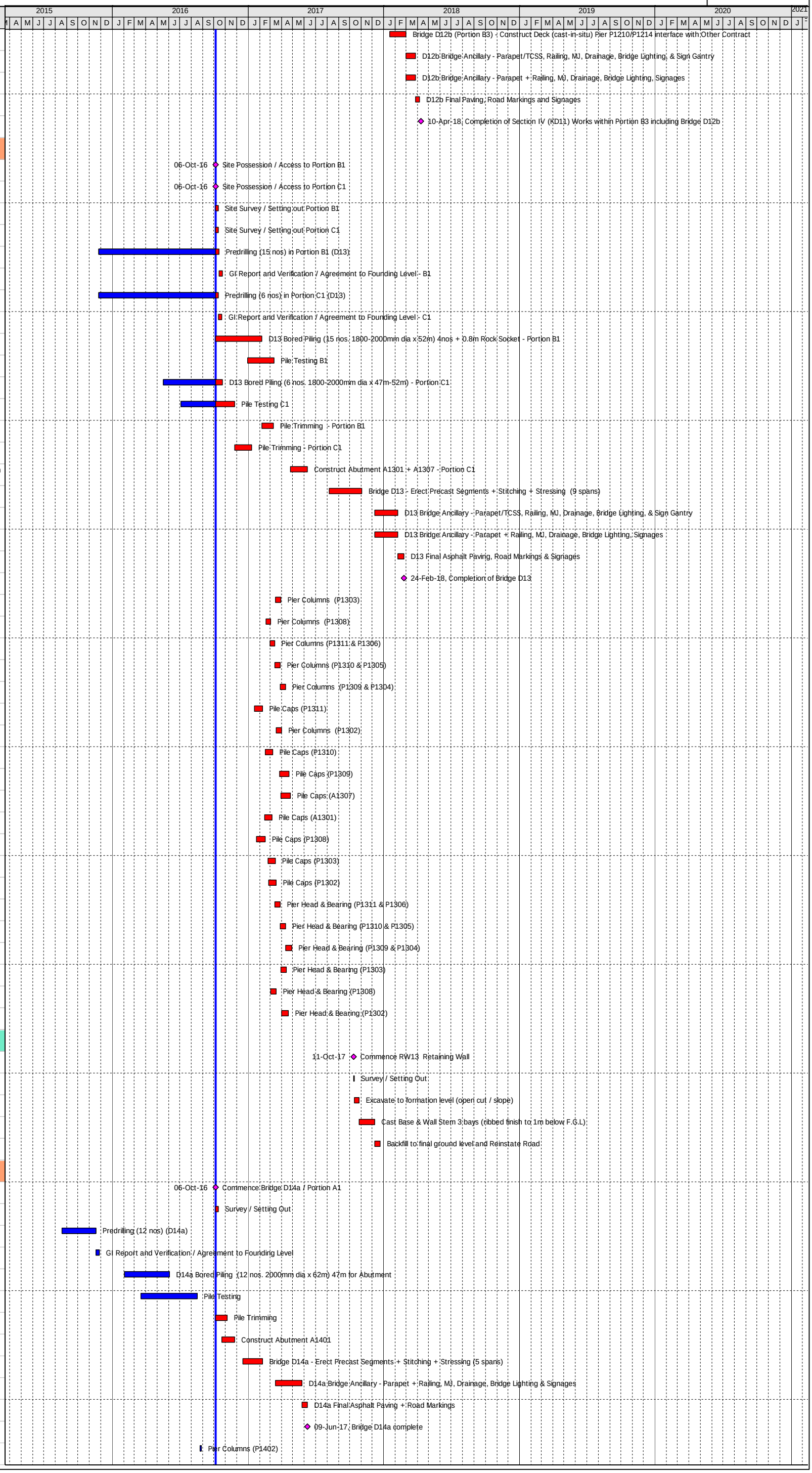
Activity ID	Activity Name
CONS.A1.9210	Pile Cap (P911)
CONS.A1.9310	Pier Head & Bearing (P913)
CONS.A1.9320	Pier Head & Bearing (P912)
CONS.A1.9330	Pier Head & Bearing (P911)
Bridge D9c in Portion A3 (Interface with Cont	
CONS.A3.1010	Site Possession / Access to Portion A3
CONS.A3.1020	Mob/ Survey / Setting Out
CONS.A3.1030	Bridge D9c (A3) - Erect Precast Segments Pier P913 to Contract Interface + Stitching +
CONS.A3.1040	D9c Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage & Bridge Lighting
CONS.A3.1045	D9c Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages
CONS.A3.1050	D9c Final Asphalt Paving + Road Markings
CONS.A3.1060	Completion of Works in Stage 1B (KD2)
Bridge D10	
CONS.A1.10120	Pile Caps (A1004)
CONS.A1.1284	Site Possession / Access to Portion A1
CONS.A1.1286	Survey / Setting Out
CONS.A1.1290.1	Predrilling (14 nos) (D10)
CONS.A1.1290.2	GI Report and Verification / Agreement to Founding Level
CONS.A1.1300	D10 Bored Piling (14 nos 1800-2200mm dia x 57m) (42m for Abutment)
CONS.A1.1305	Pile Testing
CONS.A1.1310	Pile Trimming
CONS.A1.1315	Construct Abutment A1004
CONS.A1.1340	Bridge D10 - Erect Precast Segments + Stitching + Stressing (8 spans)
CONS.A1.1350	D10 Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage, Bridge Lighting, & Sign Gantry
CONS.A1.1355	D10 Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages
CONS.A1.1360	D10 Final Asphalt Paving + Road Markings
CONS.A1.1370	Bridge D10 complete
CONS.A1.8830	Pier Columns (P1003)
CONS.A1.8840	Pier Columns (P1002 & P1006)
CONS.A1.8850	Pier Columns (P1008)
CONS.A1.8860	Pier Columns (P1001 & P1005)
CONS.A1.8870	Pier Columns (P1007)
CONS.A1.9110	Pile Caps (P1008)
CONS.A1.9120	Pile Caps (P1003)
CONS.A1.9130	Pile Caps (P1007)
CONS.A1.9140	Pile Caps (P1002)
CONS.A1.9160	Pile Caps (P1001)
CONS.A1.9350	Pier Head & Bearing (P1003)
CONS.A1.9360	Pier Head & Bearing (P1007)
CONS.A1.9370	Pier Head & Bearing (P1008)
CONS.A1.9380	Pier Head & Bearing (P1002 & P1006)
CONS.A1.9400	Pier Head & Bearing (P1001 & 1005)
Bridge D11	
CONS.A1.1375	Site Possession / Access to Portion A1 (61d)
CONS.A1.1378	Survey / Setting Out
CONS.A1.1380.1	Predrilling (3 nos) (D11)
CONS.A1.1380.2	GI Report and Verification / Agreement to Founding Level
CONS.A1.1390	D11 Bored Piling (3 nos. 2000mm dia x 65) (52m for abutment)
CONS.A1.1395	Pile Testing
CONS.A1.1400	Pile Trimming
CONS.A1.1405	Abutment A1101
CONS.A1.1430	Bridge D11 - Erect Precast Segments + Stitching + Stressing (2 spans)
CONS.A1.1440	D11 Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage, Bridge Lighting, & Sign Gantry
CONS.A1.1445	D11 Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages
CONS.A1.1450	D11 Final Asphalt Paving + Road Markings
CONS.A1.1460	Bridge D11 complete
CONS.A1.8900	Pier Columns (P1102)
CONS.A1.9070	Pile Caps (P1102)
CONS.A1.9080	Pile Caps (A1101)
CONS.A1.9420	Pier Head & Bearing (P1102)
RW11 (42m / 3 bays)	
CONS.A1.3320	Commence RW11 Retaining Wall (42m / 3 bays)
CONS.A1.3330	Survey / Setting Out
CONS.A1.3340	Excavate to formation level (open cut / slope)
CONS.A1.3350	Cast Base & Wall Stem 3 bays (ribbed finish to 1m below F.G.L)
CONS.A1.3360	Backfill to final ground level



Activity ID	Activity Name
Bridge D12a	
CONS.B1.1835	Site Possession / Access to Portion B1
CONS.B1.1837	Site Survey and Setting Out
CONS.B1.1840.1	Predrilling (17 nos) (D12a)
CONS.B1.1840.2	GI Report and Verification / Agreement to Founding Level
CONS.B1.1850	D12a Bored Piling (17 nos. 2000mm dia x 60m + 1.0m Rock Socket)
CONS.B1.1855	Pile Testing
CONS.B1.1860	Pile Trimming
CONS.B1.1890	Bridge D12a - Erect Precast Segments + Stitching + Stressing (6 spans)
CONS.B1.1900	D12a Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage, Bridge Lighting, & Sign Gantry
CONS.B1.1905	D12a Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages
CONS.B1.1910	D12a Final Asphalt Paving + Road Markings
CONS.B1.1920	Bridge D12a complete
CONS.B1.2020	Pier Columns (P1201 & P1204)
CONS.B1.2040	Pier Columns (P1202 & P1205)
CONS.B1.2050	Pier Columns (P1203 & P1414)
CONS.B1.2070	Pier Columns (P1206)
CONS.B1.2440	Pile Caps (P1206)
CONS.B1.2450	Pile Caps (P1201)
CONS.B1.2460	Pile Caps (P1202)
CONS.B1.2470	Pile Caps (P1203)
CONS.B1.2480	Pier Head & Bearing (P1201 & P1204)
CONS.B1.2500	Pier Head & Bearing (P1202 & P1205)
CONS.B1.2520	Pier Head & Bearing (P1203 & P1414)
CONS.B1.2530	Pier Head & Bearing (P1206)
Bridge D12b	
CONS.B2.2015	Site Possession / Access to Portion B2 & B5
CONS.B2.2018	Site Survey / Setting out
CONS.B2.2020.1	Predrilling (18 nos) (D12b)
CONS.B2.2020.2	GI Report and Verification / Agreement to Founding Level
CONS.B2.2030	D12b Bored Piling (18 nos. 2000mm dia x 64m + 3.3m Rock Socket)
CONS.B2.2035	Pile Testing
CONS.B2.2040	Pile Trimming
CONS.B2.2070	Bridge D12b - Erect Precast Segments + Stitching + Stressing (4 spans)
CONS.B2.2080	D12b Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage, Bridge Lighting, & Sign Gantry
CONS.B2.2085	D12b Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages
CONS.B2.2090	Final Paving, Road Markings and Signages
CONS.B2.2100	Pier Columns (P1211)
CONS.B2.2110	Pier Columns (P1212)
CONS.B2.2120	Pier Columns (P1214)
CONS.B2.2130	Pier Columns (P1213) - A (Portal)
CONS.B2.2140	Pier Columns (P1210)
CONS.B2.2150	Pier Columns (P1213) - B (Portal)
CONS.B2.2160	Pier Columns (P1208)
CONS.B2.2170	Pier Columns (P1209)
CONS.B2.2190	Pile Caps (P1211)
CONS.B2.2200	Pile Caps (P1212)
CONS.B2.2210	Pile Caps (P1213 - A)
CONS.B2.2220	Pile Caps (P1213 - B)
CONS.B2.2230	Pile Caps (P1214)
CONS.B2.2240	Pile Caps (P1207)
CONS.B2.2250	Pile Caps (P1208)
CONS.B2.2260	Pile Caps (P1209)
CONS.B2.2270	Pile Caps (P1210)
CONS.B2.2280	Pier Columns (P1207)
CONS.B2.2290	Pier Head & Bearing (P1211)
CONS.B2.2300	Pier Head & Bearing (P1214)
CONS.B2.2320	Pier Head & Bearing (P1212)
CONS.B2.2340	Pier Head & Bearing (P1207)
CONS.B2.2350	Pier Head & Bearing (P1210)
CONS.B2.2360	Pier Head & Bearing (P1208)
CONS.B2.2370	Pier Head & Bearing (P1209)
CONS.B2.2380	Bridge D12b - Erect Precast Segments + Stitching + Stressing (4 spans)
Bridge D12b (cast in-situ) in Portion B3 (Inter	
CONS.B3.2110	Site Possession/Access to Portion B3
CONS.B3.2120	Survey / Setting Out

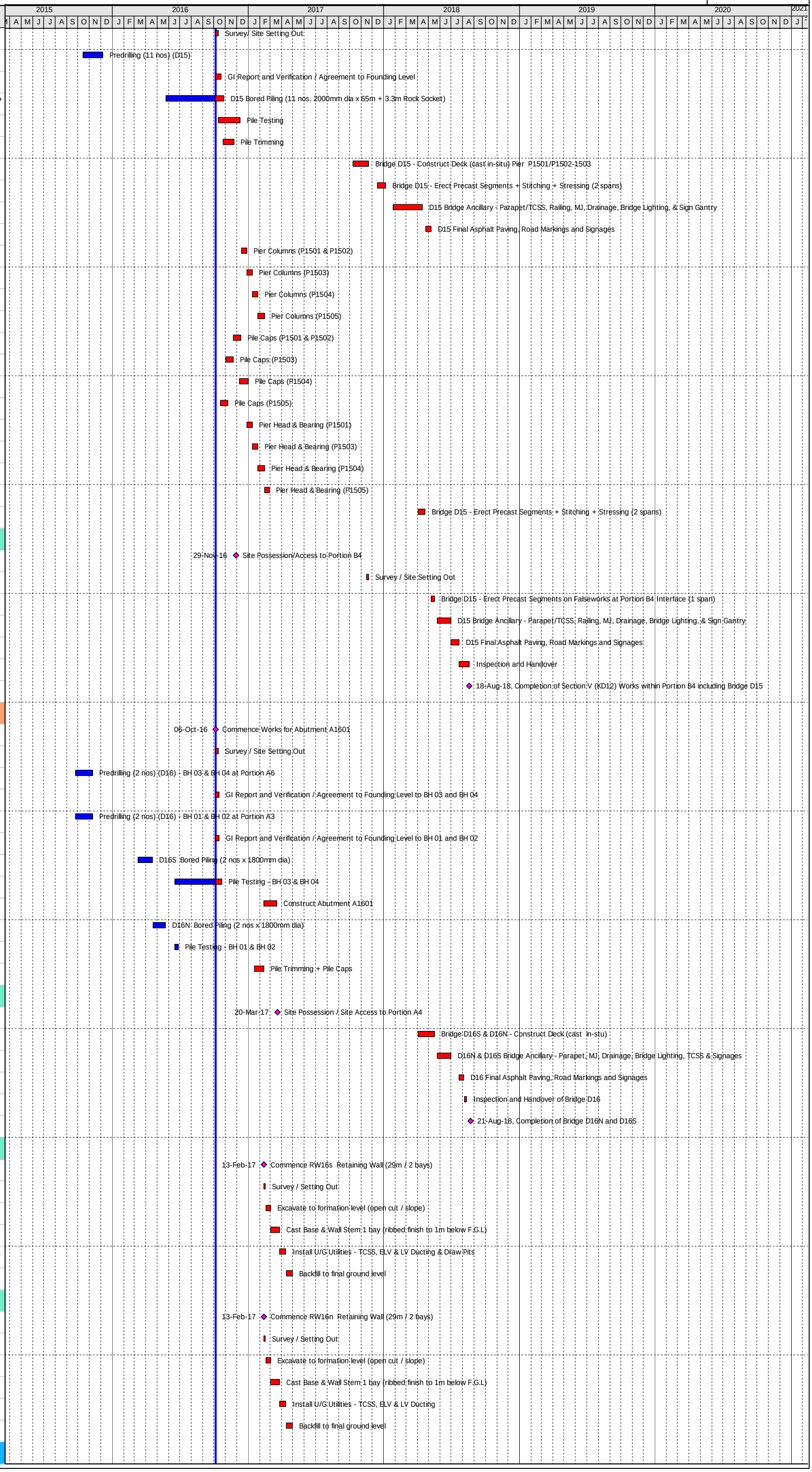


Activity ID	Activity Name
CONS.B3.2130	Bridge D12b (Portion B3) - Construct Deck (cast-in-situ) Pier P1210/P1214 interface with
CONS.B3.2140	D12b Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage, Bridge Lighting, & Sign Gantry
CONS.B3.2145	D12b Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages
CONS.B3.2150	D12b Final Paving, Road Markings and Signages
CONS.B3.2160	Completion of Section IV (KD11) Works within Portion B3 including Bridge D12b
Bridge D13 in Portion B1 and Portion C1	
CONS.B1.1925	Site Possession / Access to Portion B1
CONS.B1.1926	Site Possession / Access to Portion C1
CONS.B1.1928	Site Survey / Setting out Portion B1
CONS.B1.1929	Site Survey / Setting out Portion C1
CONS.B1.1930.1	Predrilling (15 nos) in Portion B1 (D13)
CONS.B1.1930.2	GI Report and Verification / Agreement to Founding Level - B1
CONS.B1.1932.1	Predrilling (6 nos) in Portion C1 (D13)
CONS.B1.1932.2	GI Report and Verification / Agreement to Founding Level - C1
CONS.B1.1940	D13 Bored Piling (15 nos. 1800-2000mm dia x 52m) 4nos + 0.8m Rock Socket - Portion B1
CONS.B1.1942	Pile Testing B1
CONS.B1.1946	D13 Bored Piling (6 nos. 1800-2000mm dia x 47m-52m) - Portion C1
CONS.B1.1948	Pile Testing C1
CONS.B1.1950	Pile Trimming - Portion B1
CONS.B1.1952	Pile Trimming - Portion C1
CONS.B1.1960	Construct Abutment A1301 + A1307 - Portion C1
CONS.B1.1980	Bridge D13 - Erect Precast Segments + Stitching + Stressing (9 spans)
CONS.B1.1990	D13 Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage, Bridge Lighting, & Sign Gantry
CONS.B1.1995	D13 Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages
CONS.B1.2000	D13 Final Asphalt Paving, Road Markings & Signages
CONS.B1.2010	Completion of Bridge D13
CONS.B1.2190	Pier Columns (P1303)
CONS.B1.2200	Pier Columns (P1308)
CONS.B1.2210	Pier Columns (P1311 & P1306)
CONS.B1.2220	Pier Columns (P1310 & P1305)
CONS.B1.2230	Pier Columns (P1309 & P1304)
CONS.B1.2330	Pile Caps (P1311)
CONS.B1.2340	Pier Columns (P1302)
CONS.B1.2350	Pile Caps (P1310)
CONS.B1.2360	Pile Caps (P1309)
CONS.B1.2370	Pile Caps (A1307)
CONS.B1.2380	Pile Caps (A1301)
CONS.B1.2390	Pile Caps (P1308)
CONS.B1.2400	Pile Caps (P1303)
CONS.B1.2410	Pile Caps (P1302)
CONS.B1.2560	Pier Head & Bearing (P1311 & P1306)
CONS.B1.2580	Pier Head & Bearing (P1310 & P1305)
CONS.B1.2600	Pier Head & Bearing (P1309 & P1304)
CONS.B1.2610	Pier Head & Bearing (P1303)
CONS.B1.2620	Pier Head & Bearing (P1308)
CONS.B1.2630	Pier Head & Bearing (P1302)
RW13 (40m / 3 bays)	
CONS.C2.3260	Commence RW13 Retaining Wall
CONS.C2.3270	Survey / Setting Out
CONS.C2.3280	Excavate to formation level (open cut / slope)
CONS.C2.3290	Cast Base & Wall Stem 3 bays (ribbed finish to 1m below F.G.L)
CONS.C2.3300	Backfill to final ground level and Reinstate Road
Bridge D14a	
CONS.A1.1464	Commence Bridge D14a / Portion A1
CONS.A1.1466	Survey / Setting Out
CONS.A1.1470.1	Predrilling (12 nos) (D14a)
CONS.A1.1470.2	GI Report and Verification / Agreement to Founding Level
CONS.A1.1480	D14a Bored Piling (12 nos. 2000mm dia x 62m) 47m for Abutment
CONS.A1.1485	Pile Testing
CONS.A1.1490	Pile Trimming
CONS.A1.1515	Construct Abutment A1401
CONS.A1.1520	Bridge D14a - Erect Precast Segments + Stitching + Stressing (5 spans)
CONS.A1.1530	D14a Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting & Signages
CONS.A1.1540	D14a Final Asphalt Paving + Road Markings
CONS.A1.1550	Bridge D14a complete
CONS.A1.8940	Pier Columns (P1402)



Activity ID	Activity Name
CONS.A1.8950	Pier Columns (P1403)
CONS.A1.8960	Pier Columns (P1404)
CONS.A1.8970	Pier Columns (P1405)
CONS.A1.8980	Pier Columns (P1406)
CONS.A1.9000	Pile Caps (A1401)
CONS.A1.9010	Pile Caps (P1402)
CONS.A1.9020	Pile Caps (P1403)
CONS.A1.9030	Pile Caps (P1404)
CONS.A1.9040	Pile Caps (P1405)
CONS.A1.9050	Pile Caps (P1406)
CONS.A1.9440	Pier Head & Bearing (P1402)
CONS.A1.9450	Pier Head & Bearing (P1403)
CONS.A1.9460	Pier Head & Bearing (P1404)
CONS.A1.9470	Pier Head & Bearing (P1405)
CONS.A1.9480	Pier Head & Bearing (P1406)
RW14A (29m / 2 bays)	
CONS.A1.3380	Commence RW14a Retaining Wall (29m / 2 bays)
CONS.A1.3390	Survey / Setting Out
CONS.A1.3400	Excavate to formation level (open cut / slope)
CONS.A1.3410	Cast Base & Wall Stem 2 bays (ribbed finish to 1m below F.G.L)
CONS.A1.3420	Backfill to final ground level
Bridge D14b in Portion A1 and Portion B1	
CONS.B1.1654	Access to Portion B1
CONS.B1.1656	Survey / Setting Out
CONS.B1.1660.1	Predrilling (6 nos) (D14b)
CONS.B1.1660.2	GI Report and Verification / Agreement to Founding Level
CONS.B1.1670	D14b Bored Piling (6 nos. 2000-2200mm dia x 62m) (2nos +2.3m Rock Socket)
CONS.B1.1675	Pile Testing / Coring Test for Socket Bored Pile
CONS.B1.1680	Pile Trimming
CONS.B1.1710	Bridge D14b - Erect Precast Segments + Stitching + Stressing (3 spans)
CONS.B1.1720	D14b Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting & Signages
CONS.B1.1730	D14b Final Asphalt Paving + Road Markings
CONS.B1.1740	Bridge D14b complete
CONS.B1.2090	Pier Columns (P1407)
CONS.B1.2100	Pier Columns (P1408)
CONS.B1.2110	Pier Columns (P1409)
CONS.B1.2290	Pile Caps (P1407)
CONS.B1.2300	Pile Caps (P1408)
CONS.B1.2310	Pile Caps (P1409)
CONS.B1.2640	Pier Head & Bearing (P1407)
CONS.B1.2650	Pier Head & Bearing (P1408)
CONS.B1.2660	Pier Head & Bearing (P1409)
Bridge D14c	
CONS.B1.1744	Site Possession / Access to Portion B1
CONS.B1.1746	Survey / Setting Out
CONS.B1.1750.1	Predrilling (11 nos) (D14c)
CONS.B1.1750.2	GI Report and Verification / Agreement to Founding Level
CONS.B1.1760	D14c Bored Piling (11 nos. 2000-2200mm dia x 67m + 2.3m Rock Socket)
CONS.B1.1765	Pile Testing
CONS.B1.1770	Pile Trimming
CONS.B1.1795	Bridge D14c - Construct Deck (cast in-situ) Pier P1409 to P1410
CONS.B1.1800	Bridge D14c - Erect Precast Segments + Stitching + Stressing (4 spans)
CONS.B1.1810	D14c Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting & Signages
CONS.B1.1820	D14c Final Asphalt Paving + Road Markings
CONS.B1.1830	Bridge D14c complete
CONS.B1.2120	Pier Columns (P1410)
CONS.B1.2130	Pier Columns (P1411 & P1413)
CONS.B1.2140	Pier Columns (P1412)
CONS.B1.2250	Pile Caps (P1410)
CONS.B1.2260	Pile Caps (P1411)
CONS.B1.2270	Pile Caps (P1412)
CONS.B1.2670	Pier Head & Bearing (P1410)
CONS.B1.2680	Pier Head & Bearing (P1411 & P1413)
CONS.B1.2690	Pier Head & Bearing (P1412)
Bridge D15	
CONS.B5.2104	Site Possession/Access to Portion B5

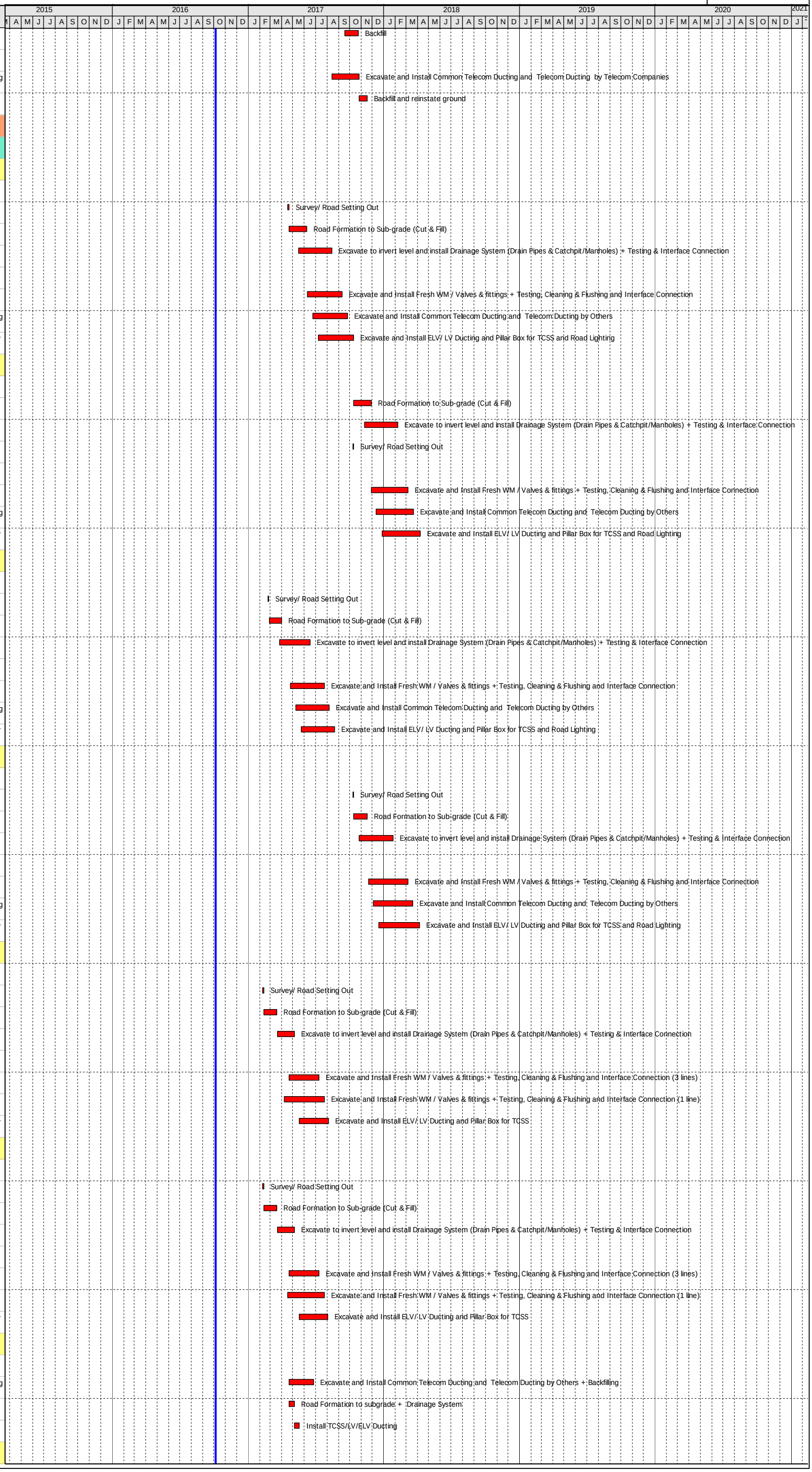
Activity ID	Activity Name
CONS.B5.2106	Survey/ Site Setting Out
CONS.B5.2110.1	Predrilling (11 nos) (D15)
CONS.B5.2110.2	GI Report and Verification / Agreement to Founding Level
CONS.B5.2120	D15 Bored Piling (11 nos. 2000mm dia x 65m + 3.3m Rock Socket)
CONS.B5.2125	Pile Testing
CONS.B5.2130	Pile Trimming
CONS.B5.2150	Bridge D15 - Construct Deck (cast in-situ) Pier P1501/P1502-1503
CONS.B5.2160	Bridge D15 - Erect Precast Segments + Stitching + Stressing (2 spans)
CONS.B5.2170	D15 Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage, Bridge Lighting, & Sign Gantry
CONS.B5.2180	D15 Final Asphalt Paving, Road Markings and Signages
CONS.B5.2190	Pier Columns (P1501 & P1502)
CONS.B5.2210	Pier Columns (P1503)
CONS.B5.2220	Pier Columns (P1504)
CONS.B5.2230	Pier Columns (P1505)
CONS.B5.2250	Pile Caps (P1501 & P1502)
CONS.B5.2260	Pile Caps (P1503)
CONS.B5.2270	Pile Caps (P1504)
CONS.B5.2280	Pile Caps (P1505)
CONS.B5.2290	Pier Head & Bearing (P1501)
CONS.B5.2310	Pier Head & Bearing (P1503)
CONS.B5.2320	Pier Head & Bearing (P1504)
CONS.B5.2330	Pier Head & Bearing (P1505)
CONS.B5.2340	Bridge D15 - Erect Precast Segments + Stitching + Stressing (2 spans)
Bridge D15 in Portion B4 (Interface with Cont	
CONS.B4.2170	Site Possession/Access to Portion B4
CONS.B4.2180	Survey / Site Setting Out
CONS.B4.2190	Bridge D15 - Erect Precast Segments on Falseworks at Portion B4 Interface (1 span)
CONS.B4.2200	D15 Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage, Bridge Lighting, & Sign Gantry
CONS.B4.2210	D15 Final Asphalt Paving, Road Markings and Signages
CONS.B4.2220	Inspection and Handover
CONS.B4.2230	Completion of Section V (KD12) Works within Portion B4 including Bridge D15
Bridge D16S and D16N and Abutment A1601 in	
CONS.A4.2230	Commence Works for Abutment A1601
CONS.A4.2240	Survey / Site Setting Out
CONS.A4.2250.1	Predrilling (2 nos) (D16) - BH 03 & BH 04 at Portion A6
CONS.A4.2250.2	GI Report and Verification / Agreement to Founding Level to BH 03 and BH 04
CONS.A4.2250.3	Predrilling (2 nos) (D16) - BH 01 & BH 02 at Portion A3
CONS.A4.2250.4	GI Report and Verification / Agreement to Founding Level to BH 01 and BH 02
CONS.A4.2260	D16S Bored Piling (2 nos x 1800mm dia)
CONS.A4.2265	Pile Testing - BH 03 & BH 04
CONS.A4.2280	Construct Abutment A1601
CONS.A4.2340	D16N Bored Piling (2 nos x 1800mm dia)
CONS.A4.2350	Pile Testing - BH 01 & BH 02
CONS.A4.2360	Pile Trimming + Pile Caps
Bridge D16S and D16N in Portion A4	
CONS.A4.2285	Site Possession / Site Access to Portion A4
CONS.A4.2290	Bridge D16S & D16N - Construct Deck (cast in-stu)
CONS.A4.2300	D16N & D16S Bridge Ancillary - Parapet, MJ, Drainage, Bridge Lighting, TCSS & Signages
CONS.A4.2310	D16 Final Asphalt Paving, Road Markings and Signages
CONS.A4.2320	Inspection and Handover of Bridge D16
CONS.A4.2330	Completion of Bridge D16N and D16S
RW16S (15m / 1 bay) in Portion A6	
CONS.A1.3500	Commence RW16s Retaining Wall (29m / 2 bays)
CONS.A1.3510	Survey / Setting Out
CONS.A1.3520	Excavate to formation level (open cut / slope)
CONS.A1.3530	Cast Base & Wall Stem 1 bay (ribbed finish to 1m below F.G.L)
CONS.A1.3540	Install U/G Utilities - TCSS, ELV & LV Ducting & Draw Pits
CONS.A1.3550	Backfill to final ground level
RW16N (15m / 1 bay) in Portion A6	
CONS.A1.3440	Commence RW16n Retaining Wall (29m / 2 bays)
CONS.A1.3450	Survey / Setting Out
CONS.A1.3460	Excavate to formation level (open cut / slope)
CONS.A1.3470	Cast Base & Wall Stem 1 bay (ribbed finish to 1m below F.G.L)
CONS.A1.3480	Install U/G Utilities - TCSS, ELV & LV Ducting
CONS.A1.3490	Backfill to final ground level
Depressed Road RC Structure	



Activity ID	Activity Name
	Stage 1- Depressed Road RC Structure (Bay 9
CONS.C1.8670	Commence Works on Depressed Road (after removal of falsework D10, D14a)
CONS.C1.8699	Excavate to formation level (open cut)
CONS.C1.8720	Construct- base slab
CONS.C1.8730	Construct - wall (Plan ad Ribbed Finishes)
CONS.C1.8740	Backfill and Compaction
	Stage 2 - Depressed Road RC Structure (Bay 1
CONS.C1.8671	Commence Works on Depressed Road (after removal of falseworks D13, D8, D9a)
CONS.C1.8690	Excavate to formation level (open cut)
CONS.C1.8721	Construct- base slab
CONS.C1.8731	Construct - wall (Plan ad Ribbed Finishes)
CONS.C1.8741	Backfill and Compaction
	Sign Gantry
	Sign Gantry Footings at Grade in Portion A1
	DS303 (Driven H Pile)
CONS.A1.4380.	Predrilling (12 nos) (DS303)
CONS.A1.4380.	GI Report and Verification / Agreement to Founding Level
CONS.A1.4390	Piling Works - Driven H Pile (12 nos)
CONS.A1.4410	Excavation, Pile Trimming + Cast Pile Caps (3 nos)
CONS.A1.4420	Backfill Foundation
	Sign Gantry Footing at Grade in Portion C1 & P
	DS302 (610mm dia. Prebored H Pile)
CONS.D1.3380	Commence Foundation / Footing for Sign Gantry
CONS.D1.3390	Mobilisation/ Survey / Setting Out
CONS.D1.3400.	Predrilling for Prebored H Pile (8 nos) (DS302)
CONS.D1.3400.	GI Report and Verification / Agreement to Founding Level
CONS.D1.3410	Pre-bored Socket H-Pile (8 nos)
CONS.D1.3420	Pile Testing
CONS.D1.3430	Excavation, Pile Trimming + Pile Caps (2 nos)
CONS.D1.3440	Backfill Foundation
	GT408 (Driven H Pile)
CONS.C1.4030.	Predrilling (8 nos) (GT408)
CONS.C1.4030.	GI Report and Verification / Agreement to Founding Level
CONS.C1.4040	Piling Works - Driven H Pile (8 nos)
CONS.C1.4060	Excavation, Pile Trimming + Cast Pile Caps (2 nos)
CONS.C1.4070	Backfill Foundation
	DS44 (Driven H Pile)
CONS.C1.4100.	Predrilling (8 nos) (DS44)
CONS.C1.4100.	GI Report and Verification / Agreement to Founding Level
CONS.C1.4110	Piling Works - Driven H Pile (8 nos)
CONS.C1.4130	Excavation, Pile Trimming + Cast Pile Caps (2 nos)
CONS.C1.4140	Backfill Foundation
	DS261 (Driven H Pile)
CONS.C1.4170.	Predrilling (8 nos) (DS261)
CONS.C1.4170.	GI Report and Verification / Agreement to Founding Level
CONS.C1.4180	Piling Works - Driven H Pile (8 nos)
CONS.C1.4200	Excavation, Pile Trimming + Cast Pile Caps (2 nos)
CONS.C1.4210	Backfill Foundation
	ADS301 (Driven H Pile)
CONS.C1.4240.	Predrilling (12 nos) (ADS301)
CONS.C1.4240.	GI Report and Verification / Agreement to Founding Level
CONS.C1.4250	Piling Works - Driven H Pile (12 nos)
CONS.C1.4270	Excavation, Pile Trimming + Cast Pile Caps (3 nos)
CONS.C1.4280	Backfill Foundation
	FADS303 (Driven H Pile)
CONS.C1.4310.	Predrilling (8 nos) (FADS303)
CONS.C1.4310.	GI Report and Verification / Agreement to Founding Level
CONS.C1.4320	Piling Works - Driven H Pile (8 nos)
CONS.C1.4340	Excavation, Pile Trimming + Cast Pile Caps (2 nos)
CONS.C1.4350	Backfill Foundation
	Erection of Sign Gantry and High Mast for TCS
CONS.C1.4360	Erection of Sign Gantry & High Mast Structure and Associated Conduits for TCSS Works
	Drainage and U/G Utilities
CONS.RW.2300	Handover area to CLP for HV Cable Laying
CONS.RW.3870	Excavate and Install HV Cable Ducting on Carriageway (West of Pump House - Portion
CONS.RW.3880	Excavate and Install HV Cable Ducting on Carriageway (East of Pump House - Portion A

Activity ID	Activity Name	Bar label (timeline 2015–2021)
CONS.RW.3890	Excavate and Install HV Cable Ducting on Carriageway (East of Pump House - Portion B	Excavate and Install HV Cable Ducting on Carriageway (East of Pump House - Portion B and C)
CONS.RW.3900	Excavate and Install HV Cable Ducting on Carriageway (West of Pump House - Portion	Excavate and Install HV Cable Ducting on Carriageway (West of Pump House - Portion D)
Drainage and U/G Utilities (West of Pump Hou		
Drainage & UU		
Road SOL 101 / 105 (Phase 1)		
Drainage System		
CONS.RW.227	Survey/ Road Setting Out	Survey/ Road Setting Out
CONS.RW.228	Road Formation to Sub-grade (Cut & Fill)	Road Formation to Sub-grade (Cut & Fill)
CONS.RW.229	Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) +	Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) + Testing & Interface Connection
Installation of Underground Utilities		
CONS.RW.231	Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and	Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and Interface Connection
CONS.RW.232	Excavate and Install Common Telecom Ducting and Telecom Ducting by Others	Excavate and Install Common Telecom Ducting and Telecom Ducting by Others
CONS.RW.233	Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS	Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS
Road SOL 101 / 105 (Phase 2)		
Drainage System		
CONS.RW.344	Survey/ Road Setting Out	Survey/ Road Setting Out
CONS.RW.345	Road Formation to Sub-grade (Cut & Fill)	Road Formation to Sub-grade (Cut & Fill)
CONS.RW.346	Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) +	Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) + Testing & Interface Connection
Installation of Underground Utilities		
CONS.RW.340	Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and	Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and Interface Connection
CONS.RW.341	Excavate and Install Common Telecom Ducting and Telecom Ducting by Others	Excavate and Install Common Telecom Ducting and Telecom Ducting by Others
CONS.RW.342	Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS	Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS
Road SOL 102 /106 /111 and the neigboring la		
Drainage System		
CONS.RW.241	Survey/ Road Setting Out	Survey/ Road Setting Out
CONS.RW.242	Road Formation to Sub-grade (Cut & Fill)	Road Formation to Sub-grade (Cut & Fill)
CONS.RW.243	Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) +	Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) + Testing & Interface Connection
Installation of Underground Utilities		
CONS.RW.294	Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and	Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and Interface Connection
CONS.RW.295	Excavate and Install Common Telecom Ducting and Telecom Ducting by Others	Excavate and Install Common Telecom Ducting and Telecom Ducting by Others
CONS.RW.296	Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS	Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS
Road SOL 102 /106 /111 and the neigboring la		
Drainage System		
CONS.RW.347	Survey/ Road Setting Out	Survey/ Road Setting Out
CONS.RW.348	Road Formation to Sub-grade (Cut & Fill)	Road Formation to Sub-grade (Cut & Fill)
CONS.RW.349	Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) +	Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) + Testing & Interface Connection
Installation of Underground Utilities		
CONS.RW.350	Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and	Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and Interface Connection
CONS.RW.351	Excavate and Install Common Telecom Ducting and Telecom Ducting by Others	Excavate and Install Common Telecom Ducting and Telecom Ducting by Others
CONS.RW.352	Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS	Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS
Road SOL 104 (Phase 1)		
Drainage System		
CONS.RW.244	Survey/ Road Setting Out	Survey/ Road Setting Out
CONS.RW.245	Road Formation to Sub-grade (Cut & Fill)	Road Formation to Sub-grade (Cut & Fill)
CONS.RW.246	Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) +	Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) + Testing & Interface Connection
Installation of Underground Utilities		
CONS.RW.247	Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and	Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and Interface Connection (3 lines)
CONS.RW.248	Excavate and Install Flush WM / Valves & fittings + Testing, Cleaning & Flushing and	Excavate and Install Flush WM / Valves & fittings + Testing, Cleaning & Flushing and Interface Connection (1 line)
CONS.RW.249	Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS	Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS
Road SOL 104 (Phase 2)		
Drainage System		
CONS.RW.356	Survey/ Road Setting Out	Survey/ Road Setting Out
CONS.RW.357	Road Formation to Sub-grade (Cut & Fill)	Road Formation to Sub-grade (Cut & Fill)
CONS.RW.358	Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) +	Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) + Testing & Interface Connection
Installation of Underground Utilities		
CONS.RW.353	Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and	Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and Interface Connection (3 lines)
CONS.RW.354	Excavate and Install Flush WM / Valves & fittings + Testing, Cleaning & Flushing and	Excavate and Install Flush WM / Valves & fittings + Testing, Cleaning & Flushing and Interface Connection (1 line)
CONS.RW.355	Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS	Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS
Undergound Utilties (ELV, Fresh WM & Teleco		
Work in Portion D1 and D2		
Sewage Rising main at Portion D1		
CONS.RM.101	Commence Works on Rising Main	16-May-17 ◆ Commence Works on Rising Main
CONS.RM.102	Site Survey / Setting Out Sewerage Alignment	Site Survey / Setting Out Sewerage Alignment
CONS.RM.103	Excavate to Invert Level & Install 2 Sewage Rising Main DN100 CHC & CHD	Excavate to Invert Level & Install 2 Sewage Rising Main DN100 CHC & CHD
CONS.RM.104	Construct Thrust Block	Construct Thrust Block
CONS.RM.105	Gravity Flow Testing	Gravity Flow Testing

Activity ID	Activity Name
CONS.RM.106	Backfill
Telecom Crossing at Portion D2 and D1	
CONS.RW.28(	Excavate and Install Common Telecom Ducting and Telecom Ducting by Telecom Companies
CONS.RW.28	Backfill and reinstate ground
Drainage and U/G Utilities (East of Pump Hous	
Drainage & UU	
Road SOL 101 / 109 / 114 (Phase 1)	
Drainage System	
CONS.RE.101	Survey/ Road Setting Out
CONS.RE.102	Road Formation to Sub-grade (Cut & Fill)
CONS.RE.103	Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) +
Installation of Underground Utilities	
CONS.RE.106	Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and
CONS.RE.107	Excavate and Install Common Telecom Ducting and Telecom Ducting by Others
CONS.RE.108	Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS and Road Lighting
Road SOL 101 / 109 / 114 (Phase 2)	
Drainage System	
CONS.RE.420	Road Formation to Sub-grade (Cut & Fill)
CONS.RE.421	Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) +
CONS.RE.422	Survey/ Road Setting Out
Installation of Underground Utilities	
CONS.RE.423	Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and
CONS.RE.424	Excavate and Install Common Telecom Ducting and Telecom Ducting by Others
CONS.RE.425	Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS and Road Lighting
Road SOL 102 and the area outside the carriage	
Drainage System	
CONS.RE.197	Survey/ Road Setting Out
CONS.RE.198	Road Formation to Sub-grade (Cut & Fill)
CONS.RE.199	Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) +
Installation of Underground Utilities	
CONS.RE.289	Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and
CONS.RE.290	Excavate and Install Common Telecom Ducting and Telecom Ducting by Others
CONS.RE.291	Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS and Road Lighting
Road SOL 102 and the area outside the carriage	
Drainage System	
CONS.RE.426	Survey/ Road Setting Out
CONS.RE.427	Road Formation to Sub-grade (Cut & Fill)
CONS.RE.428	Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) +
Installation of Underground Utilities	
CONS.RE.429	Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and
CONS.RE.430	Excavate and Install Common Telecom Ducting and Telecom Ducting by Others
CONS.RE.431	Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS and Road Lighting
Road SOL 107 / 113 (Phase 1)	
Drainage System	
CONS.RE.200	Survey/ Road Setting Out
CONS.RE.201	Road Formation to Sub-grade (Cut & Fill)
CONS.RE.202	Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) +
Installation of Underground Utilities	
CONS.RE.204	Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and
CONS.RE.205	Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and
CONS.RE.206	Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS
Road SOL 107 / 113 (Phase 2)	
Drainage System	
CONS.RE.432	Survey/ Road Setting Out
CONS.RE.433	Road Formation to Sub-grade (Cut & Fill)
CONS.RE.434	Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) +
Installation of Underground Utilities	
CONS.RE.435	Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and
CONS.RE.436	Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and
CONS.RE.437	Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS
Road SOL 108 / 106 & SOL 110	
Adjacent to Road SOL 108 / 106, Abutment A9	
CONS.RE.207	Excavate and Install Common Telecom Ducting and Telecom Ducting by Others + Backfilling
CONS.RE.216	Road Formation to subgrade + Drainage System
CONS.RE.219	Install TCSS/LV/ELV Ducting
Portion A1 and A2 - Sub-Base Area	

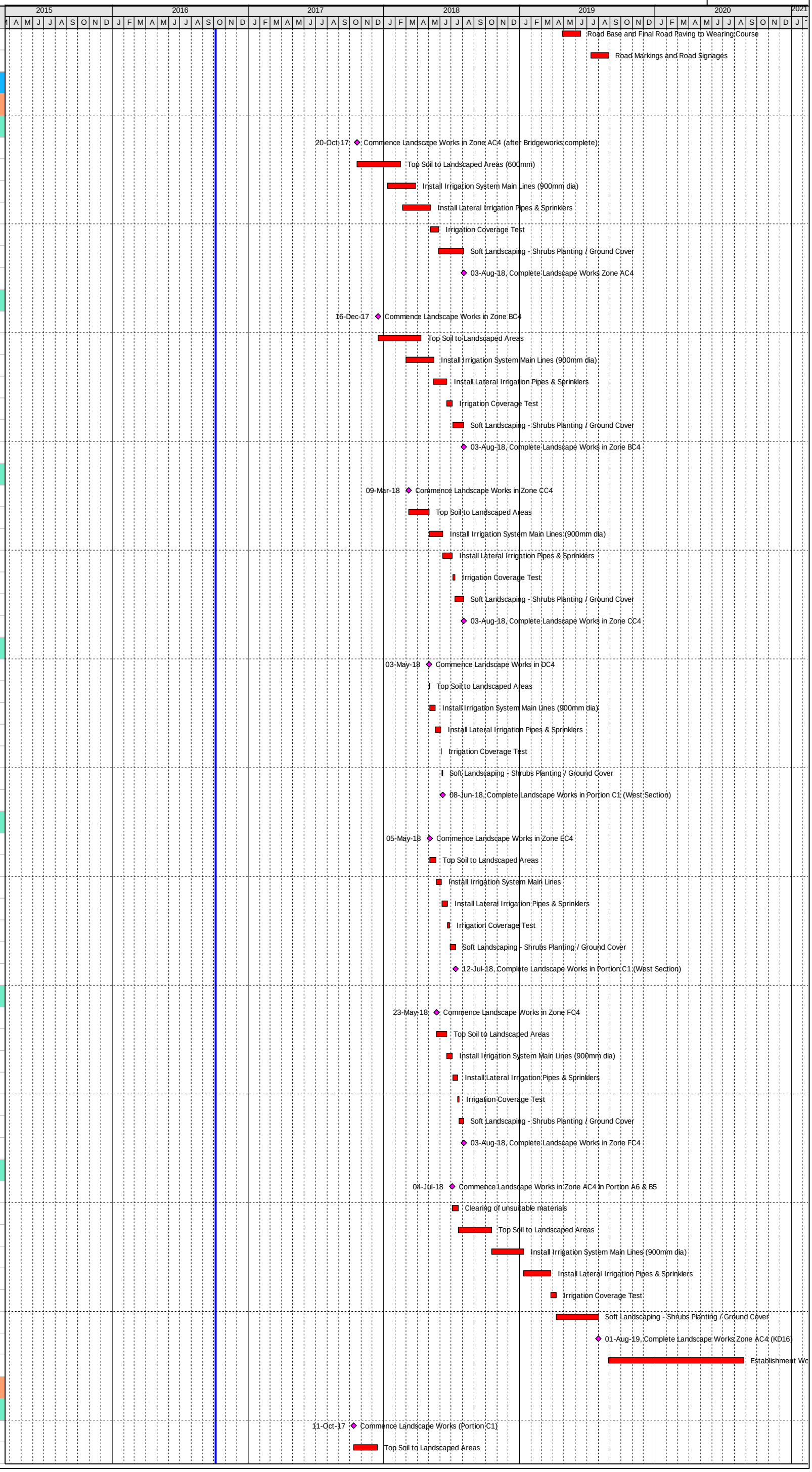


Activity ID	Activity Name
CONS.A1.4430	Demobilisation of Temporary Facilities on Site
CONS.A1.4440	Site Survey / Site Clearing
CONS.A1.4450	Area to Formation Level
CONS.A1.4460	Sub-Base Material Topping (Area 29,963 m2 x 100mm thk Subbase)
Area 3 (in Portion A6)	
Drainage System	
CONS.RE.4660	Survey/ Road Setting Out
CONS.RE.4670	Road Formation to Sub-grade (Cut & Fill)
CONS.RE.4680	Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) +
Installation of Underground Utilities	
CONS.RE.4690	Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS
CONS.RE.4700	Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and
CONS.RE.4710	Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and
Roadworks	
Area 1 (West of Pump House) (Portion C1)	
Road Works	
Road SOL 101 / 105 (Phase 1)	
Kerbing and Footings for Railing, Fencing, Sign	
CONS.RW.30(	Excavate and Construct Footings for Road Lightings / Railing / Fencing and Signages
CONS.RW.30:	Road Formation to Sub-base
CONS.RW.30(	Construct Precast Road Kerbings
Road Works to Road Base and Base Course	
CONS.RW.30:	Road Formation to Road Base
CONS.RW.30(	Road Formation to Base Course
Installation of Railing and Fencing + Road Ligl	
CONS.RW.30:	Install Road Railing and Fencing
CONS.RW.30(	Install Road Lighting and Signages
Final Paving and Road Markings	
CONS.RW.29:	Cleaning and Rectification Works
CONS.RW.29(	Final Road Paving (Wearing Course)
CONS.RW.29:	Road Markings and Road Signages
Road SOL 101 / 105 (Phase 2)	
Kerbing and Footings for Railing, Fencing, Sign	
CONS.RW.36:	Road Formation to Sub-base
CONS.RW.36(	Construct Precast Road Kerbings
Road Works to Road Base and Base Course	
CONS.RW.36:	Road Formation to Road Base
CONS.RW.36(	Road Formation to Base Course
Installation of Railing and Fencing + Road Ligl	
CONS.RW.36:	Install Road Railing and Fencing
CONS.RW.36(	Install Road Lighting and Signages
Final Paving and Road Markings	
CONS.RW.35:	Cleaning and Rectification Works
CONS.RW.36(	Final Road Paving (Wearing Course)
CONS.RW.36:	Road Markings and Road Signages
Road SOL 102 /106 /111 (Phase 1)	
Kerbing and Footings for Railing, Fencing, Sign	
CONS.RW.32:	Excavate and Construct Footings for Road Lightings / Railing / Fencing and Signages
CONS.RW.32(	Road Formation to Sub-base
CONS.RW.32:	Construct Precast Road Kerbings
Road Works to Road Base and Base Course	
CONS.RW.32:	Road Formation to Road Base
CONS.RW.32(	Road Formation to Base Course
Installation of Railing and Fencing + Road Ligl	
CONS.RW.32:	Install Road Railing and Fencing
CONS.RW.32(	Install Road Lighting and Signages
Final Paving and Road Markings	
CONS.RW.32:	Final Road Paving (Wearing Course)
CONS.RW.32(	Road Markings and Road Signages
Road SOL 102 /106 /111 (Phase 2)	
Kerbing and Footings for Railing, Fencing, Sign	
CONS.RW.37:	Excavate and Construct Footings for Road Lightings / Railing / Fencing and Signages
CONS.RW.37(	Road Formation to Sub-base
CONS.RW.37:	Construct Precast Road Kerbings
Road Works to Road Base and Base Course	
CONS.RW.36:	Road Formation to Road Base

Activity ID	Activity Name
CONS.RW.37(	Road Formation to Base Course
Installation of Railing and Fencing + Road Ligl	
CONS.RW.371	Install Road Railing and Fencing
CONS.RW.372	Install Road Lighting and Signages
Final Paving and Road Markings	
CONS.RW.373	Final Road Paving (Wearing Course)
CONS.RW.374	Road Markings and Road Signages
Road SOL 104 (Phase 1)	
Kerbing and Footings for Railing, Fencing, Sigr	
CONS.RW.332	Excavate and Construct Footings for Road Lightings / Railing / Fencing and Signages
CONS.RW.333	Road Formation to Sub-base
CONS.RW.334	Construct Precast Road Kerbings
Road Works to Road Base and Base Course	
CONS.RW.335	Road Formation to Road Base
CONS.RW.336	Road Formation to Base Course
Installation of Railing and Fencing + Road Ligl	
CONS.RW.337	Install Road Railing and Fencing
CONS.RW.338	Install Road Lighting and Signages
Final Paving and Road Markings	
CONS.RW.33(	Final Road Paving (Wearing Course)
CONS.RW.33:	Road Markings and Road Signages
Road SOL 104 (Phase 2)	
Kerbing and Footings for Railing, Fencing, Sigr	
CONS.RW.38(	Excavate and Construct Footings for Road Lightings / Railing / Fencing and Signages
CONS.RW.381	Road Formation to Sub-base
CONS.RW.382	Construct Precast Road Kerbings
Road Works to Road Base and Base Course	
CONS.RW.383	Road Formation to Road Base
CONS.RW.384	Road Formation to Base Course
Installation of Railing and Fencing + Road Ligl	
CONS.RW.385	Install Road Railing and Fencing
CONS.RW.386	Install Road Lighting and Signages
Final Paving and Road Markings	
CONS.RW.378	Final Road Paving (Wearing Course)
CONS.RW.379	Road Markings and Road Signages
Area 2 (East of Pump House Portion C1, A1, A2	
Road Works	
Road SOL 101 / 109 / 114 (Phase 1)	
Kerbing and Footings for Railing, Fencing, Sigr	
CONS.RE.384	Excavate and Construct Footings for Road Lightings / Railing / Fencing and Signages
CONS.RE.385	Road Formation to Sub-base
CONS.RE.386	Construct Precast Road Kerbings
Road Works to Road Base and Base Course	
CONS.RE.372	Road Formation to Road Base
CONS.RE.373	Road Formation to Base Course
Installation of Railing and Fencing + Road Ligl	
CONS.RE.374	Install Road Railing and Fencing
CONS.RE.375	Install Road Lighting and Signages
Road SOL 101 / 109 / 114 (Phase 2)	
Kerbing and Footings for Railing, Fencing, Sigr	
CONS.RE.442	Excavate and Construct Footings for Road Lightings / Railing / Fencing and Signages
CONS.RE.443	Road Formation to Sub-base
CONS.RE.444	Construct Precast Road Kerbings
Road Works to Road Base and Base Course	
CONS.RE.438	Road Formation to Road Base
CONS.RE.439	Road Formation to Base Course
Installation of Railing and Fencing + Road Ligl	
CONS.RE.440	Install Road Railing and Fencing
CONS.RE.441	Install Road Lighting and Signages
Road SOL 102 (Phase 1)	
Kerbing and Footings for Railing, Fencing, Sigr	
CONS.RE.415	Excavate and Construct Footings for Road Lightings / Railing / Fencing and Signages
CONS.RE.416	Construct Precast Road Kerbings
CONS.RE.417	Road Formation to Sub-base
Road Works to Road Base and Base Course	
CONS.RE.410	Road Formation to Road Base

Activity ID	Activity Name
CONS.RE.411	Road Formation to Base Course
	Installation of Railing and Fencing + Road Ligl
CONS.RE.418	Install Road Railing and Fencing
CONS.RE.419	Install Road Lighting and Signages
	Final Paving and Road Markings
CONS.RE.402	Final Road Paving (Wearing Course)
CONS.RE.403	Road Markings and Road Signages
	Road SOL 102 (Phase 2)
	Kerbing and Footings for Railing, Fencing, Sign
CONS.RE.449	Excavate and Construct Footings for Road Lightings / Railing / Fencing and Signages
CONS.RE.450	Construct Precast Road Kerbings
CONS.RE.451	Road Formation to Sub-base
	Road Works to Road Base and Base Course
CONS.RE.447	Road Formation to Road Base
CONS.RE.448	Road Formation to Base Course
	Installation of Railing and Fencing + Road Ligl
CONS.RE.452	Install Road Railing and Fencing
CONS.RE.453	Install Road Lighting and Signages
	Final Paving and Road Markings
CONS.RE.445	Final Road Paving (Wearing Course)
CONS.RE.446	Road Markings and Road Signages
	Road SOL 107 / 113 (Phase 1)
	Kerbing and Footings for Railing, Fencing, Sign
CONS.RE.393	Excavate and Construct Footings for Road Lightings / Railing / Fencing and Signages
CONS.RE.394	Road Formation to Sub-base
CONS.RE.395	Construct Precast Road Kerbings
	Road Works to Road Base and Base Course
CONS.RE.396	Road Formation to Road Base
CONS.RE.397	Road Formation to Base Course
	Installation of Railing and Fencing + Road Ligl
CONS.RE.398	Install Road Railing and Fencing
CONS.RE.399	Install Road Lighting and Signages
	Final Paving and Road Markings
CONS.RE.400	Final Road Paving (Wearing Course)
CONS.RE.401	Road Markings and Road Signages
	Road SOL 107 / 113 (Phase 2)
	Kerbing and Footings for Railing, Fencing, Sign
CONS.RE.454	Excavate and Construct Footings for Road Lightings / Railing / Fencing and Signages
CONS.RE.455	Road Formation to Sub-base
CONS.RE.456	Construct Precast Road Kerbings
	Road Works to Road Base and Base Course
CONS.RE.457	Road Formation to Road Base
CONS.RE.458	Road Formation to Base Course
	Installation of Railing and Fencing + Road Ligl
CONS.RE.459	Install Road Railing and Fencing
CONS.RE.460	Install Road Lighting and Signages
	Final Paving and Road Markings
CONS.RE.461	Final Road Paving (Wearing Course)
CONS.RE.462	Road Markings and Road Signages
	Road SOL 108 / 106 & SOL 110
	Adjacent to Road SOL 108 / 106, Abutment A9(
CONS.RE.362	Excavate and Construct footing for Railing and Road lighting
CONS.RE.363	Road formation to Subbase
CONS.RE.364	Construct Precast Road Kerbings
CONS.RE.365	Road formation to Road base and Base course
CONS.RE.366	Install Road Lighting, Railing and Signages
CONS.RE.367	Final Road Paving and Road markings (KD13 - Completion of Section VI)
	Portion A1 and A2 - Sub-Base Area
CONS.A1.8710	Demobilisation of Temporary Facilities on Site
CONS.A1.8720	Site Survey / Site Clearing
CONS.A1.8730	Area to Formation Level
CONS.A1.8740	Sub-Base Material Topping (Area 29,963 m2 x 100mm thk Subbase)
	Area 3 (in Portion A6)
	Final Paving and Road Markings
	Portion A6 - Final Paving and Road Markings
CONS.RE.3780	Road Clearing

Activity ID	Activity Name
CONS.RE.3790	Road Base and Final Road Paving to Wearing Course
CONS.RE.3800	Road Markings and Road Signages
Landscaping and Irrigation System	
Landscaping - Water Meter W04	
Zone AC4	
CONS.A1.8120	Commence Landscape Works in Zone AC4 (after Bridgeworks complete)
CONS.A1.8130	Top Soil to Landscaped Areas (600mm)
CONS.A1.8140	Install Irrigation System Main Lines (900mm dia)
CONS.A1.8150	Install Lateral Irrigation Pipes & Sprinklers
CONS.A1.8160	Irrigation Coverage Test
CONS.A1.8170	Soft Landscaping - Shrubs Planting / Ground Cover
CONS.A1.8180	Complete Landscape Works Zone AC4
Zone BC4	
CONS.A1.8200	Commence Landscape Works in Zone BC4
CONS.A1.8210	Top Soil to Landscaped Areas
CONS.A1.8220	Install Irrigation System Main Lines (900mm dia)
CONS.A1.8230	Install Lateral Irrigation Pipes & Sprinklers
CONS.A1.8240	Irrigation Coverage Test
CONS.A1.8250	Soft Landscaping - Shrubs Planting / Ground Cover
CONS.A1.8260	Complete Landscape Works in Zone BC4
Zone CC4	
CONS.A1.8280	Commence Landscape Works in Zone CC4
CONS.A1.8290	Top Soil to Landscaped Areas
CONS.A1.8300	Install Irrigation System Main Lines (900mm dia)
CONS.A1.8310	Install Lateral Irrigation Pipes & Sprinklers
CONS.A1.8320	Irrigation Coverage Test
CONS.A1.8330	Soft Landscaping - Shrubs Planting / Ground Cover
CONS.A1.8340	Complete Landscape Works in Zone CC4
Zone DC4	
CONS.A1.8360	Commence Landscape Works in DC4
CONS.A1.8370	Top Soil to Landscaped Areas
CONS.A1.8380	Install Irrigation System Main Lines (900mm dia)
CONS.A1.8390	Install Lateral Irrigation Pipes & Sprinklers
CONS.A1.8400	Irrigation Coverage Test
CONS.A1.8410	Soft Landscaping - Shrubs Planting / Ground Cover
CONS.A1.8420	Complete Landscape Works in Portion C1 (West Section)
Zone EC4	
CONS.A1.8440	Commence Landscape Works in Zone EC4
CONS.A1.8450	Top Soil to Landscaped Areas
CONS.A1.8460	Install Irrigation System Main Lines
CONS.A1.8470	Install Lateral Irrigation Pipes & Sprinklers
CONS.A1.8480	Irrigation Coverage Test
CONS.A1.8490	Soft Landscaping - Shrubs Planting / Ground Cover
CONS.A1.8500	Complete Landscape Works in Portion C1 (West Section)
Zone FC4	
CONS.A1.8520	Commence Landscape Works in Zone FC4
CONS.A1.8530	Top Soil to Landscaped Areas
CONS.A1.8540	Install Irrigation System Main Lines (900mm dia)
CONS.A1.8550	Install Lateral Irrigation Pipes & Sprinklers
CONS.A1.8560	Irrigation Coverage Test
CONS.A1.8570	Soft Landscaping - Shrubs Planting / Ground Cover
CONS.A1.8580	Complete Landscape Works in Zone FC4
Landscape Softworks in Portion A6 and B5	
CONS.A1.8590	Commence Landscape Works in Zone AC4 in Portion A6 & B5
CONS.A1.8595	Clearing of unsuitable materials
CONS.A1.8600	Top Soil to Landscaped Areas
CONS.A1.8610	Install Irrigation System Main Lines (900mm dia)
CONS.A1.8620	Install Lateral Irrigation Pipes & Sprinklers
CONS.A1.8630	Irrigation Coverage Test
CONS.A1.8640	Soft Landscaping - Shrubs Planting / Ground Cover
CONS.A1.8650	Complete Landscape Works Zone AC4 (KD16)
CONS.A1.8660	Establishment Works for Landscape Softworks in Portion A6 and B5
Landscaping - Water Meter W02	
Zone BC4	
CONS.C1.8200	Commence Landscape Works (Portion C1)
CONS.C1.8210	Top Soil to Landscaped Areas



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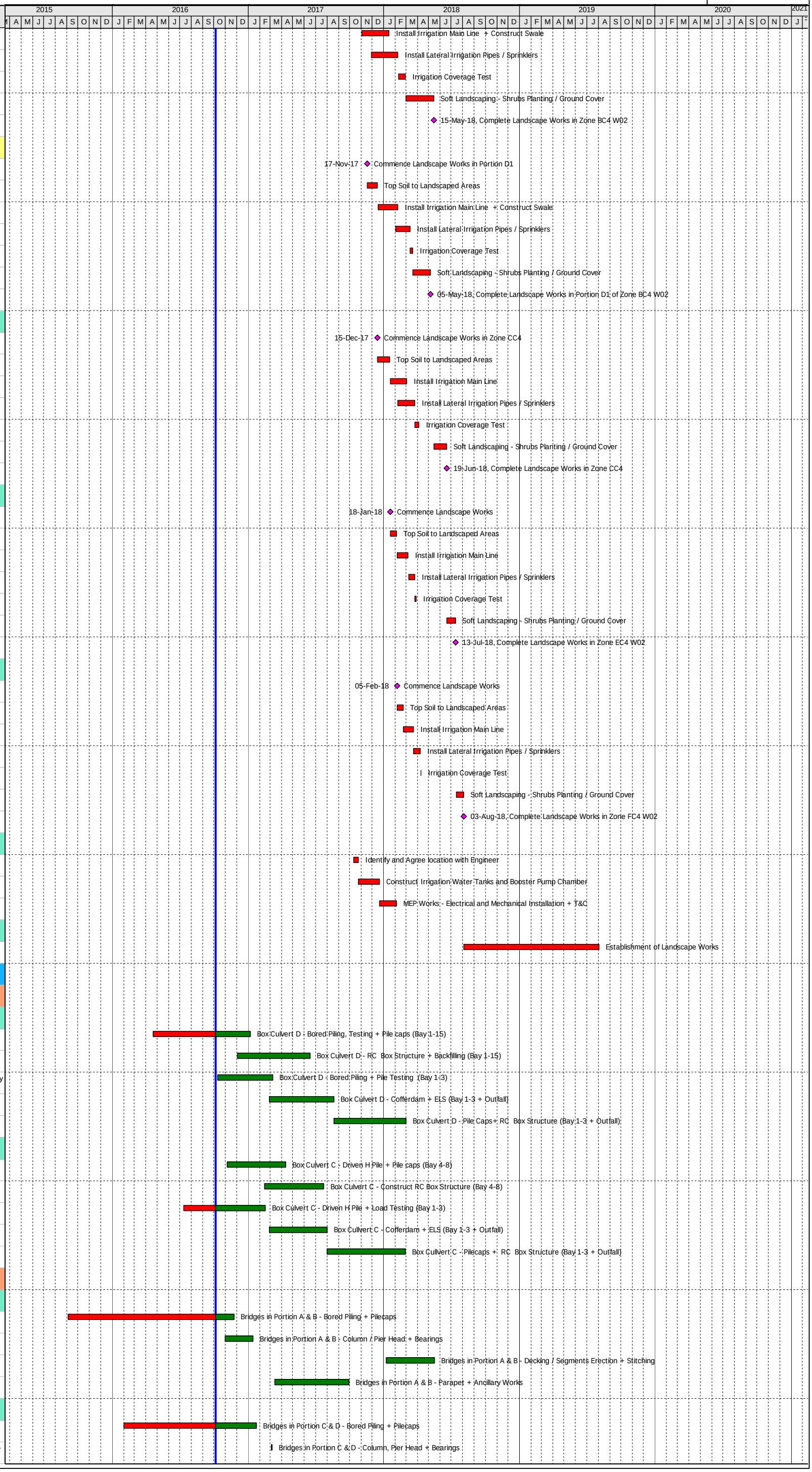
Activity ID	Activity Name
CONS.C1.8220	Install Irrigation Main Line + Construct Swale
CONS.C1.8230	Install Lateral Irrigation Pipes / Sprinklers
CONS.C1.8240	Irrigation Coverage Test
CONS.C1.8250	Soft Landscaping - Shrubs Planting / Ground Cover
CONS.C1.8260	Complete Landscape Works in Zone BC4 W02
Zone BC4 in Portion D1	
CONS.C1.8600	Commence Landscape Works in Portion D1
CONS.C1.8610	Top Soil to Landscaped Areas
CONS.C1.8620	Install Irrigation Main Line + Construct Swale
CONS.C1.8630	Install Lateral Irrigation Pipes / Sprinklers
CONS.C1.8640	Irrigation Coverage Test
CONS.C1.8650	Soft Landscaping - Shrubs Planting / Ground Cover
CONS.C1.8660	Complete Landscape Works in Portion D1 of Zone BC4 W02
Zone CC4	
CONS.C1.8270	Commence Landscape Works in Zone CC4
CONS.C1.8280	Top Soil to Landscaped Areas
CONS.C1.8290	Install Irrigation Main Line
CONS.C1.8300	Install Lateral Irrigation Pipes / Sprinklers
CONS.C1.8310	Irrigation Coverage Test
CONS.C1.8320	Soft Landscaping - Shrubs Planting / Ground Cover
CONS.C1.8330	Complete Landscape Works in Zone CC4
Zone EC4	
CONS.C1.8340	Commence Landscape Works
CONS.C1.8350	Top Soil to Landscaped Areas
CONS.C1.8360	Install Irrigation Main Line
CONS.C1.8370	Install Lateral Irrigation Pipes / Sprinklers
CONS.C1.8380	Irrigation Coverage Test
CONS.C1.8390	Soft Landscaping - Shrubs Planting / Ground Cover
CONS.C1.8400	Complete Landscape Works in Zone EC4 W02
Zone FC4	
CONS.C1.8410	Commence Landscape Works
CONS.C1.8420	Top Soil to Landscaped Areas
CONS.C1.8430	Install Irrigation Main Line
CONS.C1.8440	Install Lateral Irrigation Pipes / Sprinklers
CONS.C1.8450	Irrigation Coverage Test
CONS.C1.8460	Soft Landscaping - Shrubs Planting / Ground Cover
CONS.C1.8470	Complete Landscape Works in Zone FC4 W02
Irrigation Water Tanks and Booster Pumps	
CONS.C1.8790	Identify and Agree location with Engineer
CONS.C1.8800	Construct Irrigation Water Tanks and Booster Pump Chamber
CONS.C1.8810	MEP Works - Electrical and Mechanical Installation + T&C
Establishment Period (1 year)	
CONS.C1.8190	Establishment of Landscape Works
Executive Summary	
Box Culverts	
Box Culvert D	
BCD.ES.1010	Box Culvert D - Bored Piling, Testing + Pile caps (Bay 1-15)
BCD.ES.1020	Box Culvert D - RC Box Structure + Backfilling (Bay 1-15)
BCD.ES.1030	Box Culvert D - Bored Piling + Pile Testing (Bay 1-3)
BCD.ES.1040	Box Culvert D - Cofferdam + ELS (Bay 1-3 + Outfall)
BCD.ES.1050	Box Culvert D - Pile Caps+ RC Box Structure (Bay 1-3 + Outfall)
Box Culvert C	
BCC.ES.2010	Box Culvert C - Driven H Pile + Pile caps (Bay 4-8)
BCC.ES.2020	Box Culvert C - Construct RC Box Structure (Bay 4-8)
BCC.ES.2030	Box Culvert C - Driven H Pile + Load Testing (Bay 1-3)
BCC.ES.2040	Box Cullvert C - Cofferdam + ELS (Bay 1-3 + Outfall)
BCC.ES.2050	Box Cullvert C - Pilecaps + RC Box Structure (Bay 1-3 + Outfall)
Bridge Works	
Bridges in Portion A & B	
BRG.ES.1010	Bridges in Portion A & B - Bored Piling + Pilecaps
BRG.ES.1020	Bridges in Portion A & B - Column / Pier Head + Bearings
BRG.ES.1030	Bridges in Portion A & B - Decking / Segments Erection + Stitching
BRG.ES.1040	Bridges in Portion A & B - Parapet + Ancillary Works
Bridges in Portion C & D	
BRG.ES.2010	Bridges in Portion C & D - Bored Piling + Pilecaps
BRG.ES.2020	Bridges in Portion C & D - Column, Pier Head + Bearings



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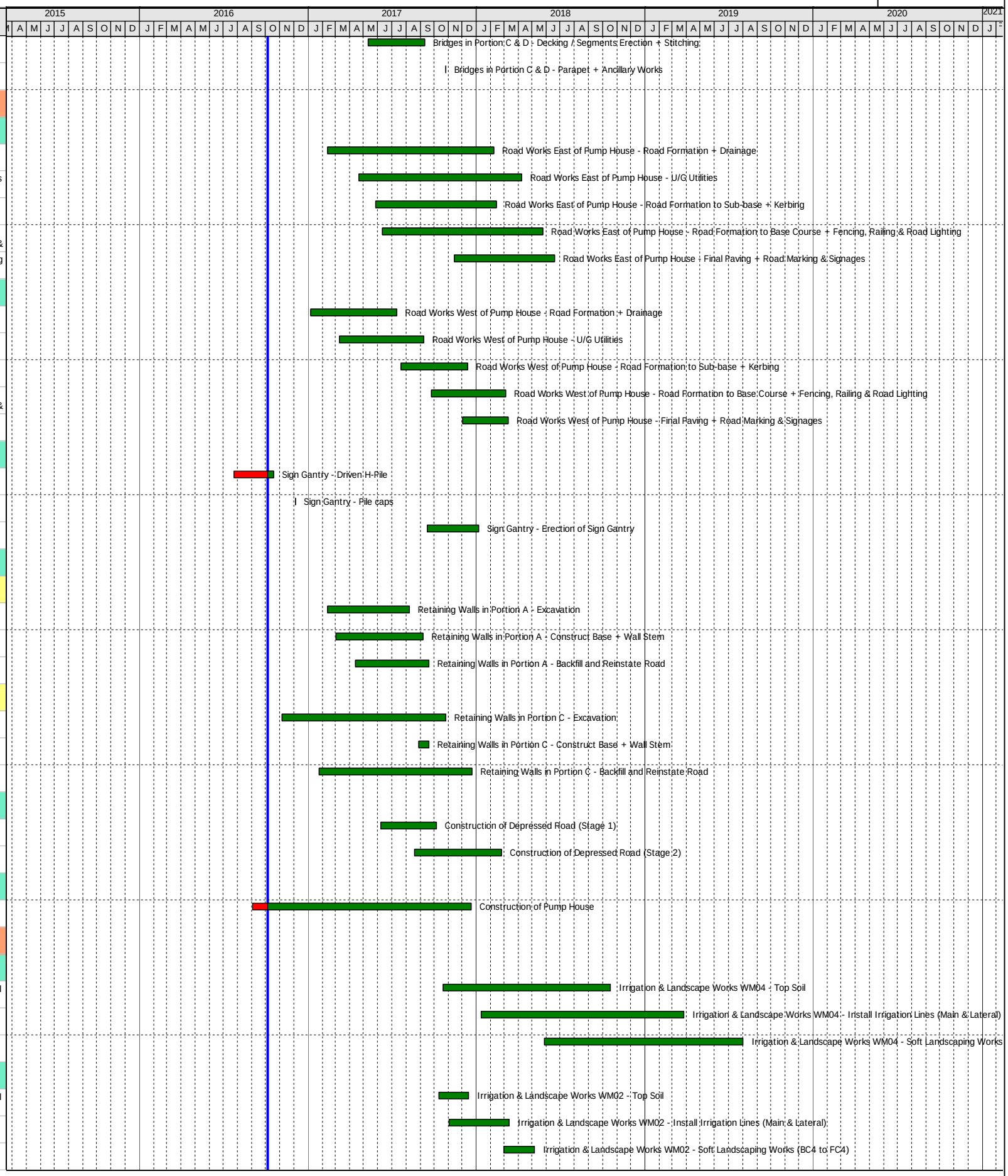
Activity ID	Activity Name
BRG.ES.2030	Bridges in Portion C & D - Decking / Segments Erection + Stitching
BRG.ES.2040	Bridges in Portion C & D - Parapet + Ancillary Works
Road Works	
Road Works - East of Pump House	
RDE.ES.1010	Road Works East of Pump House - Road Formation + Drainage
RDE.ES.1020	Road Works East of Pump House - U/G Utilities
RDE.ES.1030	Road Works East of Pump House - Road Formation to Sub-base + Kerbing
RDE.ES.1040	Road Works East of Pump House - Road Formation to Base Course + Fencing, Railing &
RDE.ES.1050	Road Works East of Pump House - Final Paving + Road Marking & Signages
Road Works - West of Pump House	
RDW.ES.2010	Road Works West of Pump House - Road Formation + Drainage
RDW.ES.2020	Road Works West of Pump House - U/G Utilities
RDW.ES.2030	Road Works West of Pump House - Road Formation to Sub-base + Kerbing
RDW.ES.2040	Road Works West of Pump House - Road Formation to Base Course + Fencing, Railing &
RDW.ES.2050	Road Works West of Pump House - Final Paving + Road Marking & Signages
Sign Gantry	
SGW.ES.1010	Sign Gantry - Driven H-Pile
SGW.ES.1020	Sign Gantry - Pile caps
SGW.ES.1030	Sign Gantry - Erection of Sign Gantry
Retaining Walls	
Retaining Walls in Portion A (East)	
RWW.ES.1040	Retaining Walls in Portion A - Excavation
RWW.ES.1050	Retaining Walls in Portion A - Construct Base + Wall Stem
RWW.ES.1060	Retaining Walls in Portion A - Backfill and Reinstate Road
Retaining Walls in Portion C (West)	
RWW.ES.1010	Retaining Walls in Portion C - Excavation
RWW.ES.1020	Retaining Walls in Portion C - Construct Base + Wall Stem
RWW.ES.1030	Retaining Walls in Portion C - Backfill and Reinstate Road
Depressed Road	
DRE.ES.1010	Construction of Depressed Road (Stage 1)
DRW.ES.1010	Construction of Depressed Road (Stage 2)
Pump House	
PHO.ES.1010	Construction of Pump House
Irrigation and Landscape	
Landscape Works - Water Meter O4	
LSW.ES.1010	Irrigation & Landscape Works WM04 - Top Soil
LSW.ES.1020	Irrigation & Landscape Works WM04 - Install Irrigation Lines (Main & Lateral)
LSW.ES.1030	Irrigation & Landscape Works WM04 - Soft Landscaping Works (AC4 to FC4)
Landscape Works - Water Meter 02	
LSW.ES.2010	Irrigation & Landscape Works WM02 - Top Soil
LSW.ES.2020	Irrigation & Landscape Works WM02 - Install Irrigation Lines (Main & Lateral)
LSW.ES.2030	Irrigation & Landscape Works WM02 - Soft Landscaping Works (BC4 to FC4)



Appendix D. Event and Action Plan

Event/Action Plan for Air Quality Monitoring

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
ACTION LEVEL				
1. Exceedance for one sample	1. Identify source, investigate the causes of exceedance and propose remedial measures; 2. Inform IEC and ER; 3. Repeat measurement to confirm finding; 4. Increase monitoring frequency to daily.	1. Check monitoring data submitted by 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 source; 2. Inform IEC and ER; 3. Advise the ER on the effectiveness of the proposed remedial measures; 4. Repeat measurement s to confirm findings; 5. Increase monitoring frequency to daily; 6. Discuss with IEC and Contractor on remedial actions required; 7. If exceedance continues, arrange meeting with IEC and ER; 8. If exceedance stops, cease additional monitoring.	1. Check monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss with ET and 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 Contractor; 3. Ensure remedial measures properly implemented.	1. Submit proposals for remedial to ER within 3 working days of notification; 2. Implement the agreed proposals; 3. Amend proposal if appropriate.

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
LIMIT LEVEL				
1. Exceedance for one sample	1. Identify source, investigate the causes of exceedance and propose remedial measures; 2. Inform ER, Contractor and EPD; 3. Repeat measurement to confirm finding; 4. Increase monitoring frequency to daily; 5. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results.	1. Check monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss with ET and 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 Contractor; 3. Ensure remedial measures 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 IEC, ER, Contractor and EPD; 2. Identify source; 3. Repeat measurement to confirm findings; 4. Increase monitoring frequency to daily; 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented; 6. Arrange meeting with IEC and ER to discuss the remedial actions to be taken; 7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results; 8. If exceedance stops, cease additional monitoring.	1. Discuss amongst ER, ET, and Contractor on the potential remedial actions; 2. Review 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 Contractor; 3. In consultation with the IEC, agree with the Contractor on the remedial measures to be implemented; 4. Ensure remedial measures properly implemented; 5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion 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 portion of works as determined by the ER until the exceedance is abated.

Event / Action Plan for Construction Noise Monitoring

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Action Level	1. Notify IEC and Contractor; 2. Identify source, investigate the causes of exceedance and propose remedial measures; 3. Report the results of investigation to the IEC, ER and Contractor; 4. Discuss with the Contractor and formulate remedial measures; 5 Increase monitoring frequency to check mitigation effectiveness.	1. Review the analysed results submitted by the ET; 2. Review the proposed remedial measures by the Contractor and advise the ER accordingly; 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Require Contractor to propose remedial measures for the analysed noise problem; 4. Ensure remedial measures are properly implemented.	1. Submit noise mitigation proposals to IEC; 2. Implement noise mitigation proposals.
Limit Level	1. Inform IEC, ER, EPD and Contractor; 2. Identify source; 3. Repeat measurements to confirm findings; 4. Increase monitoring frequency; 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented; 6. Inform IEC, ER and EPD the causes and actions taken for the exceedances; 7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results; 8. If exceedance stops, cease additional monitoring.	1. Discuss amongst ER, ET, and Contractor on the potential remedial actions; 2. Review Contractors 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 Contractor; 3. Require Contractor to propose remedial measures for the analysed noise problem; 4. Ensure remedial measures properly implemented; 5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion 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 portion of works as determined by the ER until the exceedance is abated.

Event / Action Plan for Water Quality Monitoring

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Action level being exceeded by one sampling day	1. Repeat in situ measurement to confirm findings; 2. Identify source(s) of impact; 3. Inform IEC, contractor and ER; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, ER and Contractor; 6. Ensure mitigation measures are implemented; 7. Repeat measurement on next day of exceedance to confirm findings.	1. Check monitoring data submitted by ET and Contractor's working methods; 2. Discuss with ET and Contractor on possible remedial actions; 3. Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly; 4. Assess the effectiveness of the implemented mitigation measures.	1. Confirm receipt of notification of non-compliance in writing; 2. Discuss with IEC on the proposed mitigation measures; 3. Make agreement on mitigation measures to be implemented; 4. Ensure mitigation measures are properly implemented.	1. Inform the ER and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment and consider changes of working methods; 4. Discuss with ET and IEC on possible remedial actions and propose mitigation measures to IEC and ER; 5. Implement the agreed mitigation measures. 6. Amend working methods if appropriate.
Action level being exceeded by two or more consecutive sampling days	1. Repeat in situ measurement to confirm findings; 2. Identify source(s) of impact; 3. Inform IEC, Contractor and ER; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, ER and Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the monitoring frequency to daily until no exceedance of Action level; 8. Repeat measurement on next day of exceedance to confirm findings.	1. Check monitoring data submitted by ET and Contractor's working method; 2. Discuss with ET and Contractor on possible remedial actions; 3. Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly; 4. Assess the effectiveness of the implemented mitigation measures.	1. Confirm receipt of notification of non-compliance in writing; 2. Discuss with IEC on the proposed mitigation measures; 3. Make agreement on mitigation measures to be implemented; 4. Ensure mitigation measures are properly implemented; 5. Assess the effectiveness of the implemented mitigation measures.	1. Inform the Engineer and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment and consider changes of working methods; 4. Discuss with ET and IEC on possible remedial actions and propose mitigation measures to IEC and ER within 3 working days of notification; 5. Implement the agreed mitigation measures; 6. Amend working methods if appropriate.

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Limit level being exceeded by one sampling day	1. Repeat *in-situ* measurement to confirm findings; 2. Identify source(s) of impact; 3. Inform IEC, Contractor, ER and EPD; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, ER and Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the monitoring frequency to daily until no exceedance of Limit level.	1. Check monitoring data submitted by ET and Contractor's working method; 2. Discuss with ET and Contractor on possible remedial actions; 3. Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly; 4. Assess the effectiveness of the implemented mitigation measures.	1. Confirm receipt of notification of failure in writing; 2. Discuss with IEC, ET and Contractor on the proposed mitigation measures; 3. Request Contractor to critically review the working methods; 4. Ensure mitigation measures are properly implemented; 5. Assess the effectiveness of the implemented mitigation measures.	1. Inform the ER and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment and consider changes of working methods; 4. Submit proposal of mitigation measures to ER within 3 working days of notification and discuss with ET, IEC and ER; 5. Implement the agreed mitigation measures; 6. Amend working methods if appropriate.
Limit level being exceeded by two or more consecutive sampling days	1. Repeat *in-situ* measurement to confirm findings; 2. Identify source(s) of impact; 3. Inform IEC, contractor, ER and EPD; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, ER and Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days.	1. Check monitoring data submitted by ET and Contractor's working method; 2. Discuss with ET and Contractor on possible remedial actions; 3. Review the Contractor's mitigation measures whenever necessary to assure their effectiveness and advise the ER accordingly.	1. Confirm receipt of notification of failure in writing; 2. Discuss with IEC, ET and Contractor on the proposed mitigation measures; 3. Request Contractor to critically review the working methods; 4. Make agreement on the mitigation measures to be implemented; 5. Ensure mitigation measures are properly implemented; 6. Assess the effectiveness of the implemented mitigation measures; 7. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the construction activities until no exceedance of Limit level.	1. Inform the ER and confirm notification of the non-compliance in writing; 2. Take immediate action to avoid further exceedance; 3. Rectify unacceptable practice; 4. Check all plant and equipment and consider changes of working methods; 5. Submit proposal of mitigation measures to ER within 3 working days of notification and discuss with ET, IEC and ER; 6. Implement the agreed mitigation measures; 7. Resubmit proposals of mitigation measures if problem still not under control; 8. As directed by the Engineer, to slow down or to stop all or part of the construction activities until no exceedance of Limit level.

Event / Action Plan for Dolphin Monitoring

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Action Level	1. Repeat statistical data analysis to confirm findings; 2. Review all available and relevant data, including raw data and statistical analysis results of other parameters covered in the EM&A, to ascertain if differences are as a result of natural variation or previously observed seasonal differences; 3. Identify source(s) of impact; 4. Inform the IEC, ER/SOR and Contractor; 5. Check monitoring data. 6. Review to ensure all the dolphin protective measures are fully and properly implemented and advise on additional measures if necessary.	1. Check monitoring data submitted by ET and Contractor; 2. Discuss monitoring results and finding with the ET and the Contractor.	1. Discuss monitoring with the IEC and any other measures proposed by the ET; 2. If ER/SOR is satisfied with the proposal of any other measures, ER/SOR to signify the agreement in writing on the measures to be implemented.	1. Inform the ER/SOR and confirm notification of the non-compliance in writing; 2. Discuss with the ET and the IEC and propose measures to the IEC and the ER/SOR; 3. Implement the agreed measures.

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Limit Level	1. Repeat statistical data analysis to confirm findings; 2. Review all available and relevant data, including raw data and statistical analysis results of other parameters covered in the EM&A, to ascertain if differences are as a result of natural variation or previously observed seasonal differences; 3. Identify source(s) of impact; 4. Inform the IEC, ER/SOR and Contractor of findings; 5. Check monitoring data; 6. Repeat review to ensure all the dolphin protective measures are fully and properly implemented and advise on additional measures if necessary. 7. If ET proves that the source of impact is caused by any of the construction activity by the works contract, ET to arrange a meeting to discuss with IEC, ER/SOR and Contractor the necessity of additional dolphin monitoring and/or any other potential mitigation measures (e.g., consider to modify the perimeter silt curtain or consider to control/temporarily stop relevant construction activity etc.) and submit to IEC a proposal of additional dolphin monitoring and/or mitigation measures where necessary.	1. Check monitoring data submitted by ET and Contractor; 2. Discuss monitoring results and findings with the ET and the Contractor; 3. Attend the meeting to discuss with ET, ER/SOR and Contractor the necessity of additional dolphin monitoring and any other potential mitigation measures. 4. Review proposals for additional monitoring and any other mitigation measures submitted by ET and Contractor and advise ER/SOR of the results and findings accordingly. 5. Supervise / Audit the implementation of additional monitoring and/or any other mitigation measures and advise ER/SOR the results and findings accordingly.	1. Attend the meeting to discuss with ET, IEC and Contractor the necessity of additional dolphin monitoring and any other potential mitigation measures. 2. If ER/SOR is satisfied with the proposals for additional dolphin monitoring and/or any other mitigation measures submitted by ET and Contractor and verified by IEC, ER/SOR to signify the agreement in writing on such proposals and any other mitigation measures. 3. Supervise the implementation of additional monitoring and/or any other mitigation measures.	1. Inform the ER/SOR and confirm notification of the non-compliance in writing; 2. Attend the meeting to discuss with ET, IEC and ER/SOR the necessity of additional dolphin monitoring and any other potential mitigation measures. 3. Jointly submit with ET to IEC a proposal of additional dolphin monitoring and/or any other mitigation measures when necessary. 4. Implement the agreed additional dolphin monitoring and/or any other mitigation measures.

Appendix E. Waste Flow Table

Name of Department: Highways Department

Contract No.: HY/2013/04

Monthly Summary Waste Flow Table for 2019

Month	Actual Quantities of Inert C&D Materials Generated Monthly						Actual Quantities of C&D Wastes Generated Monthly				
	Total Quantity Generated	Hard Rock and Large Broken Concrete	Reused in the Contract	Transported to other Projects (Note 2)	Disposed as Public Fill	Imported Fill	Metals	Paper/ cardboard packaging	Plastics (Note 1)	Chemical Waste	Others, e.g. general refuse
	(in '000m^3)	(in '000m^3)	(in '000m^3)	(in '000m^3)	(in '000m^3)	(in '000m^3)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000m^3)
Jan	4.274	0	0	0	4.274	0	0	0	0	0	0.1046
Feb	0.993	0	0	0	0.993	0	0	0	0	0	0.0864
Mar											
Apr											
May											
Jun											
Sub-total	5.267	0	0	0.000	5.2667	0	0	0	0	0	0.1910
Jul											
Aug											
Sep											
Oct											
Nov											
Dec											
Total	5.267	0	0	0.000	5.267	0	0	0	0	0	0.1910

Note: (1) Plastics refer to plastic bottles / containers, plastic sheets / foam from packaging material

(2) "Other Projects" refers to HKBCF Contract No. HY/2013/03

Name of Department: Highways Department

Contract No.: HY/2013/04

Monthly Summary of Excavated Marine Sediment for 2019

Month	a. Estimated Volume of Excavated Marine Sediment Generated	b. Estimate Volume of Accumulated Excavated Marine Sediment Treated	c. Reused in the Contract	d. Estimated Volume of Excavated Marine Sediment Transported to Other Projects (Note 1)	e. Estimated Volume of Treated Excavated Marine Sediment Stored on Site (Unused)
	(in m^3)	(in m^3)	(in m^3)	(in m^3)	(in m^3)
Jan	0	0	0	0	0
Feb	0	0	0	0	0
Mar					
Apr					
May					
Jun					
Sub-total	0	0	0	0	0
Jul					
Aug					
Sep					
Oct					
Nov					
Dec					
Total	0	0	0	0	0

Note: (1) "Other Projects" refers to HKBCF Contract No. HY/2013/03. The disposal of excavated marine sediments to allocated dumping site via Contract No. HY/2013/03 has been completed with the last batch disposal on 30 August 2017.

Appendix F. Environmental Licences and Permits

Environmental Licences and Permits

Item No.	Type of Permit / Licence	Reference No.	Application Date	Valid from	Valid until	Remark
1	Environmental Permit under EIAO	EP-353/2009/K	24 Mar 2016	11 Apr 2016	N/A	Issued
2	Further Environmental Permit under EIAO	FEP-01/353/2009/K	29 Nov 2018	27 Dec 2018	N/A	Issued
3	Construction Dust Notification (HKBCF Southern Portion)	387156	26 Mar 2015	1 Apr 2015	N/A	Notified
4	Construction Waste Disposal Account	7022038	16 Mar 2015	1 Apr 2015	N/A	Account approved
5	Registration as a Chemical Waste Producer (HKBCF Southern Portion)	Waste Producer Number (WPN): 5213-951-C3952-01	27 Mar 2015	27 Apr 2015	N/A	Registration completed
6	Discharge Licence under WPCO (Works Area WA3)	WT00022316-2015	1 Jun 2015	14 Aug 2015	31 Aug 2020	Issued
7	Discharge Licence under WPCO (HKBCF Works Area)	WT00028782-2017	25 May 2017	19 Jul 2017	31 Jul 2022	Issued
8	Construction Noise Permit	GW-RS0974-18	10 Oct 2018	31 Oct 2018	29 Mar 2019	Issued

Appendix G. Implementation Schedule for Environmental Mitigation Measures (EMIS)

Appendix G – Implementation Schedule of Environmental Mitigation Measures (EMIS)

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Location of the measures	Implementation Status
Air Quality				
S5.5.6.1	A1	1) The Contractor shall follow the procedures and requirements given in the Air Pollution Control (Construction Dust) Regulation	All construction sites	V
S5.5.6.2	A2	2) Proper watering of exposed spoil should be undertaken throughout the construction phase: • Any excavated or stockpile of dusty material should be covered entirely by impervious sheeting or sprayed with water to maintain the entire surface wet and then removed or backfilled or reinstated where practicable within 24 hours of the excavation or unloading; • Any dusty materials remaining after a stockpile is removed should be wetted with water and cleared from the surface of roads; • A stockpile of dusty material should not be extend beyond the pedestrian barriers, fencing or traffic cones; • The load of dusty materials on a vehicle leaving a construction site should be covered entirely by impervious sheeting to ensure that the dusty materials do not leak from the vehicle; • Where practicable, vehicle washing facilities with high pressure water jet should be provided at every discernible or designated vehicle exit point. The area where vehicle washing takes place and the road section between the washing facilities and the exit point should be paved with concrete, bituminous materials or hardcores;	All construction sites	V
S5.5.6.2	A2	• When there are open excavation and reinstatement works, hoarding of not less than 2.4m high should be provided as far as practicable along the site boundary with provision for public crossing. Good site practice shall also be adopted by the Contractor to ensure the conditions of the hoardings are properly maintained throughout the construction period; • The portion of any road leading only to construction site that is within 30m of a vehicle entrance or exit should be kept clear of dusty materials; • Surfaces where any pneumatic or power-driven drilling, cutting, polishing or other mechanical breaking operation takes place should be sprayed with water or a dust suppression chemical continuously; • Any area that involves demolition activities should be sprayed with water or a dust suppression chemical immediately prior to, during and immediately after the activities so as to maintain the entire surface wet; • Where a scaffolding is erected around the perimeter of a building under construction, effective dust screens, sheeting or netting should be provided to enclose the scaffolding from the ground floor level of the building, or a canopy should be provided from the first floor level up to the highest level of the scaffolding; • Any skip hoist for material transport should be totally enclosed by impervious sheeting; • 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	All construction sites	V
S5.5.6.2	A2	• 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; • 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; and • Exposed earth should be properly treated by compaction, turfing, hydroseeding, vegetation planting or sealing with latex, vinyl, bitumen, shotcrete or other suitable surface stabiliser within six months after the last construction activity on the construction site or part of the construction site where the exposed earth lies.	All construction sites	V
S5.5.6.3	A3	3) The Contractor should undertake proper watering on all exposed spoil (with at least 8 times per day) throughout the construction phase.	All construction sites	V
S5.5.6.4	A4	4) Engineer to incorporate the controlled measures into the Particular Specification (PS) for the civil work. The PS should also draw the Contractor's attention to the relevant latest Practice Notes issued by EPD.	All construction sites	V
S5.5.6.4	A5	5) Implement regular dust monitoring under EM&A programme during the construction stage.	Selected representative dust monitoring station	V (covered by Contract No. HY/2013/04 (AMS2, AMS3C, AMS7B) & HY/2011/03 (AMS6))

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Location of the measures	Implementation Status
S5.5.7.1	A6	The following mitigation measures should be adopted to prevent fugitive dust emissions for concrete batching plant: • Loading, unloading, handling, transfer or storage of any dusty materials should be carried out in totally enclosed system; • All dust-laden air or waste gas generated by the process operations should be properly extracted and vented to fabric filtering system to meet the emission limits for TSP; • Vents for all silos and cement/pulverised fuel ash (PFA) weighing scale should be fitted with fabric filtering system; • The materials which may generate airborne dusty emissions should be wetted by water spray system; • All receiving hoppers should be enclosed on three sides up to 3m above unloading point; • All conveyor transfer points should be totally enclosed; • All access and route roads within the premises should be paved and wetted; and • Vehicle cleaning facilities should be provided and used by all concrete trucks before leaving the premises to wash off any dust on the wheels and/or body.	Selected representative dust monitoring station	N/A
S5.5.2.7	A7	The following mitigation measures should be adopted to prevent fugitive dust emissions at barging point: • All road surface within the barging facilities will be paved; • Dust enclosures will be provided for the loading ramp; • Vehicles will be required to pass through designated wheels wash facilities; and • Continuous water spray at the loading points.	All construction sites	N/A
Construction Noise (Air borne)				
S6.4.10	N1	1) Use of good site practices to limit noise emissions by considering the following: • only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction programme; • machines and plant (such as trucks, cranes) that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum; • plant known to emit noise strongly in one direction, where possible, be orientated so that the noise is directed away from nearby NSRs; • silencers or mufflers on construction equipment should be properly fitted and maintained during the construction works; • mobile plant should be sited as far away from NSRs as possible and practicable; • material stockpiles, mobile container site officer and other structures should be effectively utilised, where practicable, to screen noise from on-site construction activities.	All construction sites	V
S6.4.11	N2	2) Install temporary hoarding located on the site boundaries between noisy construction activities and NSRs. The conditions of the hoardings shall be properly maintained throughout the construction period.	All construction sites	V
S6.4.12	N3	3) Install movable noise barriers (typically density @ 14kg/m^2), acoustic mat or full enclosure close to noisy plants including air compressor, generators, saw.	For plant items listed in Appendix 6D of the EIA report at all construction sites	V
S6.4.13	N4	4) Select "Quiet plants" which comply with the BS 5228 Part 1 or TM standards.	For plant items listed in Appendix 6D of the EIA report at all construction sites	V
S6.4.14	N5	5) Sequencing operation of construction plants where practicable.	All construction sites where practicable	V
	N6	6) Implement a noise monitoring under EM&A programme.	Selected representative noise monitoring station	V (covered by Contract No. HY/2013/04)
Sediment				
S7.3	S1	1) The requirements as recommended in ETWB TC(W) 34/2002 Management of Dredged/Excavated Sediment shall be included in the Particular Specification as appropriate.	All construction sites	V

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Location of the measures	Implementation Status
Waste Management (Construction Noise)				
S8.3.8	WM1	Construction and Demolition Material The following mitigation measures should be implemented in handling the waste: • Maintain temporary stockpiles and reuse excavated fill material for backfilling and reinstatement; • Carry out on-site sorting; • Make provisions in the Contract documents to allow and promote the use of recycled aggregates where appropriate; • Adopt 'Selective Demolition' technique to demolish the existing structures and facilities with a view to recovering broken concrete effectively for recycling purpose, where possible; • Implement a trip-ticket system for each works contract to ensure that the disposal of C&D materials are properly documented and verified; and • Implement an enhanced Waste Management Plan similar to ETWB TC(W) No. 19/2005 – "Environmental Management on Construction Sites" to encourage on-site sorting of C&D materials and to minimize their generation during the course of construction. • In addition, disposal of the C&D materials onto any sensitive locations such as agricultural lands, etc. should be avoided. The Contractor shall propose the final disposal sites to the Project Proponent and get its approval before implementation.	All construction sites	V
S8.3.9-S8.3.11	WM2	C&D Waste • Standard formwork or pre-fabrication should be used as far as practicable in order to minimise the arising of C&D materials. The use of more durable formwork or plastic facing for the construction works should be considered. Use of wooden hoardings should not be used, as in other projects. Metal hoarding should be used to enhance the possibility of recycling. The purchasing of construction materials will be carefully planned in order to avoid over ordering and wastage. • The Contractor should recycle as much of the C&D materials as possible on-site. Public fill and C&D waste should be segregated and stored in different containers or skips to enhance reuse or recycling of materials and their proper disposal. Where practicable, concrete and masonry can be crushed and used as fill. Steel reinforcement bar can be used by scrap steel mills. Different areas of the sites should be considered for such segregation and storage.	All construction sites	V
S8.2.12-S8.3.15	WM3	Chemical Waste • Chemical waste that is produced, as defined by Schedule 1 of the Waste Disposal (Chemical Waste) (General) Regulation, should be handled in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. • Containers used for the storage of chemical wastes should be suitable for the substance they are holding, resistant to corrosion, maintained in a good condition, and securely closed; have a capacity of less than 450 liters unless the specification has been approved by the EPD; and display a label in English and Chinese in accordance with instructions prescribed in Schedule 2 of the regulation. • The storage area for chemical wastes should be clearly labelled and used solely for the storage of chemical waste; enclosed on at least 3 sides; have an impermeable floor and bunding of sufficient capacity to accommodate 110% of the volume of the largest container or 20 % of the total volume of waste stored in that area, whichever is the greatest; have adequate ventilation; covered to prevent rainfall entering; and arranged so that incompatible materials are adequately separated. • Disposal of chemical waste should be via a licensed waste collector; be to a facility licensed to receive chemical waste, such as the Chemical Waste Treatment Centre which also offers a chemical waste collection service and can supply the necessary storage containers; or be to a reuser of the waste, under approval from the EPD.	All construction sites	V
S8.3.16	WM4	Sewage • Adequate numbers of portable toilets should be provided for the workers. The portable toilets should be maintained in a state, which will not deter the workers from utilizing these portable toilets. Night soil should be collected by licensed collectors regularly.	All construction sites	V
S8.3.17	WM5	General Refuse • General refuse generated on-site should be stored in enclosed bins or compaction units separately from construction and chemical wastes. • A reputable waste collector should be employed by the Contractor to remove general refuse from the site, separately from construction and chemical wastes, on a daily basis to minimize odour, pest and litter impacts. Burning of refuse on construction sites is prohibited by law. • Aluminium cans are often recovered from the waste stream by individual collectors if they are segregated and made easily accessible. Separate labelled bins for their	All construction sites	V

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Location of the measures	Implementation Status
		deposit should be provided if feasible. • Office wastes can be reduced through the recycling of paper if volumes are large enough to warrant collection. Participation in a local collection scheme should be considered by the Contractor. In addition, waste separation facilities for paper, aluminium cans, plastic bottles etc., should be provided. • Training should be provided to workers about the concepts of site cleanliness and appropriate waste management procedure, including reduction, reuse and recycling of wastes.		
Water Quality (Construction Phase)				
S9.11.1.1	W1	Mitigation during the marine works to reduce impacts to within acceptable levels have been recommended and will comprise a series of measures that restrict the method and sequencing of dredging/backfilling, as well as protection measures. Details of the measures are provided below. • Floating type perimeter silt curtains shall be around the HKBCF site before the commencement of marine works. • Silt curtain shall be fully maintained throughout the works.	Marine works	N/A
S9.11.1.7	W2	Land Works General construction activities on land should also be governed by standard good working practice. Specific measures to be written into the works contracts should include: • wastewater from temporary site facilities should be controlled to prevent direct discharge to surface or marine waters; • sewage effluent and discharges from on-site kitchen facilities shall be directed to Government sewer in accordance with the requirements of the W PCO or collected for disposal offsite. The use of soakaways shall be avoided; • 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; • 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; • temporary access roads should be surfaced with crushed stone or gravel; • rainwater pumped out from trenches or foundation excavations should be discharged into storm drains via silt removal facilities; • measures should be taken to prevent the washout of construction materials, soil, silt or debris into any drainage system; • open stockpiles of construction materials (e.g. aggregates and sand) on site should be covered with tarpaulin or similar fabric during rainstorms; • 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; • discharges of surface run-off into foul sewers must always be prevented in order not to unduly overload the foul sewerage system; • 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; • wheel wash overflow shall be directed to silt removal facilities before being discharged to the storm drain; • the section of construction road between the wheel washing bay and the public road should be surfaced with crushed stone or coarse gravel; • wastewater generated from concreting, plastering, internal decoration, cleaning work and other similar activities, shall be screened to remove large objects; • 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 W PCO or collected for off site disposal; • the Contractors shall prepare an oil / chemical cleanup plan and ensure that leakages or spillages are contained and cleaned up immediately; • waste oil should be collected and stored for recycling or disposal, in accordance with the Waste Disposal Ordinance; • 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; and	Land-based works areas	V

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Location of the measures	Implementation Status
		• surface run-off from bunded areas should pass through oil/grease traps prior to discharge to the stormwater system.		
S9.14	W3	Implement a water quality monitoring programme	At identified monitoring locations	Temporarily suspended
Ecology (Construction Phase)				
S10.7	E2	• Install silt curtain during the construction. Limit dredging and works fronts. • Good site practices. • Site runoff control.	Marine works and Land-based works areas	N/A
S10.7	E4	Watering to reduce dust generation; prevention of siltation of freshwater habitats; Site runoff should be desilted, to reduce the potential for suspended sediments, organics and other contaminants to enter streams and standing freshwater	Land-based works areas	V
S10.7	E5	Good site practices, including strictly following the permitted works hours, using quieter machines where practicable, and avoiding excessive lightings during night time	Land-based works areas	V
S10.7	E6	• Dolphin Exclusion Zone; • Dolphin watching plan	Marine works	N/A
S10.7	E7	• Decouple compressors and other equipment on working vessels • Avoidance of percussive piling	Marine works	N/A
S10.7	E8	• Control vessel speed • Skipper training • Predefined and regular routes for working vessels; avoid Brother Islands.	Marine Traffic	N/A
S10.10	E9	• Dolphin vessel monitoring	North Lantau and West Lantau	V (covered by Contract No. HY/2013/04)
Fisheries				
S11.7	F4	• Maritime Oil Spill Response Plan (MOSRP); • Contingency plan.	HKBCF	V
Landscape & Visual (Detailed Design Phase)				
S14.3.3.1	LV1	General design measures include: • Roadside planting and planting along the edge of the HKBCF Island is proposed; • Transplanting of mature trees in good health and amenity value where appropriate and reinstatement of areas disturbed during construction by compensatory hydro-seeding and planting; • Protection measures for the trees to be retained during construction activities; • Optimizing the sizes and spacing of the bridge columns; Fine-tuning the location of the bridge columns to avoid visually-sensitive locations; • Maximizing new tree, shrub and other vegetation planting to compensate tree felled and vegetation removed; • Providing planting area around peripheral of HKBCF for tree planting screening effect; • Providing salt-tolerant native trees along the planter strip at affected seawall and newly reclaimed coastline; • For HKBCF, providing aesthetic architectural design on the related buildings (e.g. similar materials for PCB building facade to Airport buildings, roof planting and subtle materials for other facilities buildings and so on), and the related infrastructure (e.g. parapet planting and transparent cover for elevated footbridges) to provide harmonious atmosphere of the HKBCF; and • Fine-tuning the sizes of the structural members to minimize the bulkiness of buildings and adjustment of building arrangement to minimise disturbance to surrounding vegetation in the HKBCF.	HKBCF	V
Landscape & Visual (Construction Phase)				
S14.3.3.3	LV2	<u>Mitigate both Landscape and Visual Impacts</u> G1. Grass-hydroseed bare soil surface and stock pile areas. G2. Add planting strip and automatic irrigation system if appropriate at some portions of bridge footbridge to screen bridge and traffic. G3. Not applicable as this is for HKLR. G4. For HKBCF, providing aesthetic architectural design on the related buildings (e.g. similar materials for PCB building facade to Airport buildings, roof planting and subtle materials for other facilities buildings and so on), and the related infrastructure (e.g. parapet planting and transparent cover for elevated footbridges) to provide harmonious atmosphere of the HKBCF	HKBCF	V

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Location of the measures	Implementation Status
		G5. Vegetation reinstatement and upgrading to disturbed areas G6. Maximizing new tree shrub and other vegetation planting to compensate tree felled and vegetation removed G7. Providing planting area around peripheral of HKBCF for tree planting screening effect; G8. Plant salt-tolerant native and shrubs etc along the planter strip at affected seawall. G9. Reserve of loose natural granite rocks for re-use. Provide new coastline to adopt "natural-look" by means of using armour rocks in the form of natural rock materials and planting strip area accommodating screen buffer to enhance "natural-look" of the new coastline.		
S14.3.3.3	LV3	Mitigate Visual Impacts V1. Minimize time for construction activities during construction period. V2. Provide screen hoarding at the portion of the project site / works areas / storage areas near VSRs who have close low-level views to the Project during HKBCF construction.		V
EM&A				
S15.2.2	EM1	An Independent Environmental Checker needs to be employed as per the EM&A Manual.	All construction sites	V
S15.5 - S15.6	EM2	1) An Environmental Team needs to be employed as per the EM&A Manual. 2) Prepare a systematic Environmental Management Plan to ensure effective implementation of the mitigation measures. 3) An environmental impact monitoring needs to be implementing by the Environmental Team to ensure all the requirements given in the EM&A Manual are fully complied with.	All construction sites	V

Legend: V = implemented; x = not implemented; N/A = not applicable

Appendix H. Statistics on Environmental Complaints, Notification of Summons and Successful Prosecutions

Statistics on Environmental Complaints, Notifications of Summons and Successful Prosecutions

Reporting Period	Complaints	Notifications of Summons	Successful Prosecutions
This reporting period	0	0	0
From commencement date of construction to end of reporting month	11	0	0

Appendix I. Environmental Site Inspection and Monitoring Schedule

Contract No. HY/2013/04 Hong Kong-Zhuhai-Macao Bridge (HZMB)
Hong Kong Boundary Crossing Facilities – Infrastructure Works Stage II (Southern Portion)

Tenative Impact Environmental Monitoring Schedule for February 2019

by Mott MacDonald monitoring team

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1 AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP NMS2 NMS3C Dolphin Monitoring	**2** AMS2 - 24 hr TSP
3 AMS2 - 1 hr TSP AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP NMS2 NMS3C	**4**	**5**	**6**	**7**	**8** AMS2 - 1 & 24 hr TSP Weekly Site Audit	**9** AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP
10	**11**	**12** AMS2 - 24 hr TSP	**13** AMS2 - 1 hr TSP Weekly Site Audit	**14** Dolphin Monitoring	**15** AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP NMS2 NMS3C	**16**
17	**18** AMS2 - 24 hr TSP	**19** AMS2 - 1 hr TSP	**20** Dolphin Monitoring Weekly Site Audit	**21** AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP NMS2 NMS3C	**22** AMS2 - 24 hr TSP	**23**
24	**25** AMS2 - 1 hr TSP Dolphin Monitoring Weekly Site Audit	**26** Dolphin Monitoring	**27** AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP NMS2 NMS3C	**28** AMS2 - 24 hr TSP		

Notes:

Air Quality Monitoring Station - AMS2, AMS3C, AMS7B

Noise Monitoring Station - NMS2, NMS3C

WQ - Water Quality Monitoring: temporarily suspended

CWD - Chinese White Dolphin

Weekly Site Audit

Remark: The schedule is subject to change due to unforeseeable circumstances (e.g. adverse weather, etc)

Contract No. HY/2013/04 Hong Kong-Zhuhai-Macao Bridge (HZMB)
Hong Kong Boundary Crossing Facilities – Infrastructure Works Stage II (Southern Portion)

Tenative Impact Environmental Monitoring Schedule for March 2019 **by Mott MacDonald monitoring team**

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1 AMS2 - 1 hr TSP	2
3	4 Dolphin Monitoring	5 AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP NMS2 NMS3C	6 AMS2 - 24 hr TSP Weekly Site Audit	7 AMS2 - 1 hr TSP	8	9
10	11 AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP NMS2 NMS3C Dolphin Monitoring	12 AMS2 - 24 hr TSP	13 AMS2 - 1 hr TSP Dolphin Monitoring Weekly Site Audit	14	15	16 AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP
17	18 AMS2 - 24 hr TSP Dolphin Monitoring Weekly Site Audit	19 AMS2 - 1 hr TSP	20	21 AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP NMS2 NMS3C	22 AMS2 - 24 hr TSP	23
24	25 AMS2 - 1 hr TSP	26	27 AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP NMS2 NMS3C Weekly Site Audit	28 AMS2 - 24 hr TSP	29 AMS2 - 1 hr TSP	30
31						

Notes:

Air Quality Monitoring Station - AMS2, AMS3C, AMS7B
Noise Monitoring Station - NMS2, NMS3C
WQ - Water Quality Monitoring: temporarily suspended
CWD - Chinese White Dolphin
Weekly Site Audit

Remark: The schedule is subject to change due to unforeseeable circumstances (e.g. adverse weather, etc)

Appendix J. Calibration Certificates

EQUIPMENT CALIBRATION RECORD

Type :	Laser Dust Monitor
Manufacturer / Brand :	SIBATA
Model No.:	LD-3B
Equipment No.:	LD-3B-002
Serial No.:	974350
Sensitivity Adjustment Scale Setting :	622 CPM

Standard Equipment

Equipment :	MFC High Volume Air Sampler
Venue :	Tung Chung Pier
Model No.:	TE-5170 Total Suspended Particulate
Serial No.:	S/N3641
Previous Calibration Date:	12-Jul-2018

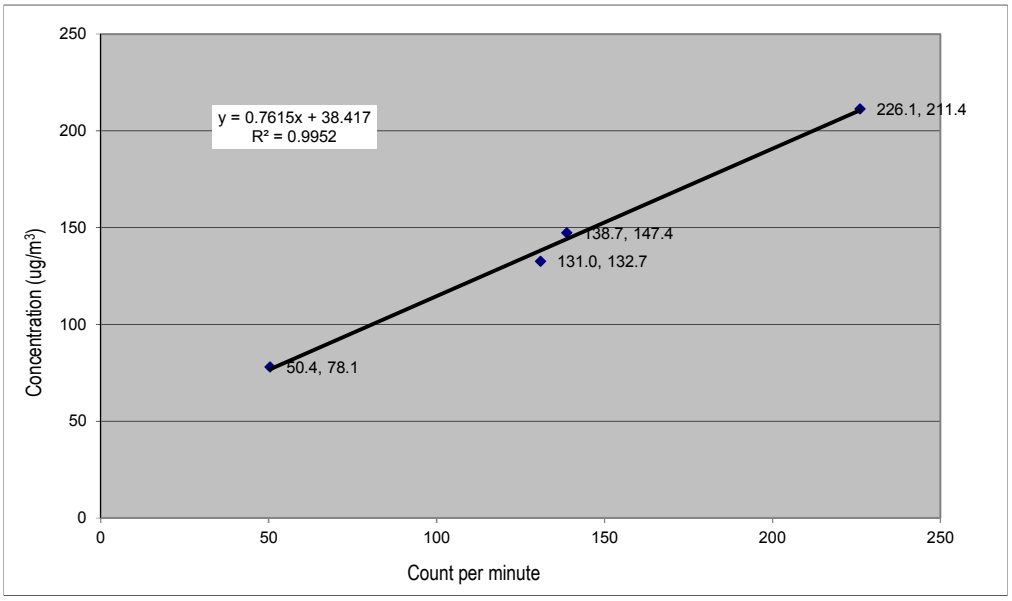
Calibration Result

Sensitivity Adjustment Scale Setting (Before Calibration) :	624 CPM
Sensitivity Adjustment Scale Setting (After Calibration) :	624 CPM

Hour	Date (dd-mm-yy)	Time		Ambient Condition		Concentration (ug/m^3) Y-axis	Total Count	Count/Minute X-axis
				Temp (^{o}C)	R.H. (%)			
1	24-Aug-18	09:07	09:37	29.4	80%	78.1	1513	50.4
2	24-Aug-18	10:00	11:00	30.5	76%	132.7	7857	131.0
3	24-Aug-18	11:12	12:42	30.6	76%	147.4	12486	138.7
4	24-Aug-18	13:21	15:21	31.0	71%	211.4	27133	226.1

Be Linear Regression of Y or X
Slope (K-factor): 0.7615 Intercept,b: 38.417
Correlation coefficient (R): 0.9976

Remark: _____



Recorded by: Shing Mak Signature: Shing Date: 07-Sep-2018

Checked by: Eva Keung Signature: Eva Date: 07-Sep-2018

EQUIPMENT CALIBRATION RECORD

Type :	Laser Dust Monitor
Manufacturer / Brand :	SIBATA
Model No.:	LD-5R
Equipment No.:	LD-5R-001
Serial No.:	640595
Sensitivity Adjustment Scale Setting :	765 CPM

Standard Equipment

Equipment :	MFC High Volume Air Sampler
Venue :	Tung Chung Pier
Model No.:	TE-5170 Total Suspended Particulate
Serial No.:	S/N3641
Previous Calibration Date:	12-Jul-2018

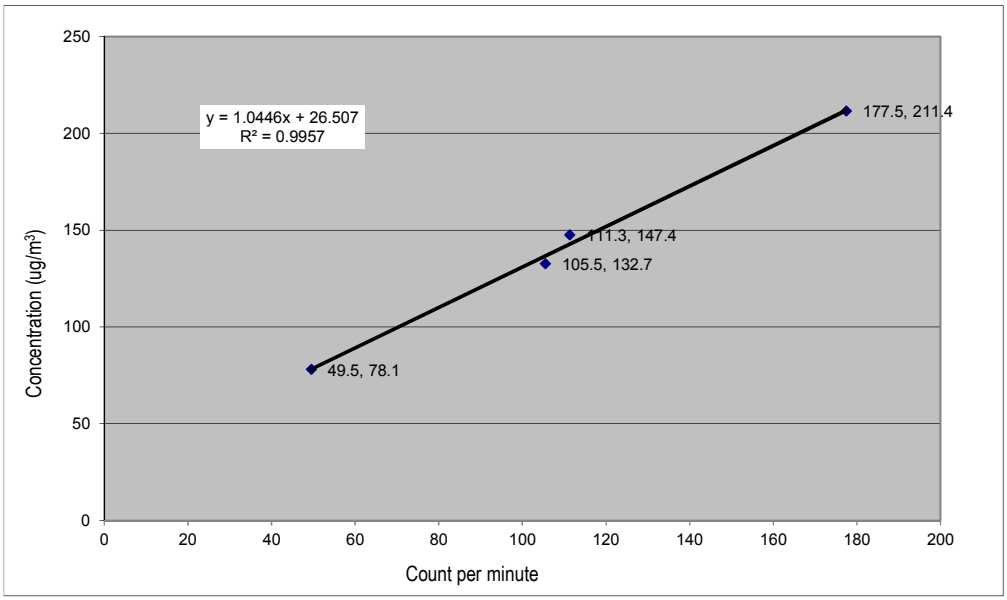
Calibration Result

Sensitivity Adjustment Scale Setting (Before Calibration) :	763 CPM
Sensitivity Adjustment Scale Setting (After Calibration) :	763 CPM

Hour	Date (dd-mmm-yy)	Time		Ambient Condition		Concentration (ug/m^3) Y-axis	Total Count	Count/Minute X-axis
				Temp (^{o}C)	R.H. (%)			
1	24-Aug-18	09:07	09:37	29.4	80%	78.1	1485	49.5
2	24-Aug-18	10:00	11:00	30.5	76%	132.7	6331	105.5
3	24-Aug-18	11:12	12:42	30.6	76%	147.4	10017	111.3
4	24-Aug-18	13:21	15:21	31.0	71%	211.4	21297	177.5

Be Linear Regression of Y or X
Slope (K-factor): 1.0446 Intercept,b: 26.507
Correlation coefficient (R): 0.9978

Remark: _____



Recorded by: Shing Mak Signature: Shing Date: 07-Sep-2018

Checked by: Eva Keung Signature: Eva Date: 07-Sep-2018

EQUIPMENT CALIBRATION RECORD

Type :	Laser Dust Monitor
Manufacturer / Brand :	SIBATA
Model No.:	LD-5R
Equipment No.:	LD-5R-002
Serial No.:	861988
Sensitivity Adjustment Scale Setting :	621 CPM

Standard Equipment

Equipment :	MFC High Volume Air Sampler
Venue :	Tung Chung Pier
Model No.:	TE-5170 Total Suspended Particulate
Serial No.:	S/N3641
Previous Calibration Date	12-Jul-2018

Calibration Result

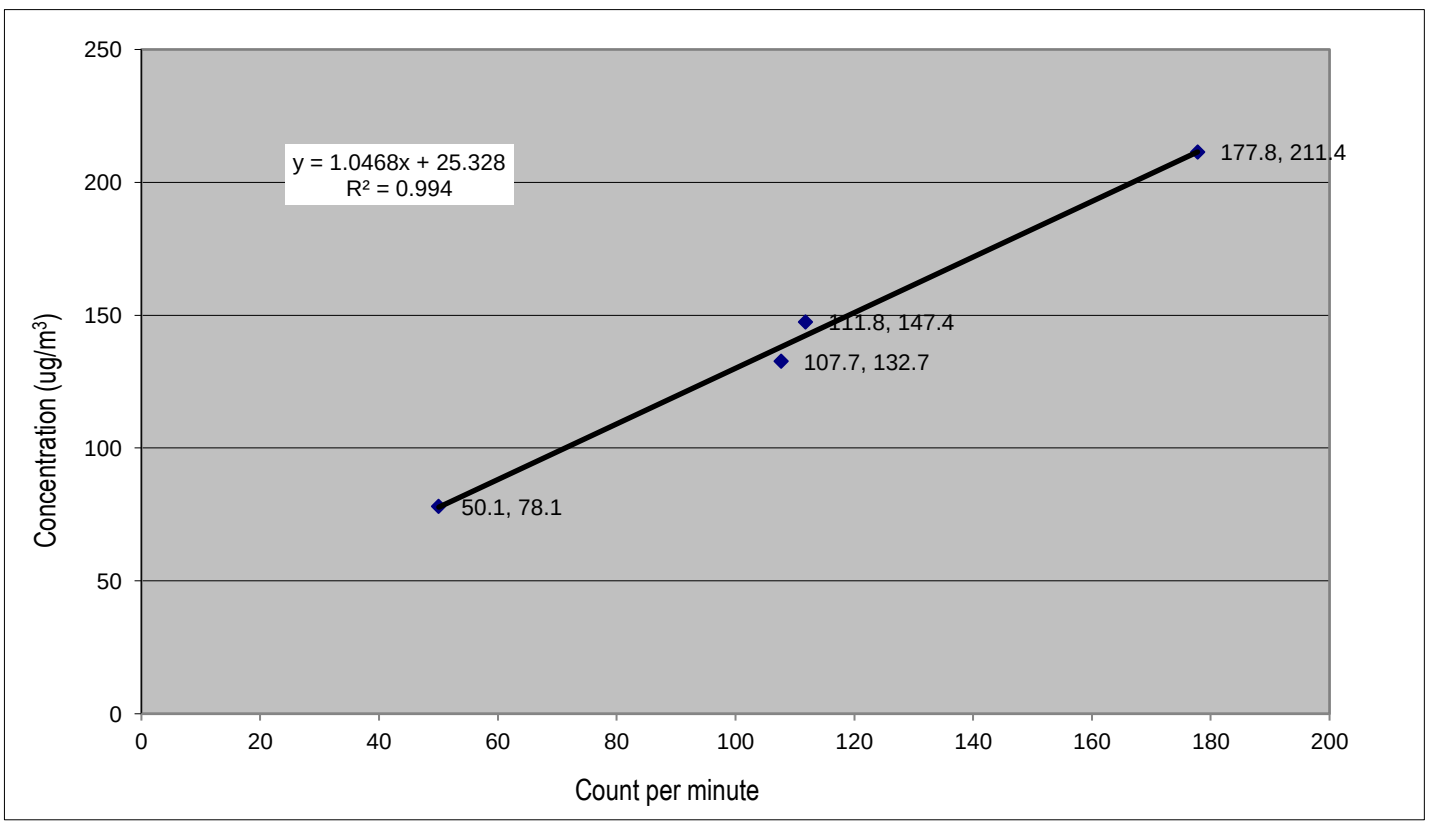
Sensitivity Adjustment Scale Setting (Before Calibration) : 622 CPM

Sensitivity Adjustment Scale Setting (After Calibration) : 622 CPM

Hour	Date (dd-mmm-yy)	Time		Ambient Condition		Concentration (ug/m^3) Y-axis	Total Count	Count/Minute X-axis
				Temp (^{o}C)	R.H. (%)			
1	24-Aug-18	09:07	09:37	29.4	80%	78.1	1502	50.1
2	24-Aug-18	10:00	11:00	30.5	76%	132.7	6460	107.7
3	24-Aug-18	11:12	12:42	30.6	76%	147.4	10065	111.8
4	24-Aug-18	13:21	15:21	31.0	71%	211.4	21334	177.8

Be Linear Regression of Y or X
Slope (K-factor): 1.0468 Intercept,b: 25.328
Correlation coefficient (R): 0.9970

Remark:



Recorded by: Icy Chan Signature: Icy Date: 07-Sep-2018

Checked by: Eva Keung Signature: Eva Date: 07-Sep-2018

ALS Technichem (HK) Pty Ltd

ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES

SUB-CONTRACTING REPORT

CONTACT	: MR K.W. FAN	WORK ORDER	: **HK1864495**
CLIENT	: ENVIROTECH SERVICES CO.		
ADDRESS	: RM113, 1/F, MY LOFT, 9 HOI WING ROAD, TUEN MUN, N.T. HONG KONG	SUB-BATCH	: 1
		DATE RECEIVED	: 11-DEC-2018
		DATE OF ISSUE	: 28-DEC-2018
PROJECT	: ----	NO. OF SAMPLES	: 1
		CLIENT ORDER	: ---

General Comments

- Sample(s) were received in ambient condition.
- Sample(s) analysed and reported on as received basis.
- Calibration was subcontracted to and analysed by Action United Enviro Services.

Signatories

This document has been signed by those names that appear on this report and are the authorised signatories

Signatories	*Position*
Richard Fung	General Manager

This is the Final Report and supersedes any preliminary report with this batch number.

Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

ALS Technichem (HK) Pty Ltd
Part of the ALS Laboratory Group
11/F, Chung Shun Knitting Centre 1 - 3 Wing Yip Street Kwai Chung N.T. Hong Kong
Tel. +852 2610 1044 Fax +852 2610 2021 www.alsglobal.com

WORK ORDER	: HK1864495
SUB-BATCH	: 1
CLIENT	: ENVIROTECH SERVICES CO.
PROJECT	: ---

ALS Lab ID	Client's Sample ID	Sample Type	Sample Date	External Lab Report No.
HK1864495-001	S/N: 235780	Equipments	11-Dec-2018	S/N: 235780

Equipment Verification Report (TSP)

Equipment Calibrated:

Type:	Laser Dust monitor
Manufacturer:	Sibata LD-3B
Serial No.	235780
Equipment Ref:	Nil
Job Order	HK1864495

Standard Equipment:

Standard Equipment:	Higher Volume Sampler
Location & Location ID:	AUES office (calibration room)
Equipment Ref:	HVS 018
Last Calibration Date:	21 September 2018

Equipment Verification Results:

Testing Date: 17&18 December 2018

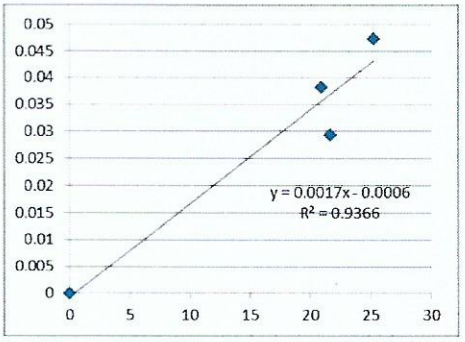
Hour	Time	Mean Temp °C	Mean Pressure (hPa)	Concentration in mg/m^3 (Standard Equipment)	Total Count (Calibrated Equipment)	Count/Minute (Total Count/min)
2hr03min	12:20 ~ 14:23	18.0	1022.2	0.038	2557	20.9
2hr14min	09:11 ~ 11:25	18.1	1022.2	0.029	2891	21.6
2hr14min	11:33 ~ 13:47	18.1	1022.2	0.047	3379	25.3

Linear Regression of Y or X

Slope (K-factor): 0.0017

Correlation Coefficient 0.9678

Date of Issue 28 December 2018



Remarks:

1. **Strong** Correlation (R>0.8)
2. Factor 0.0017 should be applied for TSP monitoring

*If R<0.5, repair or re-verification is required for the equipment

Operator : Fai So Signature : Date : 28 December 2018

QC Reviewer : Ben Tam Signature : Date : 28 December 2018

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location :	Gold King Industrial Building, Kwai Chung	Date of Calibration:	21-Sep-18
Location ID :	Calibration Room	Next Calibration Date:	21-Dec-18

CONDITIONS

Sea Level Pressure (hPa)	1011.6	Corrected Pressure (mm Hg)	758.7
Temperature (°C)	29.2	Temperature (K)	302

CALIBRATION ORIFICE

Make->	TISCH	Qstd Slope ->	2.02017
Model->	5025A	Qstd Intercept ->	-0.03691
Calibration Date->	13-Feb-18	Expiry Date->	13-Feb-19

CALIBRATION

Plate No.	H20 (L) (in)	H2O (R) (in)	H20 (in)	Qstd (m3/min)	I (chart)	IC corrected
18	5.4	5.4	10.8	1.632	56	55.56
13	4.3	4.3	8.6	1.459	48	47.62
10	3.3	3.3	6.6	1.280	43	42.66
8	2.1	2.1	4.2	1.025	34	33.73
5	1.3	1.3	2.6	0.810	24	23.81

LINEAR REGRESSION

Slope = 37.2548
Intercept = -5.5606
Corr. coeff. = 0.9970

Calculations :

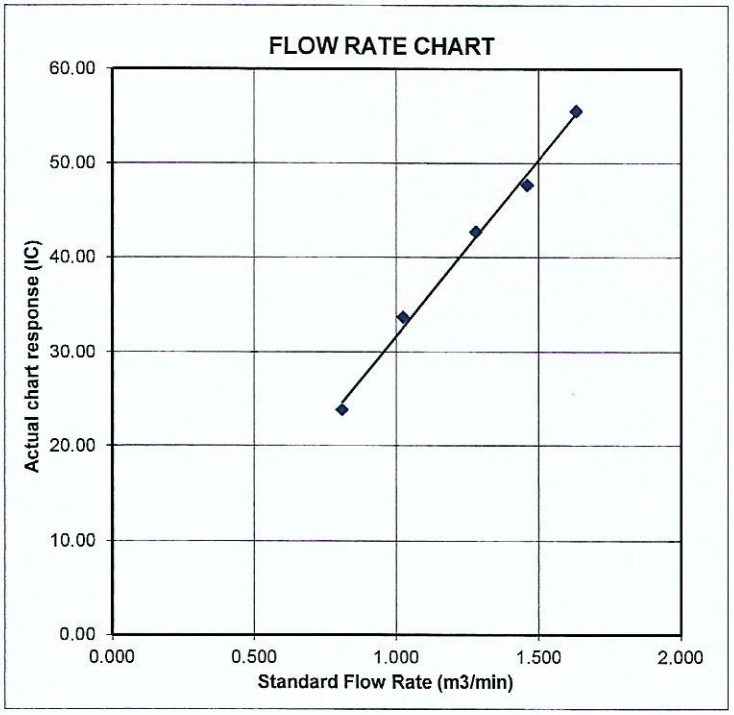
Qstd = 1/m[Sqrt(H20(Pa/Pstd)(Tstd/Ta))-b]
IC = I[Sqrt(Pa/Pstd)(Tstd/Ta)]

Qstd = standard flow rate
IC = corrected chart respones
I = actual chart response
m = calibrator Qstd slope
b = calibrator Qstd intercept
Ta = actual temperature during calibration (deg K)
Pstd = actual pressure during calibration (mm Hg)

For subsequent calculation of sampler flow:

1/m((I)[Sqrt(298/Tav)(Pav/760)]-b)

m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure



TISCH Environmental

RECALIBRATION DUE DATE:
February 13, 2019

Certificate of Calibration

Calibration Certification Information				
Cal. Date:	February 13, 2018	**Rootsmeter S/N:** 438320	**Ta:** 293	°K
Operator:	Jim Tisch		**Pa:** 763.3	mm Hg
Calibration Model #:	TE-5025A	**Calibrator S/N:** **1612**		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3970	3.2	2.00
2	3	4	1	1.0000	6.3	4.00
3	5	6	1	0.8900	7.9	5.00
4	7	8	1	0.8440	8.7	5.50
5	9	10	1	0.7010	12.6	8.00

Data Tabulation

Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H\left(Ta/Pa\right)}$ (y-axis)
1.0172	0.7281	1.4293	0.9958	0.7128	0.8762
1.0130	1.0130	2.0213	0.9917	0.9917	1.2392
1.0109	1.1358	2.2599	0.9896	1.1120	1.3854
1.0098	1.1964	2.3702	0.9886	1.1713	1.4530
1.0046	1.4331	2.8586	0.9835	1.4030	1.7524
QSTD	**m=**	**2.02017**	**QA**	**m=**	**1.26500**
	b=	**-0.03691**		**b=**	**-0.02263**
	r=	**0.99988**		**r=**	**0.99988**

Calculations

Vstd=	ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta)	**Va=**	ΔVol((Pa-ΔP)/Pa)
Qstd=	Vstd/ΔTime	**Qa=**	Va/ΔTime

For subsequent flow rate calculations:

Qstd= $1/m\left(\left(\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}\right)-b\right)$

Qa= $1/m\left(\left(\sqrt{\Delta H\left(Ta/Pa\right)}\right)-b\right)$

Standard Conditions	
Tstd:	298.15 °K
Pstd:	760 mm Hg

Key
ΔH: calibrator manometer reading (in H2O)
ΔP: rootsmeter manometer reading (mm Hg)
Ta: actual absolute temperature (°K)
Pa: actual barometric pressure (mm Hg)
b: intercept
m: slope

RECALIBRATION
US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30

Tisch Environmental, Inc.
145 South Miami Avenue
Village of Cleves, OH 45002

www.tisch-env.cor
TOLL FREE: (877)263-761(
FAX: (513)467-900

ALS Technichem (HK) Pty Ltd

ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES

SUB-CONTRACTING REPORT

CONTACT	: MR K.W. FAN	WORK ORDER	: **HK1864496**
CLIENT	: ENVIROTECH SERVICES CO.		
ADDRESS	: RM113, 1/F, MY LOFT, 9 HOI WING ROAD, TUEN MUN, N.T. HONG KONG	SUB-BATCH	: 1
		DATE RECEIVED	: 11-DEC-2018
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PROJECT	: ----	NO. OF SAMPLES	: 1
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Signatories

This document has been signed by those names that appear on this report and are the authorised signatories

Signatories	*Position*
Richard Fung	General Manager

This is the Final Report and supersedes any preliminary report with this batch number.

Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

ALS Technichem (HK) Pty Ltd
Part of the ALS Laboratory Group
11/F, Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong
Tel. +852 2610 1044 Fax. +852 2610 2021 www.alsglobal.com

WORK ORDER	: HK1864496
SUB-BATCH	: 1
CLIENT	: ENVIROTECH SERVICES CO.
PROJECT	: ----

ALS Lab ID	Client's Sample ID	Sample Type	Sample Date	External Lab Report No.
HK1864496-001	S/N: 6Z7784	Equipments	11-Dec-2018	S/N: 6Z7784

Equipment Verification Report (TSP)

Equipment Calibrated:

Type:	Laser Dust monitor
Manufacturer:	Sibata LD-3B
Serial No.	6Z7784
Equipment Ref:	Nil
Job Order	HK1864496

Standard Equipment:

Standard Equipment:	Higher Volume Sampler
Location & Location ID:	AUES office (calibration room)
Equipment Ref:	HVS 018
Last Calibration Date:	21 September 2018

Equipment Verification Results:

Testing Date: 17&18 December 2018

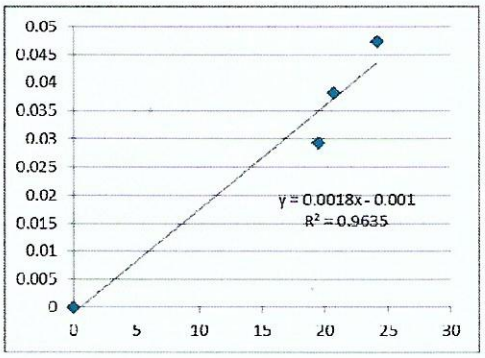
Hour	Time	Mean Temp °C	Mean Pressure (hPa)	Concentration in mg/m^3 (Standard Equipment)	Total Count (Calibrated Equipment)	Count/Minute (Total Count/min)
2hr03min	12:20 ~ 14:23	18.0	1022.2	0.038	2533	20.7
2hr14min	09:11 ~ 11:25	18.1	1022.2	0.029	2601	19.4
2hr14min	11:33 ~ 13:47	18.1	1022.2	0.047	3232	24.2

Linear Regression of Y or X

Slope (K-factor): 0.0018

Correlation Coefficient 0.9816

Date of Issue 28 December 2018



Remarks:

1. **Strong** Correlation (R>0.8)
2. Factor 0.0018 should be applied for TSP monitoring

*If R<0.5, repair or re-verification is required for the equipment

Operator : Fai So Signature : Date : 28 December 2018

QC Reviewer : Ben Tam Signature : Date : 28 December 2018

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location :	Gold King Industrial Building, Kwai Chung	Date of Calibration:	21-Sep-18
Location ID :	Calibration Room	Next Calibration Date:	21-Dec-18

CONDITIONS

Sea Level Pressure (hPa)	1011.6	Corrected Pressure (mm Hg)	758.7
Temperature (°C)	29.2	Temperature (K)	302

CALIBRATION ORIFICE

Make->	TISCH	Qstd Slope ->	2.02017
Model->	5025A	Qstd Intercept ->	-0.03691
Calibration Date->	13-Feb-18	Expiry Date->	13-Feb-19

CALIBRATION

Plate No.	H20 (L) (in)	H2O (R) (in)	H20 (in)	Qstd (m3/min)	I (chart)	IC corrected	LINEAR REGRESSION
18	5.4	5.4	10.8	1.632	56	55.56	Slope = 37.2548
13	4.3	4.3	8.6	1.459	48	47.62	Intercept = -5.5606
10	3.3	3.3	6.6	1.280	43	42.66	Corr. coeff. = 0.9970
8	2.1	2.1	4.2	1.025	34	33.73	
5	1.3	1.3	2.6	0.810	24	23.81	

Calculations :

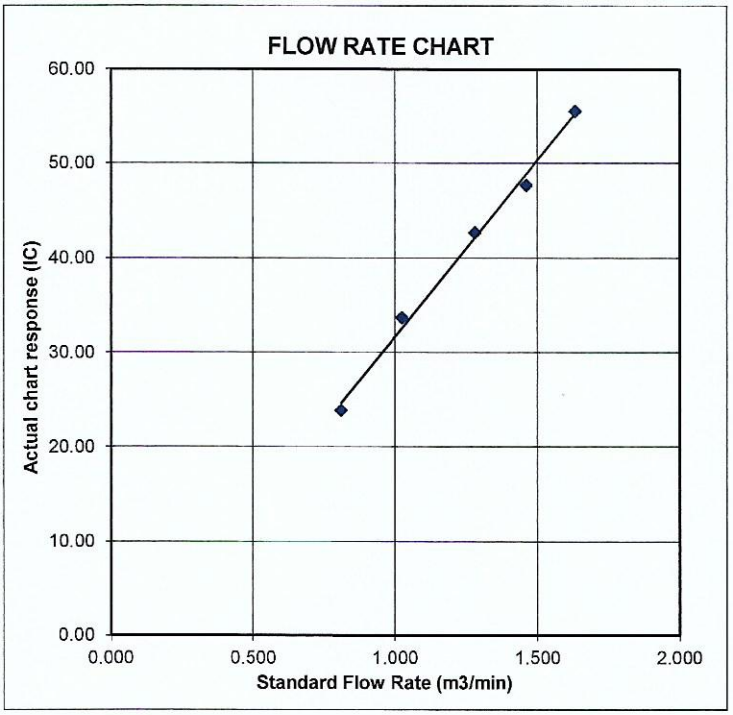
Qstd = 1/m[Sqrt(H20(Pa/Pstd)(Tstd/Ta))-b]
IC = I[Sqrt(Pa/Pstd)(Tstd/Ta)]

Qstd = standard flow rate
IC = corrected chart respones
I = actual chart response
m = calibrator Qstd slope
b = calibrator Qstd intercept
Ta = actual temperature during calibration (deg K)
Pstd = actual pressure during calibration (mm Hg)

For subsequent calculation of sampler flow:

1/m((I)[Sqrt(298/Tav)(Pav/760)]-b)

m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure



TISCH Environmental

RECALIBRATION DUE DATE:
February 13, 2019

Certificate of Calibration

Calibration Certification Information				
Cal. Date:	February 13, 2018	**Rootsmeter S/N:** 438320	**Ta:** 293	°K
Operator:	Jim Tisch		**Pa:** 763.3	mm Hg
Calibration Model #:	TE-5025A	**Calibrator S/N:** **1612**		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3970	3.2	2.00
2	3	4	1	1.0000	6.3	4.00
3	5	6	1	0.8900	7.9	5.00
4	7	8	1	0.8440	8.7	5.50
5	9	10	1	0.7010	12.6	8.00

Data Tabulation

Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H\left(Ta/Pa\right)}$ (y-axis)
1.0172	0.7281	1.4293	0.9958	0.7128	0.8762
1.0130	1.0130	2.0213	0.9917	0.9917	1.2392
1.0109	1.1358	2.2599	0.9896	1.1120	1.3854
1.0098	1.1964	2.3702	0.9886	1.1713	1.4530
1.0046	1.4331	2.8586	0.9835	1.4030	1.7524
QSTD	**m=**	**2.02017**	**QA**	**m=**	**1.26500**
	b=	**-0.03691**		**b=**	**-0.02263**
	r=	**0.99988**		**r=**	**0.99988**

Calculations

Vstd=	ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta)	**Va=**	ΔVol((Pa-ΔP)/Pa)
Qstd=	Vstd/ΔTime	**Qa=**	Va/ΔTime

For subsequent flow rate calculations:

Qstd= $1/m\left(\left(\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}\right)-b\right)$

Qa= $1/m\left(\left(\sqrt{\Delta H\left(Ta/Pa\right)}\right)-b\right)$

Standard Conditions	
Tstd:	298.15 °K
Pstd:	760 mm Hg

Key
ΔH: calibrator manometer reading (in H2O)
ΔP: rootsmeter manometer reading (mm Hg)
Ta: actual absolute temperature (°K)
Pa: actual barometric pressure (mm Hg)
b: intercept
m: slope

RECALIBRATION

US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30

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145 South Miami Avenue
Village of Cleves, OH 45002

www.tisch-env.cor
TOLL FREE: (877)263-761(
FAX: (513)467-900

ENVIROTECH SERVICES CO.

High-Volume TSP Sampler
5-Point Calibration Record

Location : AMS2(Tung Chung Development Pier)
Calibrated by : P.F.Yeung
Date : 25/01/2019

Sampler
Model : TE-5170
Serial Number : S/N3641

Calibration Orifice and Standard Calibration Relationship
Serial Number : 2454
Service Date : 19 Mar 2018
Slope (m) : 2.05242
Intercept (b) : -0.01383
Correlation Coefficient(r) : 0.99994

Standard Condition
Pstd (hpa) : 1013
Tstd (K) : 298.18

Calibration Condition
Pa (hpa) : 1021
Ta(K) : 292

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC	Y
1	18 holes	12.4	3.571	1.747	56	56.80
2	13 holes	9.3	3.093	1.514	51	51.72
3	10 holes	7.3	2.740	1.342	45	45.64
4	7 holes	4.8	2.222	1.089	38	38.54
5	5 holes	2.8	1.697	0.834	30	30.43

Notes:Z=SQRT{dH(Pa/Pstd)(Tstd/Ta)}, X=Z/m-b ,Y(Corrected Flow)=IC*{SQRT(Pa/Pstd)(Tstd/Ta)}

Sampler Calibration Relationship

Slope(m):29.286 **Intercept(b):6.404** **Correlation Coefficient(r): 0.9980**

Checked by: Magnum Fan **Date: 28/01/2019**

High-Volume TSP Sampler
5-Point Calibration Record

Location	:	AMS3C (Ying Tung Estate)
Calibrated by	:	P.F.Yeung
Date	:	20/12/2018

Sampler

Model	:	TE-5170
Serial Number	:	S/N 3977

Calibration Orifice and Standard Calibration Relationship

Serial Number	:	2454
Service Date	:	19 Mar 2018
Slope (m)	:	2.05242
Intercept (b)	:	-0.01383
Correlation Coefficient(r)	:	0.99994

Standard Condition

Pstd (hpa)	:	1013
Tstd (K)	:	298.18

Calibration Condition

Pa (hpa)	:	1017
Ta(K)	:	292

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	11.6	3.447	1.686	54	54.66
2	13 holes	9.2	3.070	1.503	50	50.61
3	10 holes	6.8	2.640	1.293	44	44.54
4	7 holes	4.9	2.241	1.098	37	37.45
5	5 holes	2.4	1.568	0.771	30	30.37

Notes:Z=SQRT{dH(Pa/Pstd)(Tstd/Ta)}, X=Z/m-b ,Y(Corrected Flow)=IC*{SQRT(Pa/Pstd)(Tstd/Ta)}

Sampler Calibration Relationship (Linear Regression)

Slope(m):27.469 Intercept(b):8.633 Correlation Coefficient(r): 0.9962

Checked by: Magnum Fan Date: 27/12/2018

High-Volume TSP Sampler
5-Point Calibration Record

Location	:	AMS7B
Calibrated by	:	P.F.Yeung
Date	:	20/12/2018

Sampler

Model	:	TE-5170
Serial Number	:	S/N 3976

Calibration Orifice and Standard Calibration Relationship

Serial Number	:	2454
Service Date	:	19 Mar 2018
Slope (m)	:	2.05242
Intercept (b)	:	-0.01383
Correlation Coefficient(r)	:	0.99994

Standard Condition

Pstd (hpa)	:	1013
Tstd (K)	:	298.18

Calibration Condition

Pa (hpa)	:	1017
Ta(K)	:	292

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	12.0	3.506	1.715	55	55.67
2	13 holes	9.3	3.087	1.511	50	50.61
3	10 holes	7.5	2.772	1.357	45	45.55
4	7 holes	4.8	2.218	1.087	37	37.45
5	5 holes	3.0	1.753	0.861	30	30.37

Notes:Z=SQRT{dH(Pa/Pstd)(Tstd/Ta)}, X=Z/m-b ,Y(Corrected Flow)=IC*{SQRT(Pa/Pstd)(Tstd/Ta)}

Sampler Calibration Relationship (Linear Regression)

Slope(m):29.939 Intercept(b):4.821 Correlation Coefficient(r): 0.9993

Checked by: Magnum Fan Date: 27/12/2018

High-Volume TSP Sampler
5-Point Calibration Record

Location	:	AMS3C (Ying Tung Estate)
Calibrated by	:	P.F.Yeung
Date	:	20/02/2019

Sampler

Model	:	TE-5170
Serial Number	:	S/N 3977

Calibration Orifice and Standard Calibration Relationship

Serial Number	:	2454
Service Date	:	19 Mar 2018
Slope (m)	:	2.05242
Intercept (b)	:	-0.01383
Correlation Coefficient(r)	:	0.99994

Standard Condition

Pstd (hpa)	:	1013
Tstd (K)	:	298.18

Calibration Condition

Pa (hpa)	:	1017
Ta(K)	:	295

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	12.0	3.489	1.706	55	55.39
2	13 holes	9.0	3.021	1.479	50	50.35
3	10 holes	6.8	2.626	1.286	45	45.32
4	7 holes	4.6	2.160	1.059	38	38.27
5	5 holes	2.5	1.592	0.783	30	30.21

Notes:Z=SQRT{dH(Pa/Pstd)(Tstd/Ta)}, X=Z/m-b ,Y(Corrected Flow)=IC*{SQRT(Pa/Pstd)(Tstd/Ta)}

Sampler Calibration Relationship (Linear Regression)

Slope(m):27.598 Intercept(b):9.062 Correlation Coefficient(r): 0.9980

Checked by: Magnum Fan Date: 25/02/2019

High-Volume TSP Sampler
5-Point Calibration Record

Location	:	AMS7B
Calibrated by	:	P.F.Yeung
Date	:	20/02/2019

Sampler

Model	:	TE-5170
Serial Number	:	S/N 3976

Calibration Orifice and Standard Calibration Relationship

Serial Number	:	2454
Service Date	:	19 Mar 2018
Slope (m)	:	2.05242
Intercept (b)	:	-0.01383
Correlation Coefficient(r)	:	0.99994

Standard Condition

Pstd (hpa)	:	1013
Tstd (K)	:	298.18

Calibration Condition

Pa (hpa)	:	1017
Ta(K)	:	295

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1	18 holes	12.0	3.489	1.706	54	54.38
2	13 holes	9.2	3.055	1.495	50	50.35
3	10 holes	7.4	2.739	1.341	44	44.31
4	7 holes	4.6	2.160	1.059	38	38.29
5	5 holes	2.8	1.685	0.828	30	30.21

Notes:Z=SQRT{dH(Pa/Pstd)(Tstd/Ta)}, X=Z/m-b ,Y(Corrected Flow)=IC*{SQRT(Pa/Pstd)(Tstd/Ta)}

Sampler Calibration Relationship (Linear Regression)

Slope(m):27.481 Intercept(b):8.165 Correlation Coefficient(r): 0.9950

Checked by: Magnum Fan Date: 25/02/2019

TISCH Environmental

RECALIBRATION DUE DATE:
March 19, 2019

Certificate of Calibration

Calibration Certification Information					
Cal. Date:	March 19, 2018	**Rootsmeter S/N:** 438320	**Ta:** 294	°K
Operator:	Jim Tisch		**Pa:** 746.8	mm Hg
Calibration Model #:	TE-5025A	**Calibrator S/N:** **2454**		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4300	3.2	2.00
2	3	4	1	1.0040	6.4	4.00
3	5	6	1	0.9030	7.9	5.00
4	7	8	1	0.8590	8.7	5.50
5	9	10	1	0.7080	12.8	8.00

Data Tabulation

Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H\left(Ta/Pa\right)}$ (y-axis)
0.9917	0.6935	1.4113	0.9957	0.6963	0.8874
0.9874	0.9835	1.9959	0.9914	0.9875	1.2549
0.9854	1.0913	2.2315	0.9894	1.0957	1.4030
0.9843	1.1459	2.3405	0.9883	1.1506	1.4715
0.9789	1.3826	2.8227	0.9829	1.3882	1.7747
QSTD	**m=**	**2.05242**	**QA**	**m=**	**1.28519**
	b=	**-0.01383**		**b=**	**-0.00869**
	r=	**0.99994**		**r=**	**0.99994**

Calculations

Vstd=	ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta)	**Va=**	ΔVol((Pa-ΔP)/Pa)
Qstd=	Vstd/ΔTime	**Qa=**	Va/ΔTime

For subsequent flow rate calculations:

Qstd= $1/m\left(\left(\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}\right)-b\right)$

Qa= $1/m\left(\left(\sqrt{\Delta H\left(Ta/Pa\right)}\right)-b\right)$

Standard Conditions	
Tstd:	298.15 °K
Pstd:	760 mm Hg

Key
ΔH: calibrator manometer reading (in H2O)
ΔP: rootsmeter manometer reading (mm Hg)
Ta: actual absolute temperature (°K)
Pa: actual barometric pressure (mm Hg)
b: intercept
m: slope

RECALIBRATION

US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30

Tisch Environmental, Inc.
145 South Miami Avenue
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輝創工程有限公司
Sun Creation Engineering Limited
Calibration & Testing Laboratory

Certificate of Calibration
校正證書

Certificate No. : C183089
證書編號

ITEM TESTED / 送檢項目 (Job No. / 序引編號 : IC18-1132) Date of Receipt / 收件日期 : 31 May 2018

Description / 儀器名稱 : Sound Level Meter
Manufacturer / 製造商 : Rion
Model No. / 型號 : NL-52
Serial No. / 編號 : 00331805
Supplied By / 委託者 : Envirotech Services Co.
Room 113, 1/F, My Loft, 9 Hoi Wing Road, Tuen Mun,
New Territories, Hong Kong

TEST CONDITIONS / 測試條件

Temperature / 溫度 : (23 ± 2)°C Relative Humidity / 相對濕度 : (50 ± 25)%
Line Voltage / 電壓 : ---

TEST SPECIFICATIONS / 測試規範

Calibration check

DATE OF TEST / 測試日期 : 10 June 2018

TEST RESULTS / 測試結果

The results apply to the particular unit-under-test only.
The results do not exceed manufacturer's specification.
The results are detailed in the subsequent page(s).

The test equipment used for calibration are traceable to National Standards via :
- The Government of The Hong Kong Special Administrative Region Standard & Calibration Laboratory
- Agilent Technologies / Keysight Technologies
- Rohde & Schwarz Laboratory, Germany
- Fluke Everett Service Center, USA

Tested By 測試 : K C Lee
Engineer

Certified By 核證 : H C Chan
Engineer

Date of Issue 簽發日期 : 14 June 2018

Certificate of Calibration
校正證書

Certificate No. : C183089
證書編號

1. The unit-under-test (UUT) was allowed to stabilize in the laboratory for over 12 hours, and switched on to warm up for over 10 minutes before the commencement of the test.

2. Self-calibration was performed before the test.

3. The results presented are the mean of 3 measurements at each calibration point.

4. Test equipment :

Equipment ID	Description	Certificate No.
CL280	40 MHz Arbitrary Waveform Generator	C180024
CL281	Multifunction Acoustic Calibrator	PA160023

5. Test procedure : MA101N.

6. Results :

6.1 Sound Pressure Level

6.1.1 Reference Sound Pressure Level

UUT Setting				Applied Value		UUT Reading (dB)	IEC 61672 Class 1 Spec. (dB)
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)		
30 - 130	L_A	A	Fast	94.00	1	94.2	± 1.1

6.1.2 Linearity

UUT Setting				Applied Value		UUT Reading (dB)
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)	
30 - 130	L_A	A	Fast	94.00	1	94.2 (Ref.)
				104.00		104.2
				114.00		114.2

IEC 61672 Class 1 Spec. : ± 0.6 dB per 10 dB step and ± 1.1 dB for overall different.

6.2 Time Weighting

UUT Setting				Applied Value		UUT Reading (dB)	IEC 61672 Class 1 Spec. (dB)
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)		
30 - 130	L_A	A	Fast	94.00	1	94.2	Ref.
			Slow			94.2	± 0.3

Certificate of Calibration
校正證書

Certificate No. : C183089
證書編號

6.3 Frequency Weighting

6.3.1 A-Weighting

UUT Setting				Applied Value		UUT Reading (dB)	IEC 61672 Class 1 Spec. (dB)
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq.		
30 - 130	L_A	A	Fast	94.00	63 Hz	67.9	-26.2 ± 1.5
					125 Hz	78.0	-16.1 ± 1.5
					250 Hz	85.5	-8.6 ± 1.4
					500 Hz	91.0	-3.2 ± 1.4
					1 kHz	94.2	Ref.
					2 kHz	95.4	+1.2 ± 1.6
					4 kHz	95.2	+1.0 ± 1.6
					8 kHz	93.2	-1.1 (+2.1 ; -3.1)
					12.5 kHz	89.8	-4.3 (+3.0 ; -6.0)

6.3.2 C-Weighting

UUT Setting				Applied Value		UUT Reading (dB)	IEC 61672 Class 1 Spec. (dB)
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq.		
30 - 130	L_C	C	Fast	94.00	63 Hz	93.3	-0.8 ± 1.5
					125 Hz	94.0	-0.2 ± 1.5
					250 Hz	94.2	0.0 ± 1.4
					500 Hz	94.2	0.0 ± 1.4
					1 kHz	94.2	Ref.
					2 kHz	94.1	-0.2 ± 1.6
					4 kHz	93.4	-0.8 ± 1.6
					8 kHz	91.3	-3.0 (+2.1 ; -3.1)
					12.5 kHz	87.9	-6.2 (+3.0 ; -6.0)

Remarks : - UUT Microphone Model No. : UC-59 & S/N : 04870

- Mfr's Spec. : IEC 61672 Class 1

- Uncertainties of Applied Value :

94 dB	: 63 Hz - 125 Hz	: ± 0.35 dB
	250 Hz - 500 Hz	: ± 0.30 dB
	1 kHz	: ± 0.20 dB
	2 kHz - 4 kHz	: ± 0.35 dB
	8 kHz	: ± 0.45 dB
	12.5 kHz	: ± 0.70 dB
104 dB	: 1 kHz	: ± 0.10 dB (Ref. 94 dB)
114 dB	: 1 kHz	: ± 0.10 dB (Ref. 94 dB)

- The uncertainties are for a confidence probability of not less than 95 %.

Note :
Only the original copy or the laboratory's certified true copy is valid.

The values given in this Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environment changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Sun Creation Engineering Limited shall not be liable for any loss or damage resulting from the use of the equipment.

Sun Creation Engineering Limited – Calibration & Testing Laboratory
c/o 4/F, 1 Hing On Lane, Tuen Mun, New Territories, Hong Kong
輝創工程有限公司 — 校正及檢測實驗所
c/o 香港新界屯門興安里一號四樓
Tel/電話: (852) 2927 2606 Fax/傳真: (852) 2744 8986 E-mail/電郵: callab@suncreation.com Website/網址: www.suncreation.com

輝創工程有限公司
Sun Creation Engineering Limited
Calibration & Testing Laboratory

Certificate of Calibration
校正證書

Certificate No. : C183084
證書編號

ITEM TESTED / 送檢項目 (Job No. / 序引編號 : IC18-1101) Date of Receipt / 收件日期 : 30 May 2018

Description / 儀器名稱 : Precision Acoustic Calibrator
Manufacturer / 製造商 : LARSON DAVIS
Model No. / 型號 : CAL200
Serial No. / 編號 : 11333
Supplied By / 委託者 : Envirotech Services Co.
Room 113, 1/F, My Loft, 9 Hoi Wing Road, Tuen Mun,
New Territories, Hong Kong

TEST CONDITIONS / 測試條件

Temperature / 溫度 : (23 ± 2)°C Relative Humidity / 相對濕度 : (50 ± 25)%
Line Voltage / 電壓 : ---

TEST SPECIFICATIONS / 測試規範

Calibration check

DATE OF TEST / 測試日期 : 9 June 2018

TEST RESULTS / 測試結果

The results apply to the particular unit-under-test only.
The results do not exceed manufacturer's specification.
The results are detailed in the subsequent page(s).

The test equipment used for calibration are traceable to National Standards via :
- The Government of The Hong Kong Special Administrative Region Standard & Calibration Laboratory
- Agilent Technologies / Keysight Technologies
- Rohde & Schwarz Laboratory, Germany
- Fluke Everett Service Center, USA

Tested By 測試 : K C Lee
Engineer

Certified By 核證 : H C Chan
Engineer

Date of Issue 簽發日期 : 14 June 2018

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輝創工程有限公司
Sun Creation Engineering Limited
Calibration & Testing Laboratory

Certificate of Calibration
校正證書

Certificate No. : C183084
證書編號

1. The unit-under-test (UUT) was allowed to stabilize in the laboratory for over 12 hours before the commencement of the test.

2. The results presented are the mean of 3 measurements at each calibration point.

3. Test equipment :

Equipment ID	Description	Certificate No.
CL130	Universal Counter	C173864
CL281	Multifunction Acoustic Calibrator	PA160023
TST150A	Measuring Amplifier	C181288

4. Test procedure : MA100N.

5. Results :

5.1 Sound Level Accuracy

UUT Nominal Value	Measured Value (dB)	Mfr's Spec. (dB)	Uncertainty of Measured Value (dB)
94 dB, 1 kHz	93.8	± 0.2	± 0.2
114 dB, 1 kHz	113.8		

5.2 Frequency Accuracy

UUT Nominal Value (kHz)	Measured Value (kHz)	Mfr's Spec.	Uncertainty of Measured Value (Hz)
1	1.000	1 kHz ± 1 %	± 1

Remark : The uncertainties are for a confidence probability of not less than 95 %.

Note :
Only the original copy or the laboratory's certified true copy is valid.

The values given in this Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environment changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Sun Creation Engineering Limited shall not be liable for any loss or damage resulting from the use of the equipment.

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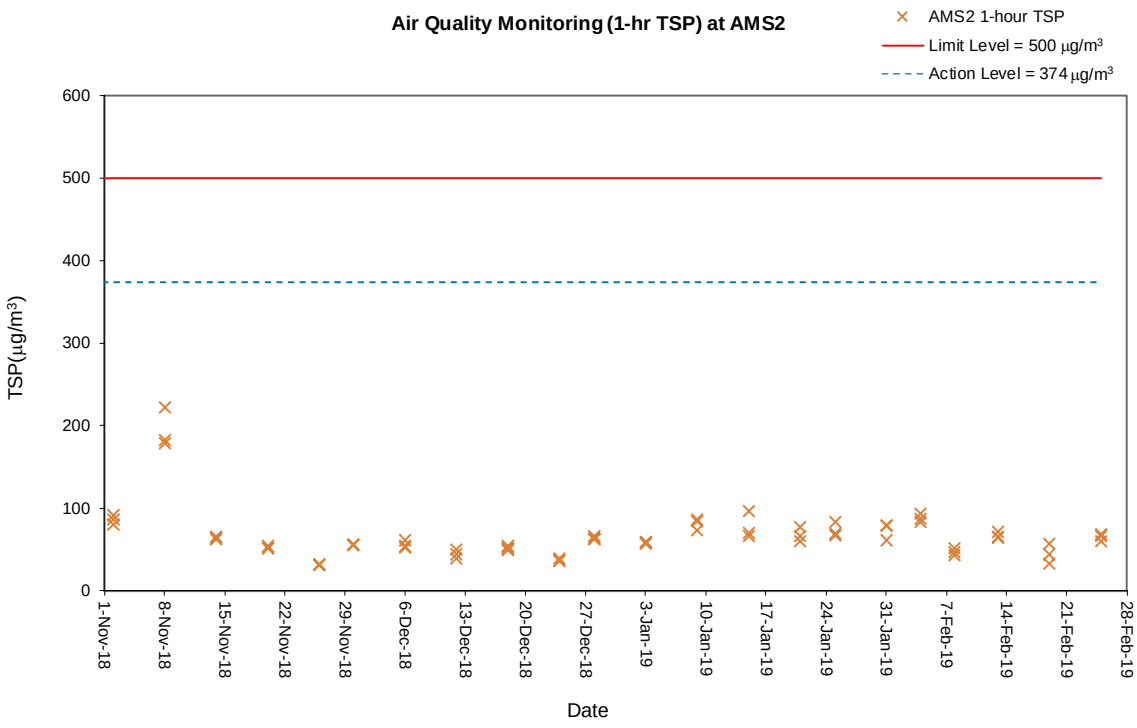
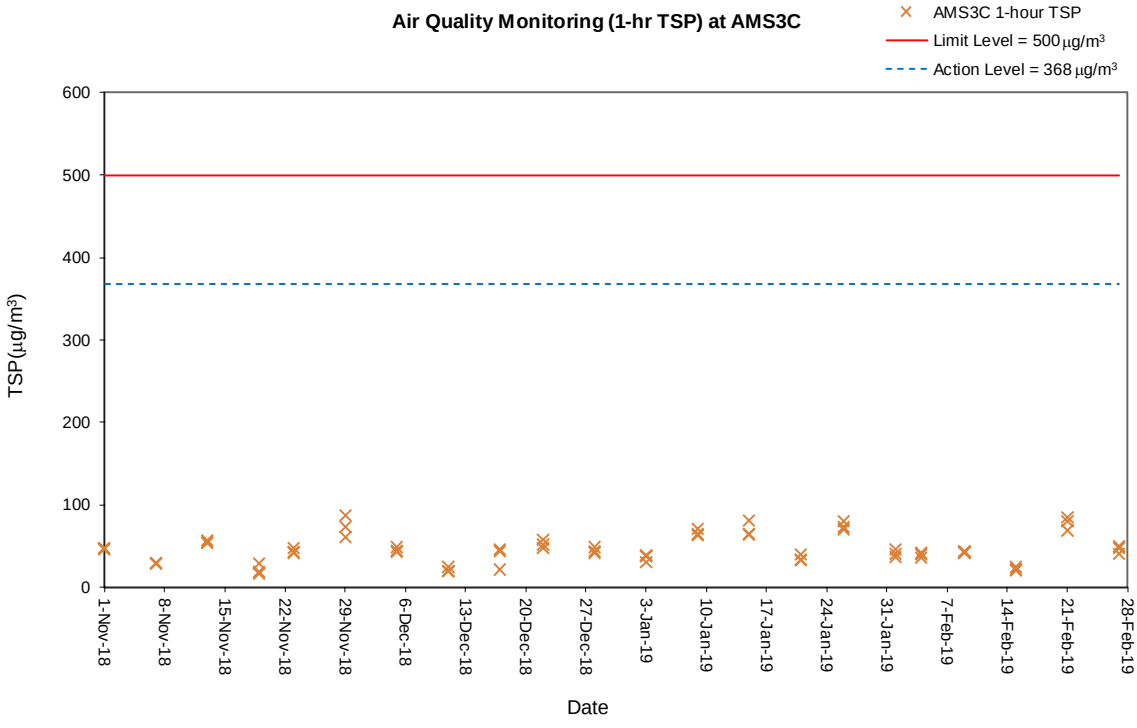
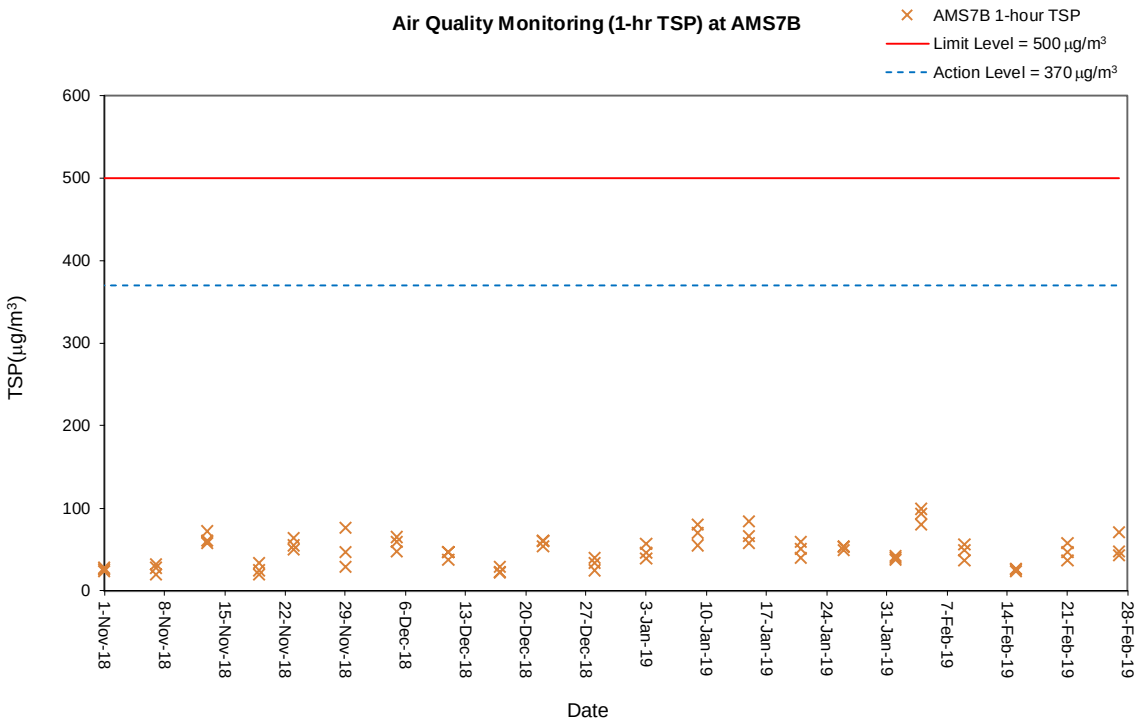
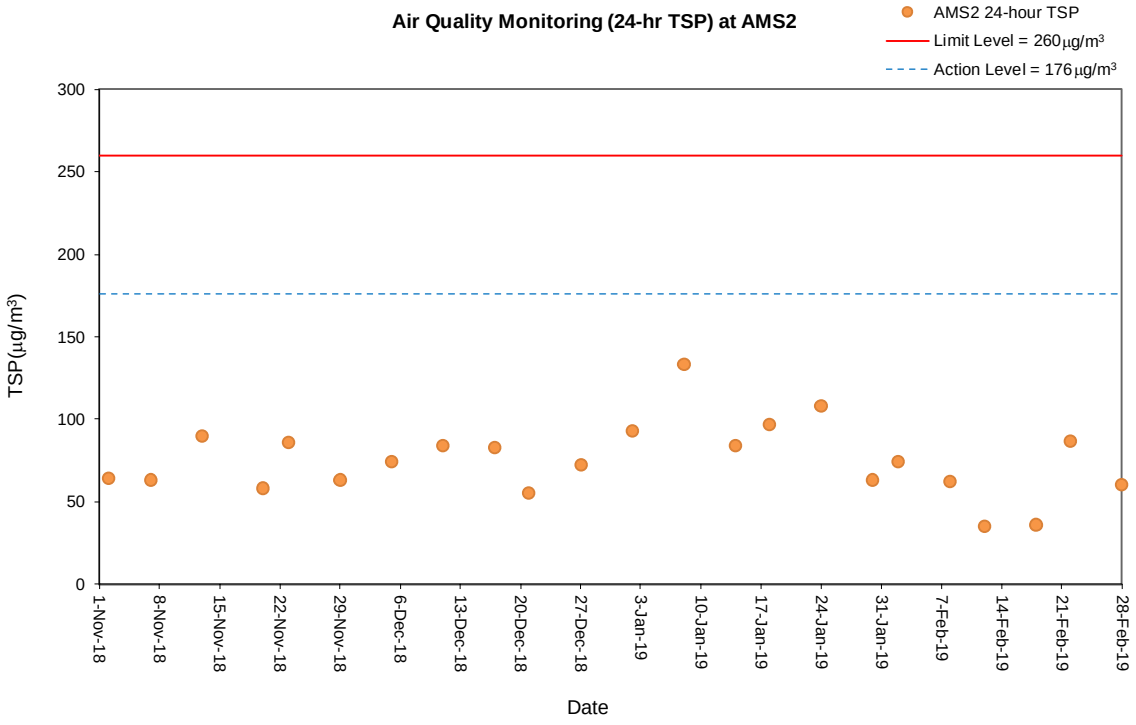
Appendix K. Monitoring Data and Graphical Plots (Air Quality, Noise and Water Quality)

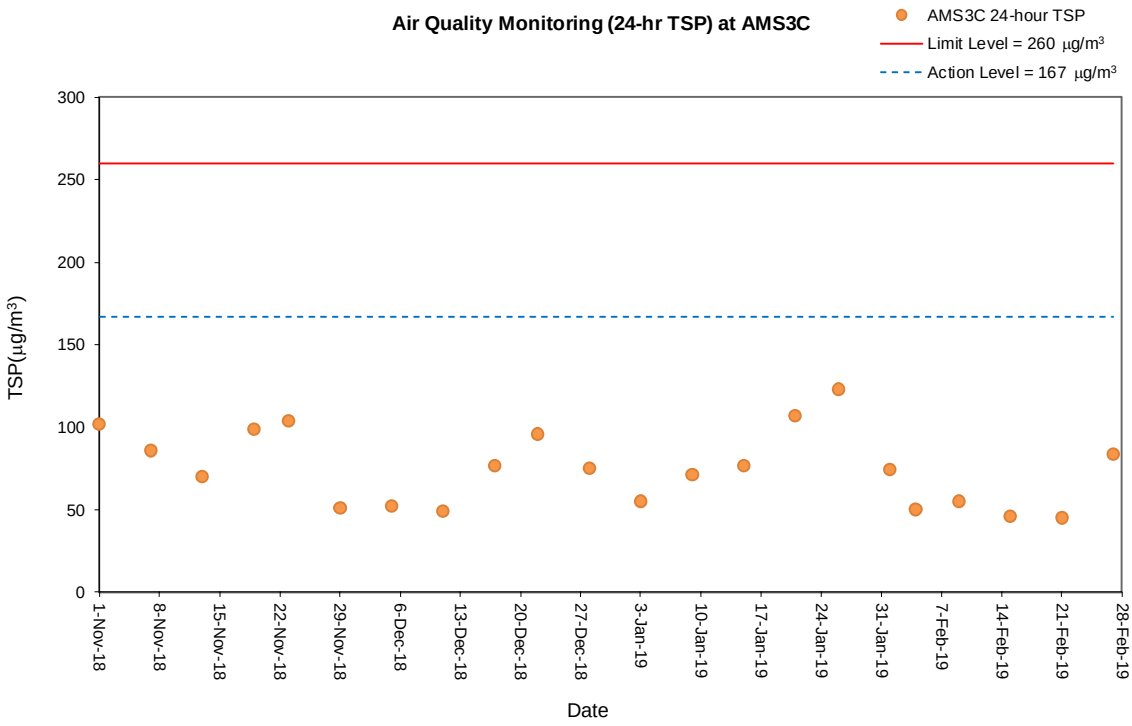
Project	Contract	Station	Date	Parameter	Start Time	Result	Unit
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	04-Feb-19	1-hr TSP	08:45	87	µg/m^3
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	04-Feb-19	1-hr TSP	09:45	93	µg/m^3
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	04-Feb-19	1-hr TSP	10:45	83	µg/m^3
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	08-Feb-19	1-hr TSP	09:05	51	µg/m^3
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	08-Feb-19	1-hr TSP	10:05	47	µg/m^3
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	08-Feb-19	1-hr TSP	11:05	43	µg/m^3
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	13-Feb-19	1-hr TSP	09:12	65	µg/m^3
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	13-Feb-19	1-hr TSP	10:12	64	µg/m^3
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	13-Feb-19	1-hr TSP	11:12	71	µg/m^3
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	19-Feb-19	1-hr TSP	09:09	57	µg/m^3
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	19-Feb-19	1-hr TSP	10:09	44	µg/m^3
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	19-Feb-19	1-hr TSP	11:09	33	µg/m^3
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	25-Feb-19	1-hr TSP	09:00	60	µg/m^3
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	25-Feb-19	1-hr TSP	10:00	66	µg/m^3
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	25-Feb-19	1-hr TSP	11:00	68	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	01-Feb-19	1-hr TSP	08:56	46	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	01-Feb-19	1-hr TSP	09:56	41	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	01-Feb-19	1-hr TSP	10:56	37	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	04-Feb-19	1-hr TSP	10:08	40	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	04-Feb-19	1-hr TSP	11:08	42	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	04-Feb-19	1-hr TSP	12:08	36	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	09-Feb-19	1-hr TSP	08:33	44	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	09-Feb-19	1-hr TSP	09:33	43	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	09-Feb-19	1-hr TSP	10:33	42	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	15-Feb-19	1-hr TSP	08:10	25	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	15-Feb-19	1-hr TSP	09:10	22	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	15-Feb-19	1-hr TSP	10:10	21	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	21-Feb-19	1-hr TSP	08:10	85	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	21-Feb-19	1-hr TSP	09:10	80	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	21-Feb-19	1-hr TSP	10:10	69	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	27-Feb-19	1-hr TSP	08:20	50	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	27-Feb-19	1-hr TSP	09:20	48	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	27-Feb-19	1-hr TSP	10:20	41	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	01-Feb-19	1-hr TSP	09:52	42	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	01-Feb-19	1-hr TSP	10:52	40	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	01-Feb-19	1-hr TSP	11:52	38	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	04-Feb-19	1-hr TSP	08:07	93	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	04-Feb-19	1-hr TSP	09:07	99	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	04-Feb-19	1-hr TSP	10:07	80	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	09-Feb-19	1-hr TSP	09:48	37	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	09-Feb-19	1-hr TSP	10:48	56	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	09-Feb-19	1-hr TSP	11:48	49	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	15-Feb-19	1-hr TSP	10:03	27	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	15-Feb-19	1-hr TSP	11:03	26	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	15-Feb-19	1-hr TSP	12:03	24	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	21-Feb-19	1-hr TSP	10:05	58	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	21-Feb-19	1-hr TSP	11:05	47	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	21-Feb-19	1-hr TSP	12:05	37	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	27-Feb-19	1-hr TSP	14:14	43	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	27-Feb-19	1-hr TSP	15:14	48	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	27-Feb-19	1-hr TSP	16:14	71	µg/m^3
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	02-Feb-19	24-hr TSP	08:00	74	µg/m^3
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	08-Feb-19	24-hr TSP	12:10	62	µg/m^3
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	12-Feb-19	24-hr TSP	08:00	35	µg/m^3
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	18-Feb-19	24-hr TSP	08:00	36	µg/m^3
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	22-Feb-19	24-hr TSP	08:00	87	µg/m^3
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	28-Feb-19	24-hr TSP	08:00	60	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	01-Feb-19	24-hr TSP	08:56	74	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	04-Feb-19	24-hr TSP	10:23	50	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	09-Feb-19	24-hr TSP	13:58	55	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	15-Feb-19	24-hr TSP	08:19	46	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	21-Feb-19	24-hr TSP	08:16	45	µg/m^3
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	27-Feb-19	24-hr TSP	10:09	84	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	01-Feb-19	24-hr TSP	09:55	109	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	04-Feb-19	24-hr TSP	12:20	58	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	09-Feb-19	24-hr TSP	14:17	60	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	15-Feb-19	24-hr TSP	10:09	74	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	21-Feb-19	24-hr TSP	10:09	84	µg/m^3
HKBCF	HY/2013/04	AMS7B 3RS Site Office	27-Feb-19	24-hr TSP	14:12	76	µg/m^3

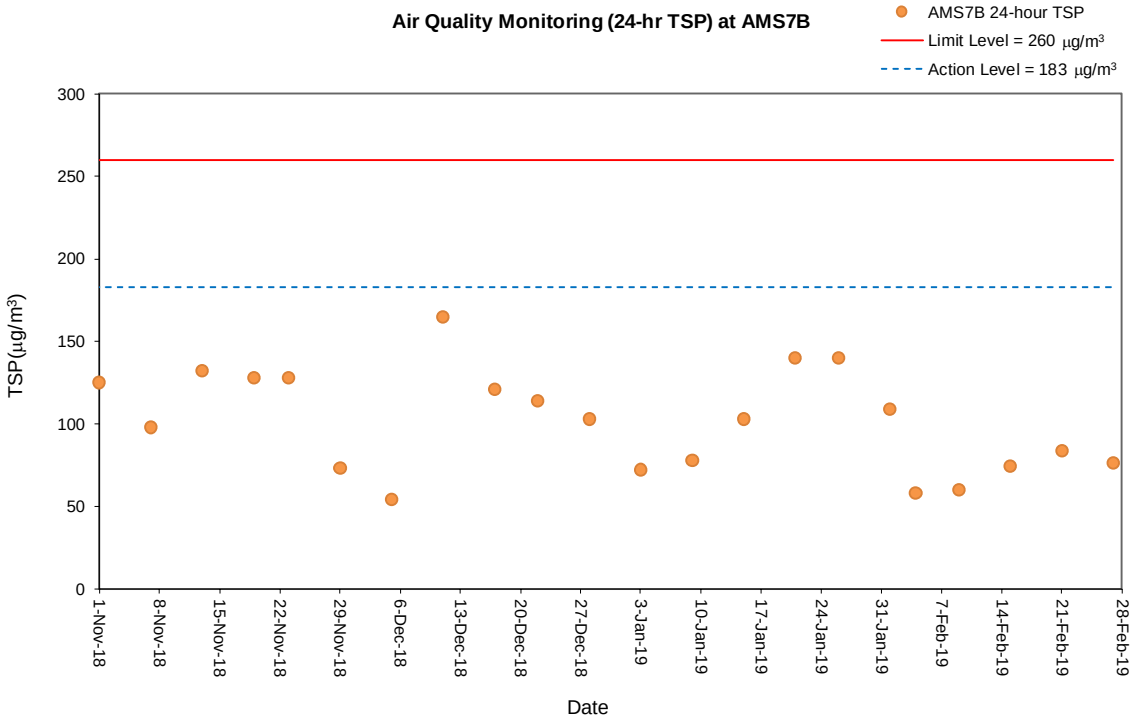

Air Quality Monitoring (1-hr TSP) at AMS2
AMS2 1-hour TSP
Limit Level = 500 μg/m³
Action Level = 374 μg/m³
TSP(μg/m³)
600
500
400
300
200
100
0
1-Nov-18
8-Nov-18
15-Nov-18
22-Nov-18
29-Nov-18
6-Dec-18
13-Dec-18
20-Dec-18
27-Dec-18
3-Jan-19
10-Jan-19
17-Jan-19
24-Jan-19
31-Jan-19
7-Feb-19
14-Feb-19
21-Feb-19
28-Feb-19
Date


Air Quality Monitoring (1-hr TSP) at AMS3C
AMS3C 1-hour TSP
Limit Level = 500 μg/m³
Action Level = 368 μg/m³
TSP(μg/m³)
600
500
400
300
200
100
0
1-Nov-18
8-Nov-18
15-Nov-18
22-Nov-18
29-Nov-18
6-Dec-18
13-Dec-18
20-Dec-18
27-Dec-18
3-Jan-19
10-Jan-19
17-Jan-19
24-Jan-19
31-Jan-19
7-Feb-19
14-Feb-19
21-Feb-19
28-Feb-19
Date


Air Quality Monitoring (1-hr TSP) at AMS7B
AMS7B 1-hour TSP
Limit Level = 500 μg/m³
Action Level = 370 μg/m³
TSP(μg/m³)
600
500
400
300
200
100
0
1-Nov-18
8-Nov-18
15-Nov-18
22-Nov-18
29-Nov-18
6-Dec-18
13-Dec-18
20-Dec-18
27-Dec-18
3-Jan-19
10-Jan-19
17-Jan-19
24-Jan-19
31-Jan-19
7-Feb-19
14-Feb-19
21-Feb-19
28-Feb-19
Date


Air Quality Monitoring (24-hr TSP) at AMS2
AMS2 24-hour TSP
Limit Level = 260 μg/m³
Action Level = 176 μg/m³
TSP(μg/m³)
300
250
200
150
100
50
0
1-Nov-18
8-Nov-18
15-Nov-18
22-Nov-18
29-Nov-18
6-Dec-18
13-Dec-18
20-Dec-18
27-Dec-18
3-Jan-19
10-Jan-19
17-Jan-19
24-Jan-19
31-Jan-19
7-Feb-19
14-Feb-19
21-Feb-19
28-Feb-19
Date


Air Quality Monitoring (24-hr TSP) at AMS3C
AMS3C 24-hour TSP
Limit Level = 260 μg/m³
Action Level = 167 μg/m³
TSP(μg/m³)
300
250
200
150
100
50
0
1-Nov-18
8-Nov-18
15-Nov-18
22-Nov-18
29-Nov-18
6-Dec-18
13-Dec-18
20-Dec-18
27-Dec-18
3-Jan-19
10-Jan-19
17-Jan-19
24-Jan-19
31-Jan-19
7-Feb-19
14-Feb-19
21-Feb-19
28-Feb-19
Date

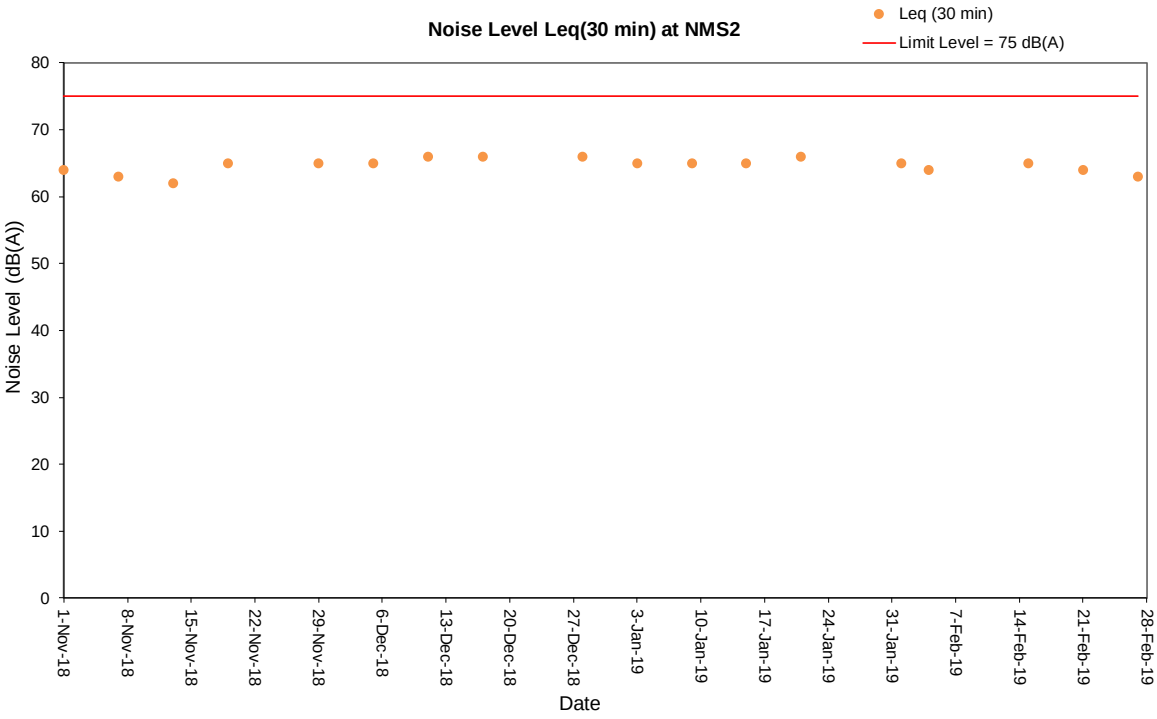

Air Quality Monitoring (24-hr TSP) at AMS7B
AMS7B 24-hour TSP
Limit Level = 260 μg/m³
Action Level = 183 μg/m³
TSP(μg/m³)
300
250
200
150
100
50
0
1-Nov-18
8-Nov-18
15-Nov-18
22-Nov-18
29-Nov-18
6-Dec-18
13-Dec-18
20-Dec-18
27-Dec-18
3-Jan-19
10-Jan-19
17-Jan-19
24-Jan-19
31-Jan-19
7-Feb-19
14-Feb-19
21-Feb-19
28-Feb-19
Date

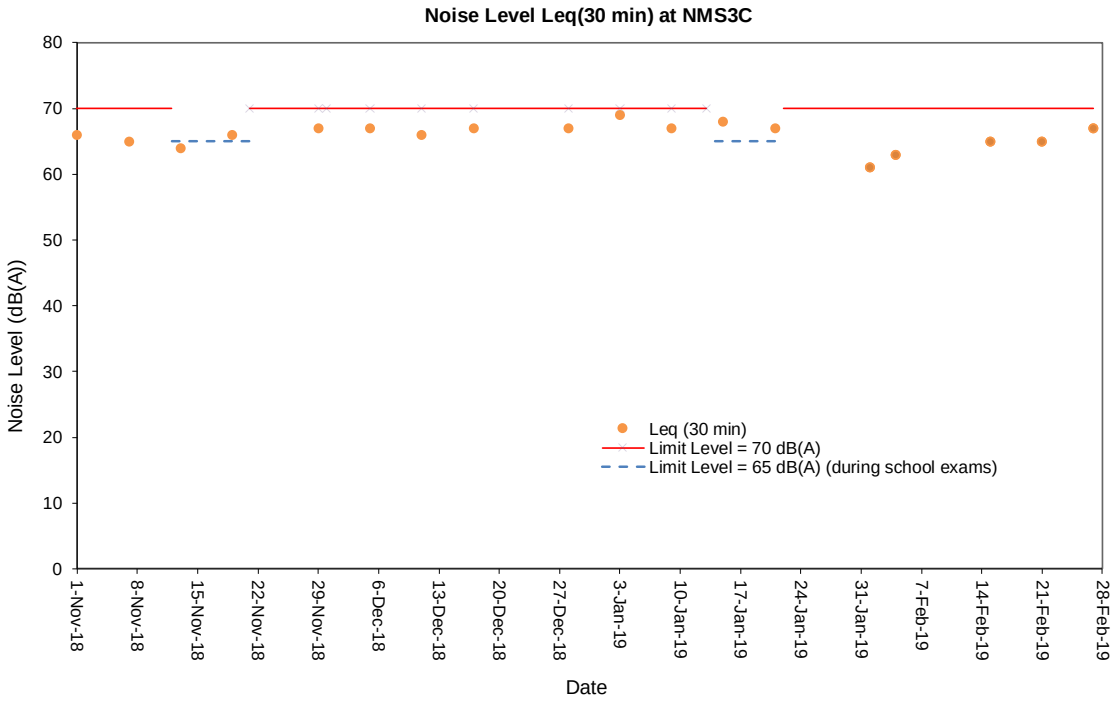
Contract No. HY/2013/04 HZMB HKBCF -
Infrastructure Works (Stage II) - Southern Portion

Noise Monitoring Data

Project	Contract	Date	Station	Start Time	Noise Level for 30 min, dB(A)			Weather	Wind Speed, m/s	Facade / Free Field	Limit Level, dB(A)
					L_{eq}	L_{10}	L_{90}				
HKBCF	HY/2013/04	01-Feb-19	NMS2 Seaview Crescent	10:46	65	69	61	Cloudy	<5	Facade	75
HKBCF	HY/2013/04	04-Feb-19	NMS2 Seaview Crescent	08:54	64	67	59	Sunny	<5	Facade	75
HKBCF	HY/2013/04	15-Feb-19	NMS2 Seaview Crescent	11:03	65	68	61	Sunny	<5	Facade	75
HKBCF	HY/2013/04	21-Feb-19	NMS2 Seaview Crescent	11:05	64	66	60	Sunny	<5	Facade	75
HKBCF	HY/2013/04	27-Feb-19	NMS2 Seaview Crescent	11:31	63	66	59	Sunny	<5	Facade	75
HKBCF	HY/2013/04	01-Feb-19	NMS3C Ying Tung Estate Refuse Collection Point	08:04	61	65	53	Cloudy	<5	Free Field *	70
HKBCF	HY/2013/04	04-Feb-19	NMS3C Ying Tung Estate Refuse Collection Point	10:36	63	66	59	Sunny	<5	Free Field *	70
HKBCF	HY/2013/04	15-Feb-19	NMS3C Ying Tung Estate Refuse Collection Point	08:29	65	68	61	Sunny	<5	Free Field *	70
HKBCF	HY/2013/04	21-Feb-19	NMS3C Ying Tung Estate Refuse Collection Point	08:30	65	67	62	Sunny	<5	Free Field *	70
HKBCF	HY/2013/04	27-Feb-19	NMS3C Ying Tung Estate Refuse Collection Point	08:45	67	71	62	Sunny	<5	Free Field *	70

Remark: * Free field measurent; noise level shown includes +3dB(A) correction factor





Remark: The measured noise level on 19 November 2018 at NMS3C exceeded the noise Limit Level of 65 dB(A) during examination period at Ho Yu College but it was below the baseline level. Therefore, it is not considered as an exceedance. As such the Event and Action Plan was not triggered.

The measured noise levels recorded at NMS3C on 15 January 2019 and 21 January 2019 were 68.4 dB(A) and 66.7 dB(A) respectively, which exceeded the noise level of 65dB(A) during examination period and were higher than the baseline level of 66.3 dB(A). Therefore, baseline correction was carried out and the corrected noise levels which solely represent the noise level of construction works were 64.2 dB(A) and 56.1 dB(A) respectively, therefore there was no exceedance after correction. As such the Event and Action Plan was not triggered.

Appendix L. Dolphin Monitoring Results

CONTRACT NO. HY/2013/04
Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Infrastructure Works Stage II (Southern Portion) Dolphin Monthly Monitoring

Monthly Progress Report (February 2019)

Submitted to Mott MacDonald Hong Kong Limited &
China State Construction Engineering (Hong Kong) Limited

Submitted by
Samuel K.Y. Hung, Ph.D.,
Hong Kong Cetacean Research Project

1 March 2019

1. Introduction

1.1. For the Hong Kong-Zhuhai-Macao Bridge (HZMB) Hong Kong Boundary Crossing Facilities (HKBCF), the construction of the Infrastructure Works Stage II (Southern Portion) requires the contractor (i.e. China State Construction Engineering (Hong Kong) Limited) and the associated environmental team (Mott MacDonald Hong Kong Limited) to implement the Environmental Monitoring and Audit (EM&A) programme.

1.2. According to the HKBCF EM&A Manual, monthly line-transect vessel surveys for Chinese White Dolphins should be conducted to cover the Northwest (NWL) and Northeast Lantau (NEL) survey areas, which should be the same as in AFCD annual marine mammal monitoring programme. However, as such construction-phase monitoring surveys have been undertaken by the HKLR03 project in the same areas (i.e. NWL and NEL), a combined monitoring approach is recommend by the Highways Department, that the HKBCF EM&A project should utilize the monitoring data collected by HKLR03 project to avoid any redundancy in monitoring effort.

1.3. In October 2018, the Director of Hong Kong Cetacean Research Project (HKCRP), Dr. Samuel Hung, has been appointed by the environmental team as the dolphin specialist for the HKBCF EM&A project. He is responsible for the dolphin monitoring study,

including the collection and collation of dolphin monitoring data from the HKLR03 project to examine any potential impacts of HKBCF constructions works on the dolphins. From the monitoring results, any changes in dolphin occurrence within the study area will be reviewed for possible causes, and appropriate actions and additional mitigation measures will be recommended as necessary.

1.4. The present monthly progress report of this HKBCF construction-phase dolphin monitoring programme is submitted to the environmental team and the contractor, summarizing the results of the survey findings during the month of February 2019 by utilizing the survey data collected from the HKLR03 project.

2. Monitoring Methodology

2.1. Vessel-based Line-transect Survey

2.1.1. According to the requirement of the updated EM&A manual, the dolphin monitoring programme should cover all transect lines in NEL and NWL survey areas (see Figure 1) twice per month throughout the entire construction period. The co-ordinates of all transect lines are shown in Table 1.

Table 1 Co-ordinates of transect lines

Line No.		Easting	Northing		Line No.		Easting	Northing
1	Start Point	804671	815456		13	Start Point	816506	819480
1	End Point	804671	831404		13	End Point	816506	824859
2	Start Point	805476	820800		14	Start Point	817537	820220
2	End Point	805476	826654		14	End Point	817537	824613
3	Start Point	806464	821150		15	Start Point	818568	820735
3	End Point	806464	822911		15	End Point	818568	824433
4	Start Point	807518	821500		16	Start Point	819532	821420
4	End Point	807518	829230		16	End Point	819532	824209
5	Start Point	808504	821850		17	Start Point	820451	822125
5	End Point	808504	828602		17	End Point	820451	823671
6	Start Point	809490	822150		18	Start Point	821504	822371

6	End Point	809490	825352		18	End Point	821504	823761
7	Start Point	810499	822000		19	Start Point	822513	823268
7	End Point	810499	824613		19	End Point	822513	824321
8	Start Point	811508	821123		20	Start Point	823477	823402
8	End Point	811508	824254		20	End Point	823477	824613
9	Start Point	812516	821303		21	Start Point	805476	827081
9	End Point	812516	824254		21	End Point	805476	830562
10	Start Point	813525	821176		22	Start Point	806464	824033
10	End Point	813525	824657		22	End Point	806464	829598
11	Start Point	814556	818853		23	Start Point	814559	821739
11	End Point	814556	820992		23	End Point	814559	824768
12	Start Point	815542	818807		24	Start Point	805476	815900
12	End Point	815542	824882		24	End Point	805476	819100

2.1.2. The HKLR03 survey team used standard line-transect methods (Buckland et al. 2001) to conduct the systematic vessel surveys, and followed the same technique of data collection that has been adopted over the last 20 years of marine mammal monitoring surveys in Hong Kong developed by HKCRP (see Hung 2017, 2018). For each monitoring vessel survey, a 15-m inboard vessel with an open upper deck (about 4.5 m above water surface) was used to make observations from the flying bridge area.

2.1.3. Two experienced observers (a data recorder and a primary observer) made up the on-effort survey team, and the survey vessel transited different transect lines at a constant speed of 13-15 km per hour. The data recorder searched with unaided eyes and filled out the datasheets, while the primary observer searched for dolphins and porpoises continuously through 7 x 50 *Fuijnon* marine binoculars. Both observers searched the sea ahead of the vessel, between 270^{o} and 90^{o} (in relation to the bow, which is defined as 0^{o}). One to two additional experienced observers were available on the boat to work in shift (i.e. rotate every 30 minutes) in order to minimize fatigue of the survey team members. All observers were experienced in small cetacean survey techniques and identifying local cetacean species.

2.1.4. During on-effort survey periods, the survey team recorded effort data including time, position (latitude and longitude), weather conditions (Beaufort sea state and visibility),

and distance traveled in each series (a continuous period of search effort) with the assistance of a handheld GPS (*Garmin eTrex Legend*).

2.1.5. Data including time, position and vessel speed were also automatically and continuously logged by handheld GPS throughout the entire survey for subsequent review.

2.1.6. When dolphins were sighted, the survey team would end the survey effort, and immediately record the initial sighting distance and angle of the dolphin group from the survey vessel, as well as the sighting time and position. Then the research vessel was diverted from its course to approach the animals for species identification, group size estimation, assessment of group composition, and behavioural observations. The perpendicular distance (PSD) of the dolphin group to the transect line was later calculated from the initial sighting distance and angle.

2.1.7. Survey effort being conducted along the parallel transect lines that were perpendicular to the coastlines (as indicated in Figure 1) was labeled as "primary" survey effort, while the survey effort conducted along the connecting lines between parallel lines was labeled as "secondary" survey effort. According to HKCRP long-term dolphin monitoring data, encounter rates of Chinese White Dolphins deduced from effort and sighting data collected along primary and secondary lines were similar in NEL and NWL survey areas. Therefore, both primary and secondary survey effort were presented as on-effort survey effort in this report.

2.1.8. Encounter rates of Chinese White Dolphins (number of on-effort sightings per 100 km of survey effort and number of dolphins from all on-effort sightings per 100 km of survey effort) were calculated in NEL and NWL survey areas in relation to the amount of survey effort conducted during each month of monitoring survey. Only data collected under Beaufort 3 or below condition would be used for encounter rate analysis. Dolphin encounter rates were calculated using primary survey effort alone, as well as the combined survey effort from both primary and secondary lines.

2.2. Photo-identification Work

2.2.1. When a group of Chinese White Dolphins were sighted during the line-transect survey, the HKLR03 survey team would end effort and approach the group slowly from the side and behind to take photographs of them. Every attempt was made to photograph every dolphin in the group, and even photograph both sides of the dolphins, since the colouration and markings on both sides may not be symmetrical.

2.2.2. A professional digital camera (*Canon* EOS 7D model), equipped with long telephoto

lenses (100-400 mm zoom), were available on board for researchers to take sharp, close-up photographs of dolphins as they surfaced. The images were shot at the highest available resolution and stored on Compact Flash memory cards for downloading onto a computer.

2.2.3. All digital images taken in the field were first examined, and those containing potentially identifiable individuals were sorted out. These photographs would then be examined in greater detail, and were carefully compared to the existing Chinese White Dolphin photo-identification catalogue maintained by HKCRP since 1995.

2.2.4. Chinese White Dolphins can be identified by their natural markings, such as nicks, cuts, scars and deformities on their dorsal fin and body, and their unique spotting patterns were also used as secondary identifying features (Jefferson 2000).

2.2.5. All photographs of each individual were then compiled and arranged in chronological order, with data including the date and location first identified (initial sighting), re-sightings, associated dolphins, distinctive features, and age classes entered into a computer database.

3. Monitoring Results

3.1. Vessel-based Line-transect Survey

3.1.1. Under the HKLR03 dolphin monitoring programme, two sets of systematic line-transect vessel surveys were conducted on the 1st, 14th, 20th, 25th and 26th of February 2019, to cover all transect lines in NWL and NEL survey areas twice during the monitoring month. The survey routes of each survey day are presented in Figures 2-6.

3.1.2. From the two sets of HKLR03 surveys conducted in February 2019, 273.04 km of survey effort was collected, with 94.6% of the total survey effort being conducted under favourable weather conditions (i.e. Beaufort Sea State 3 or below with good visibility) (Appendix I).

3.1.3. Among the NEL and NWL survey areas, 107.30 km and 165.74 km of survey effort were conducted respectively. Moreover, the total survey effort conducted on primary and secondary lines were 195.52 km and 77.52 km respectively (Appendix I).

3.1.4. Six groups of 18 Chinese White Dolphins were sighted during the two sets of HKLR03 monitoring surveys conducted in February 2019 (Appendix II). All six dolphin groups

were sighted in NWL, while no dolphin was sighted at all in NEL. Notably, all six groups were sighted during on-effort search, and four of them were made on primary lines (Appendix II). None of them was associated with any operating fishing vessel.

3.1.5. Distribution of dolphin sightings made in this monitoring month is shown in Figure 7. The six dolphin groups were sparsely sighted in the western end of North Lantau region with apparent concentration, and their locations include the waters near Lung Kwu Chau, between Lung Kwu Chau and Sha Chau, near Pillar Point, and to the west and north of the third runway expansion work site (Figure 7). All sightings were also located far away from the HKBCF work site.

3.1.6. From the HKLR03 surveys conducted in February 2019, the encounter rates of Chinese White Dolphins deduced from the survey effort and on-effort sighting data made under favourable conditions (Beaufort 3 or below) are shown in Tables 2 & 3.

Table 2. Dolphin encounter rates deduced from the two sets of HKLR03 surveys (two surveys in each set) conducted in February 2019 in Northeast (NEL) and Northwest Lantau (NWL)

		Encounter rate (STG) (no. of on-effort dolphin sightings per 100 km of survey effort)	**Encounter rate (ANI)** (no. of dolphins from all on-effort sightings per 100 km of survey effort)
		Primary Lines Only	**Primary Lines Only**
NEL	Set 1: February 1st / 14th	0.0	0.0
	Set 2: February 20th/ 25th/26th	0.0	0.0
NWL	Set 1: February 1st / 14th	3.9	7.7
	Set 2: February 20th/ 25th/26th	3.3	13.2

Table 3. Overall dolphin encounter rates (sightings per 100 km of survey effort) from the two sets of HKLR03 surveys conducted in February 2019 on primary lines only as well as both primary lines and secondary lines in Northeast (NEL) and Northwest Lantau (NWL)

	Encounter rate (STG) (no. of on-effort dolphin sightings per 100 km of survey effort)		**Encounter rate (ANI)** (no. of dolphins from all on-effort sightings per 100 km of survey effort)	
	Primary Lines Only	**Both Primary and Secondary Lines**	**Primary Lines Only**	**Both Primary and Secondary Lines**
Northeast Lantau	0.0	0.0	0.0	0.0
Northwest Lantau	3.6	3.8	10.7	11.5

3.1.7. The average dolphin group size recorded during the February's HKLR03 surveys was 3.0 individuals per group, with four sightings composed of small groups of 1-3 animals only and two sighting with medium-sized group of 4-5 animals. Such average was similar to the ones recorded in previous monitoring months.

3.2. Photo-identification Work

3.2.1. During the two sets of HKLR03 surveys conducted in February 2019, eleven known individual dolphins were sighted 16 times in total (Appendices III and IV). Most of these identified individuals were re-sighted only once, but three individuals (CH34, NL136 and NL202) were re-sighted twice, while NL123 were sighted thrice.

3.2.2. Notably, none of the identified individuals were sighted with their young calves during their re-sightings in the present monitoring month.

4. Conclusion

4.1. During this month of dolphin monitoring, no adverse impact from the construction activities of the HKBCF on Chinese White Dolphins was noticeable from general observations.

4.2. Due to monthly variation in dolphin occurrence within the study area, it would be more appropriate to draw conclusion on whether any impacts on dolphins have been detected related to the construction activities of the HKBCF in the quarterly EM&A reports, where comparison on distribution, group size and encounter rates of dolphins between the quarterly impact monitoring period and baseline monitoring period will be made.

5. References

Buckland, S. T., Anderson, D. R., Burnham, K. P., Laake, J. L., Borchers, D. L., and Thomas, L. 2001. Introduction to distance sampling: estimating abundance of biological populations. Oxford University Press, London.

Hung, S. K. 2017. Monitoring of Marine Mammals in Hong Kong waters: final report (2016-17). An unpublished report submitted to the Agriculture, Fisheries and Conservation Department, 162 pp.

Hung, S. K. 2018. Monitoring of Marine Mammals in Hong Kong waters: final report

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Jefferson, T. A. 2000. Population biology of the Indo-Pacific hump-backed dolphin in Hong Kong waters. Wildlife Monographs 144:1-65.

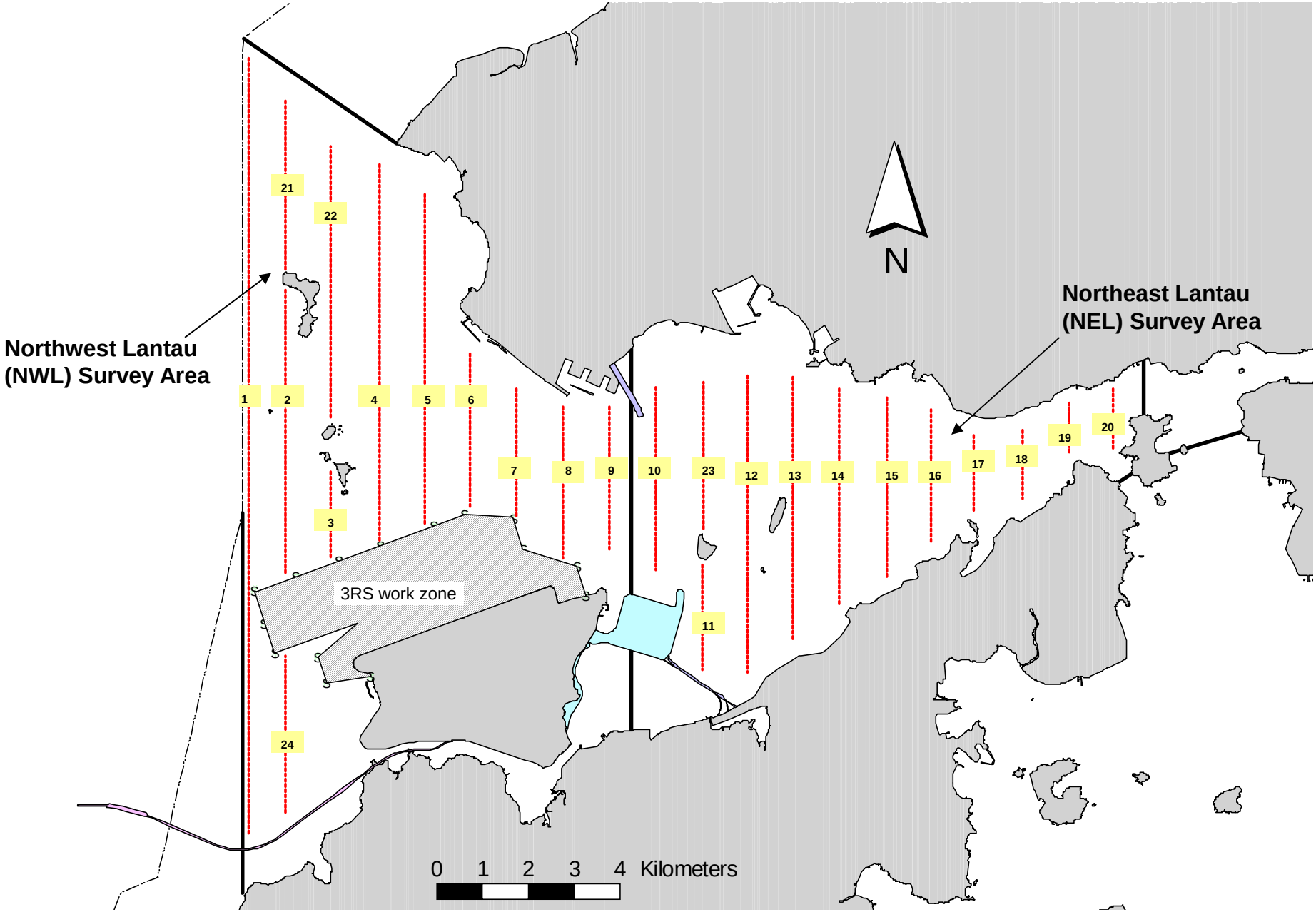

Figure 1. Transect Line Layout in Northwest and Northeast Lantau Survey Areas

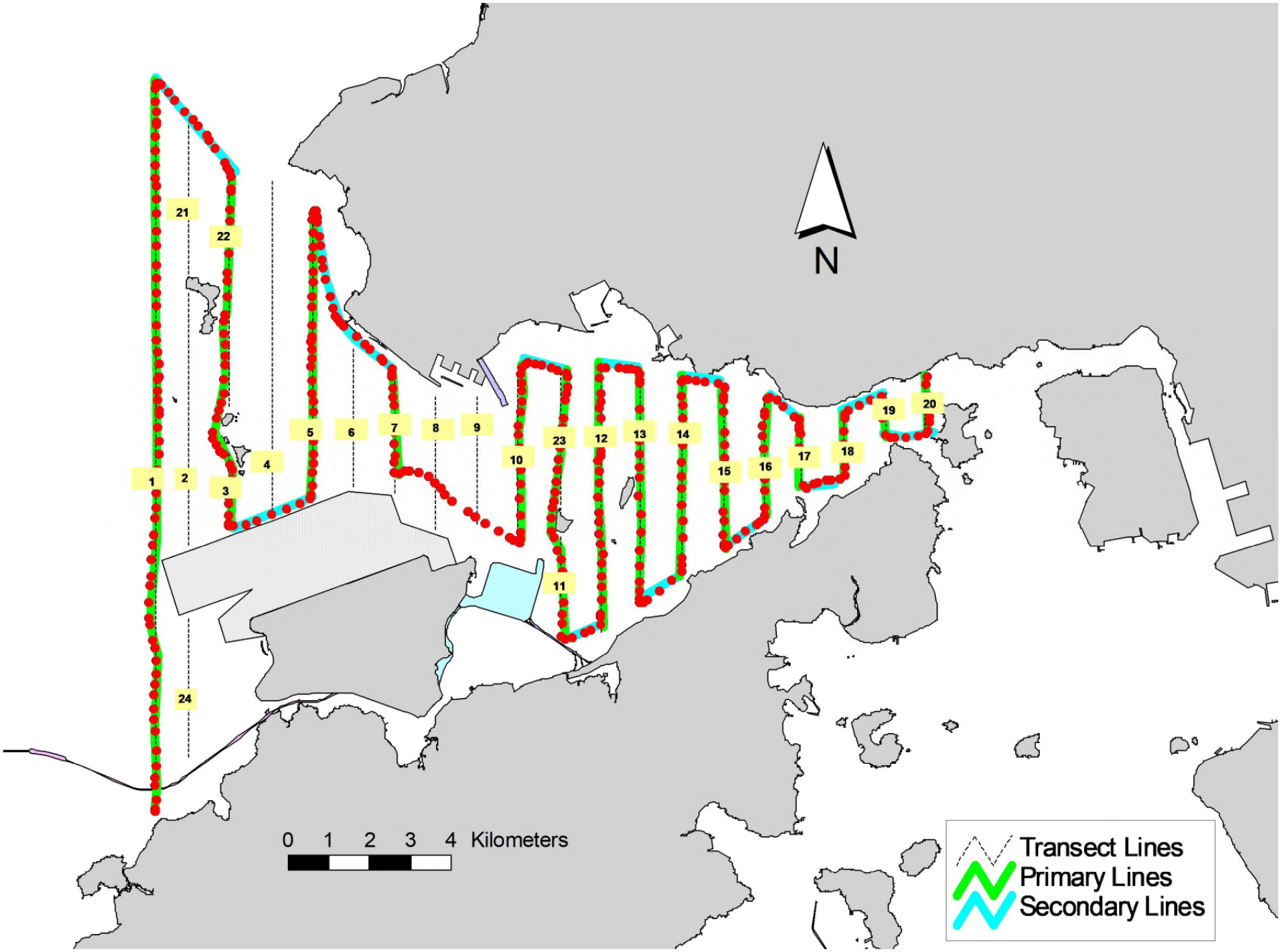

Figure 2. Survey Route on February 1st, 2019 (from HKLR03 project)

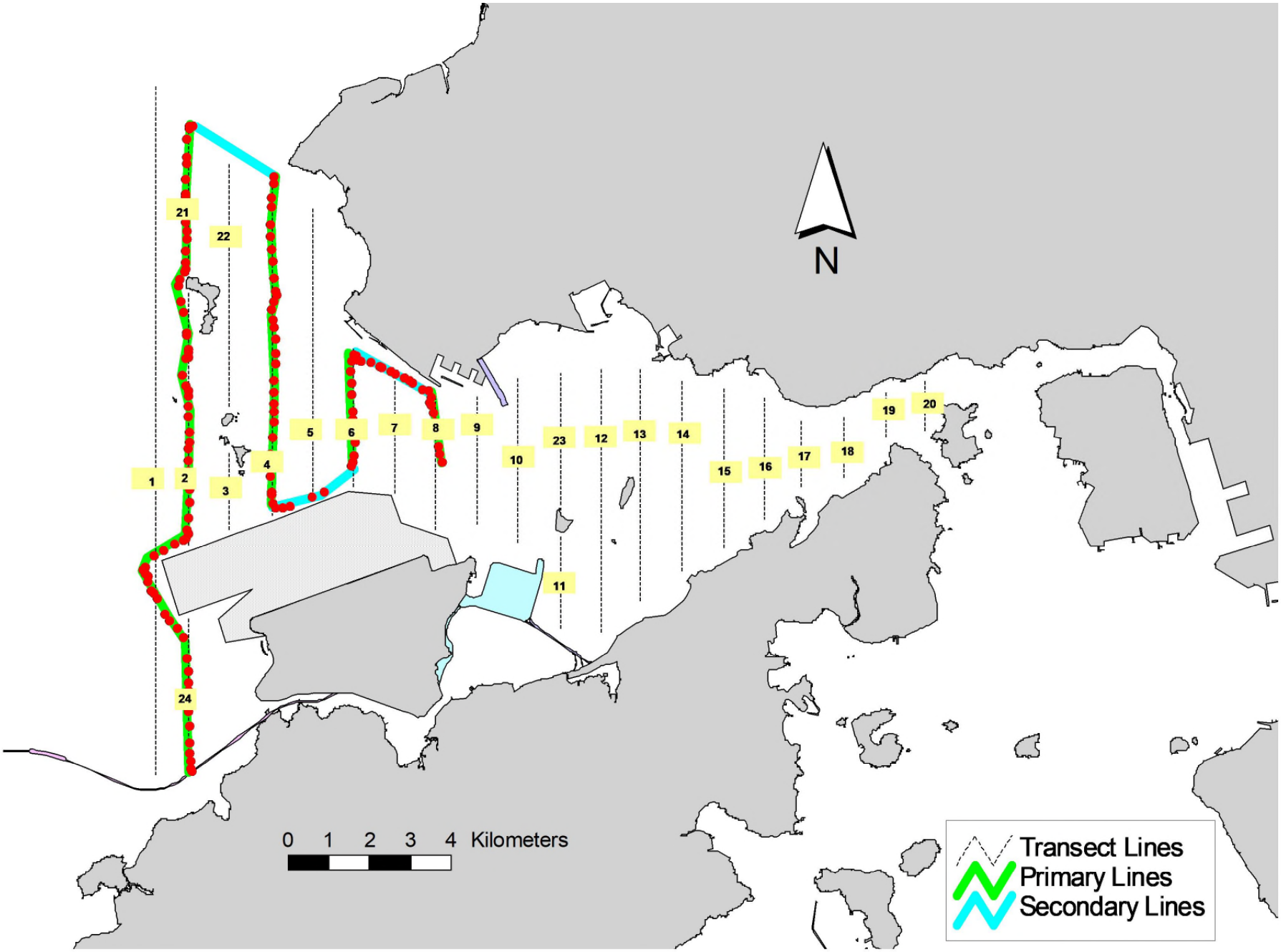

Figure 3. Survey Route on February 14th, 2019 (from HKLR03 project)

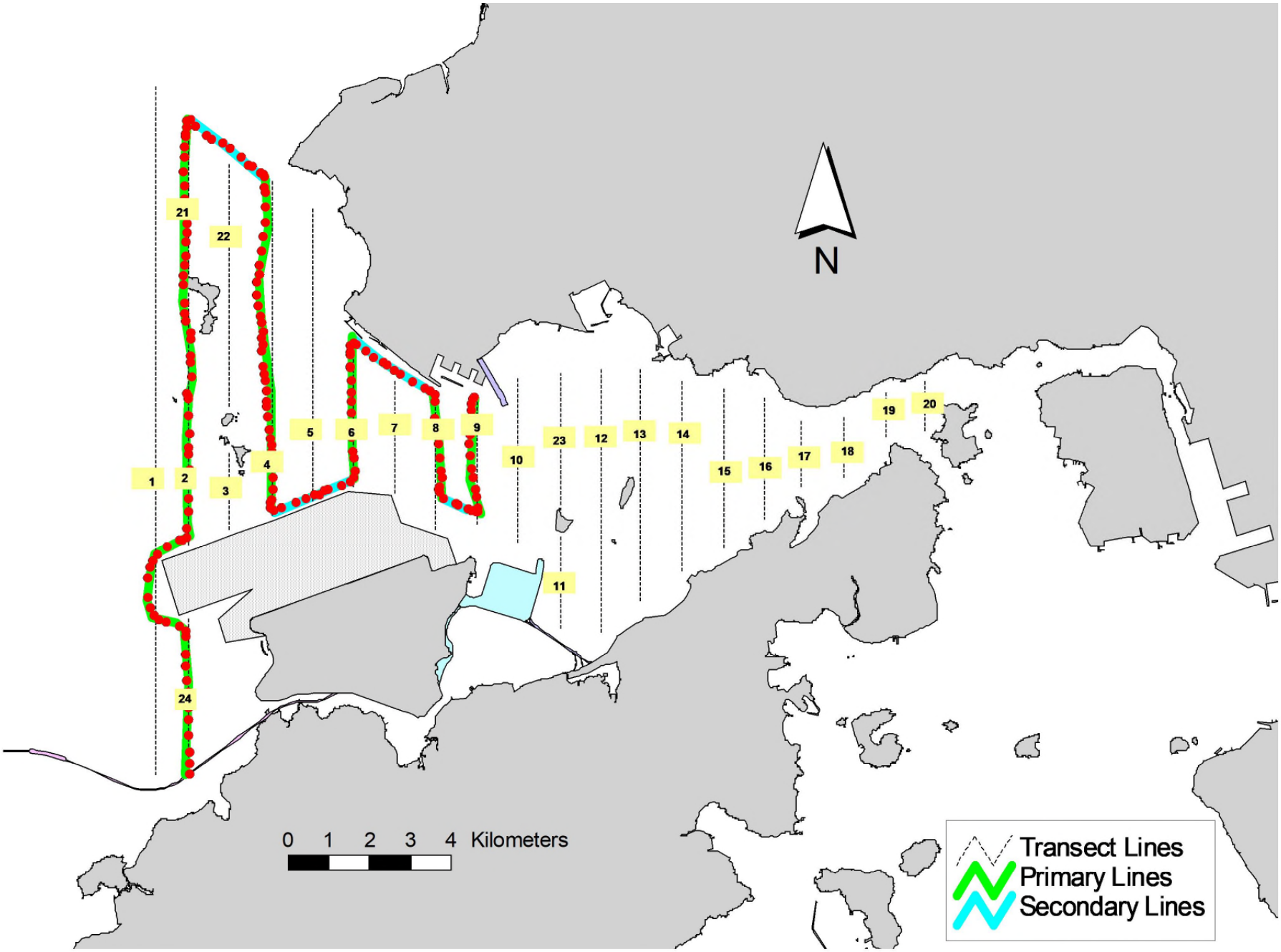

Figure 4. Survey Route on February 20th, 2019 (from HKLR03 project)

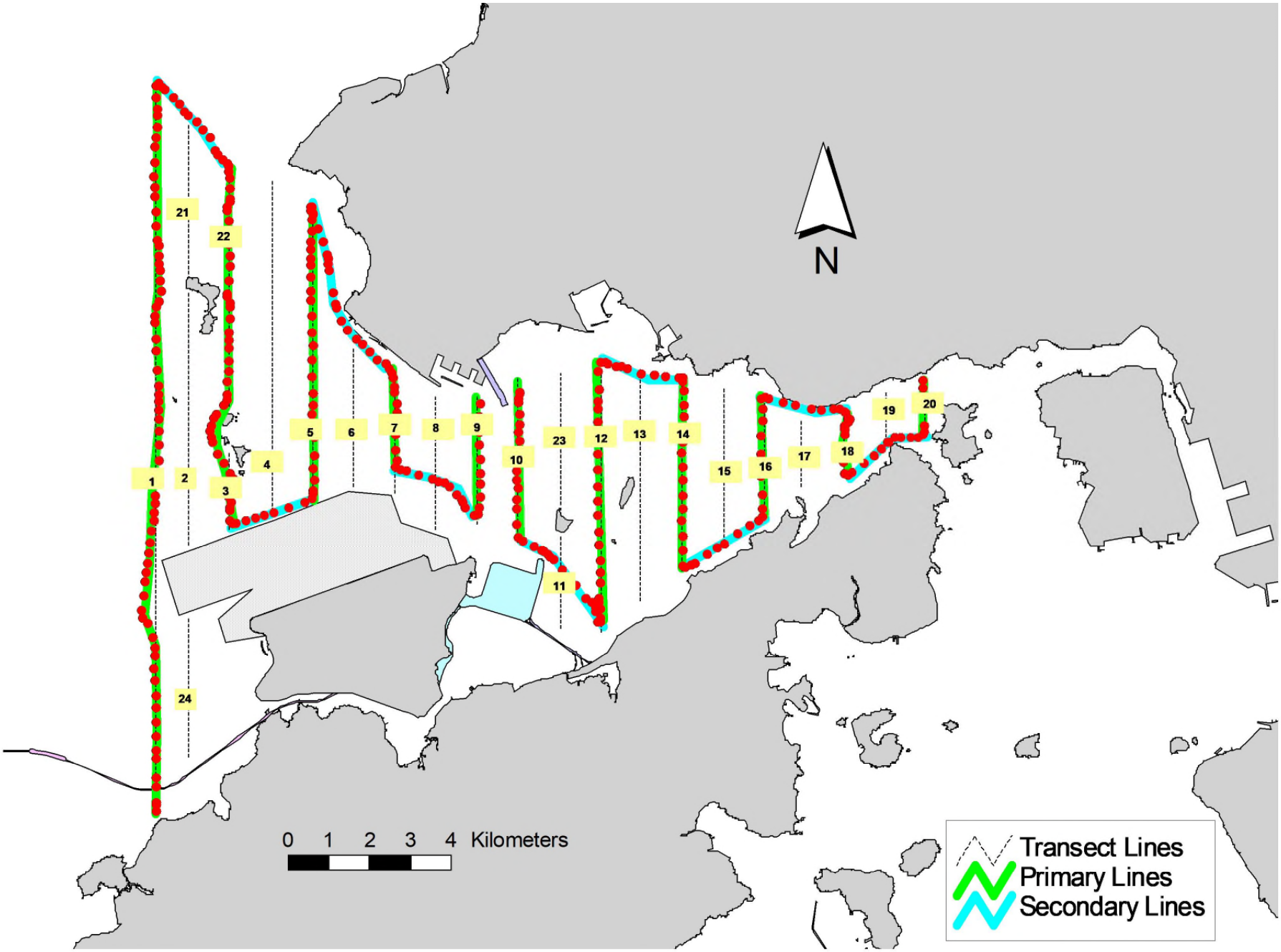

Figure 5. Survey Route on February 25th, 2019 (from HKLR03 project)

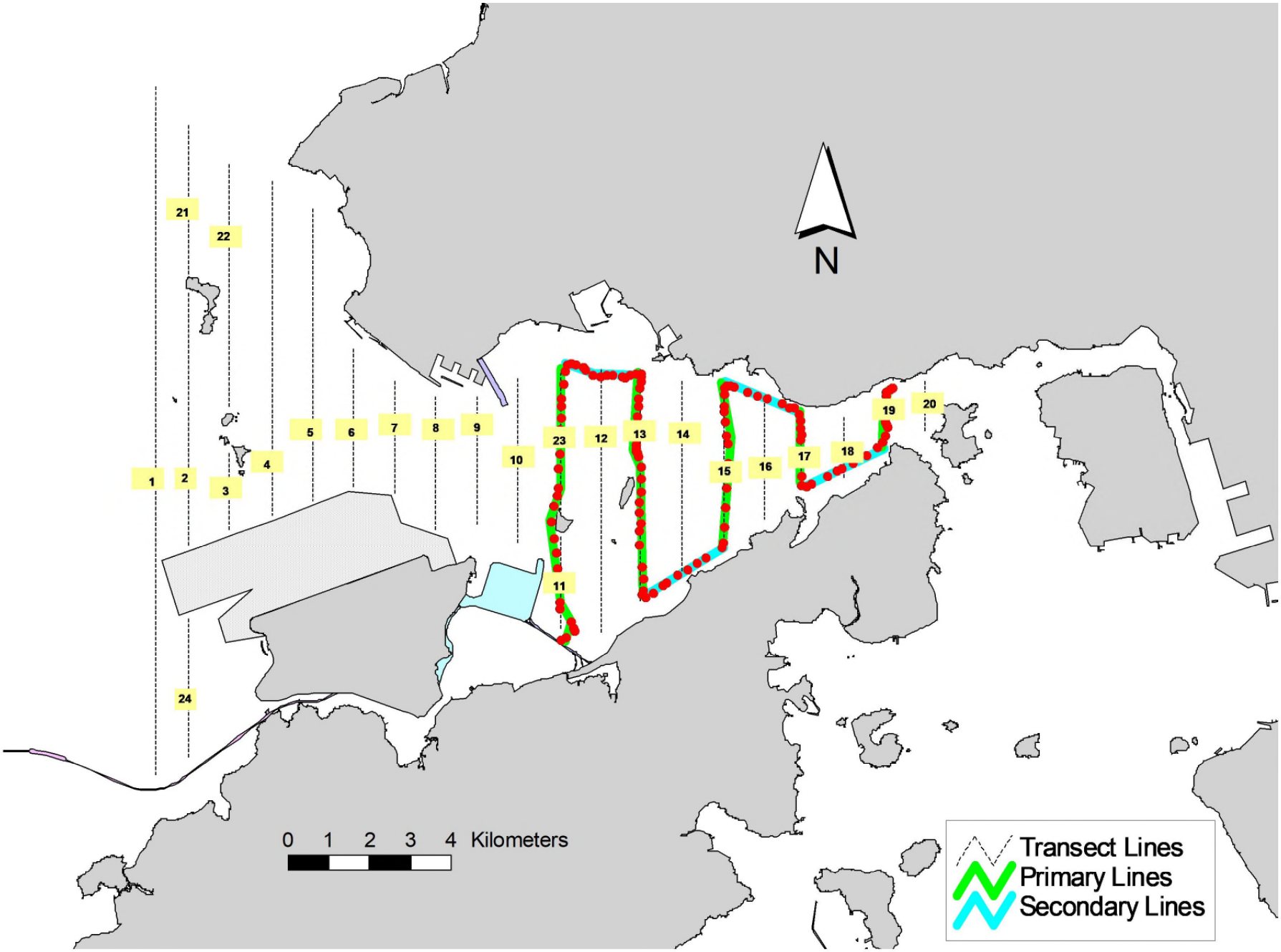

Figure 6. Survey Route on February 26th, 2019 (from HKLR03 project)

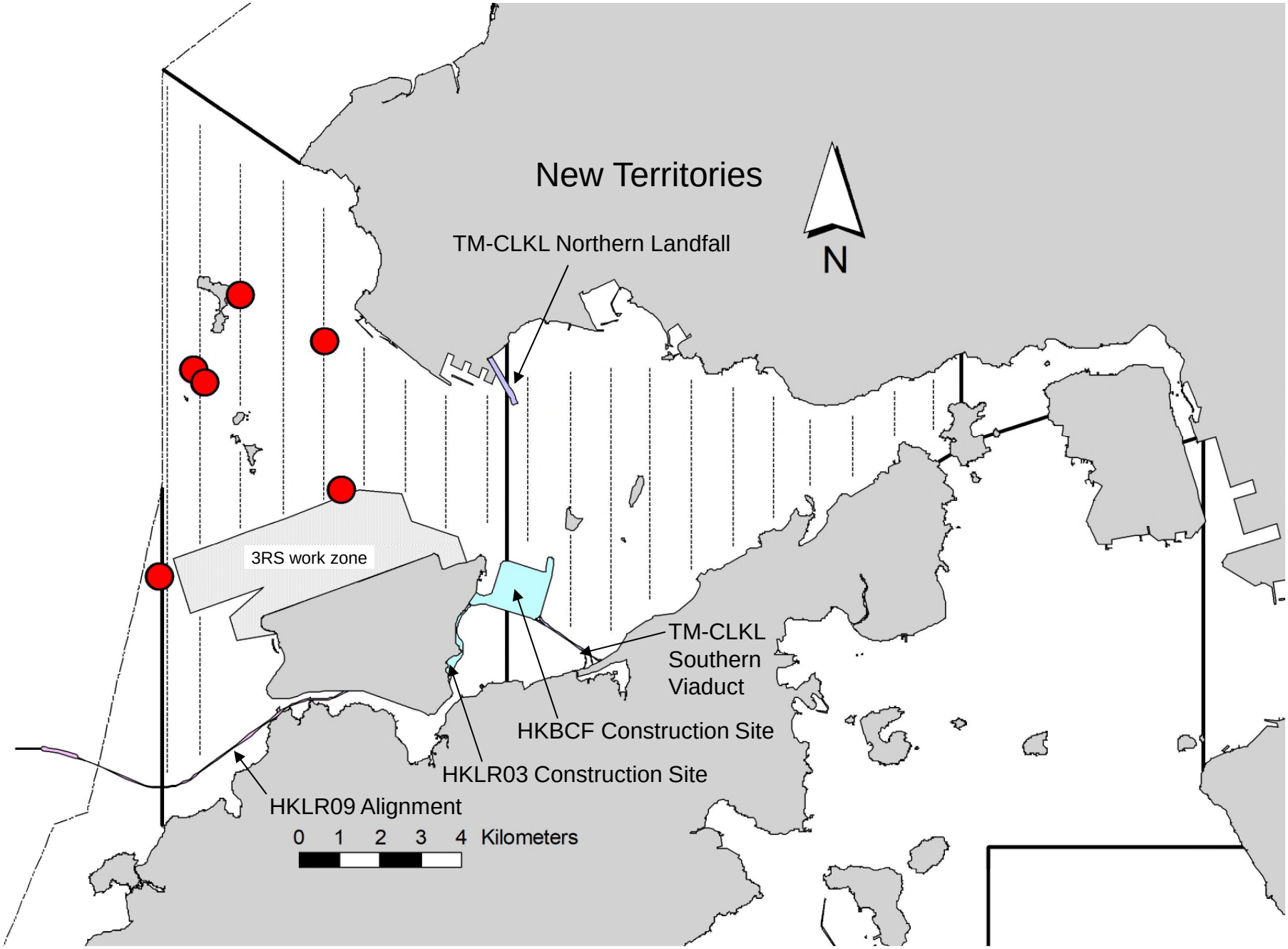

Figure 7. Distribution of Chinese White Dolphin Sightings during February 2019 HKLR03 Monitoring Surveys

Appendix I. HKLR03 Survey Effort Database (February 2019)

(Abbreviations: BEAU = Beaufort Sea State; P = Primary Line Effort; S = Secondary Line Effort)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
1-Feb-19	NW LANTAU	2	6.59	WINTER	STANDARD36826	HKLR	P
1-Feb-19	NW LANTAU	3	20.70	WINTER	STANDARD36826	HKLR	P
1-Feb-19	NW LANTAU	4	5.70	WINTER	STANDARD36826	HKLR	P
1-Feb-19	NW LANTAU	1	1.06	WINTER	STANDARD36826	HKLR	S
1-Feb-19	NW LANTAU	2	5.60	WINTER	STANDARD36826	HKLR	S
1-Feb-19	NW LANTAU	3	4.30	WINTER	STANDARD36826	HKLR	S
1-Feb-19	NE LANTAU	1	2.60	WINTER	STANDARD36826	HKLR	P
1-Feb-19	NE LANTAU	2	33.86	WINTER	STANDARD36826	HKLR	P
1-Feb-19	NE LANTAU	1	2.30	WINTER	STANDARD36826	HKLR	S
1-Feb-19	NE LANTAU	2	10.14	WINTER	STANDARD36826	HKLR	S
14-Feb-19	NW LANTAU	2	11.58	WINTER	STANDARD36826	HKLR	P
14-Feb-19	NW LANTAU	3	12.95	WINTER	STANDARD36826	HKLR	P
14-Feb-19	NW LANTAU	4	3.30	WINTER	STANDARD36826	HKLR	P
14-Feb-19	NW LANTAU	2	1.76	WINTER	STANDARD36826	HKLR	S
14-Feb-19	NW LANTAU	3	7.76	WINTER	STANDARD36826	HKLR	S
20-Feb-19	NW LANTAU	2	15.35	WINTER	STANDARD36826	HKLR	P
20-Feb-19	NW LANTAU	3	12.38	WINTER	STANDARD36826	HKLR	P
20-Feb-19	NW LANTAU	2	7.25	WINTER	STANDARD36826	HKLR	S
20-Feb-19	NW LANTAU	3	5.06	WINTER	STANDARD36826	HKLR	S
25-Feb-19	NW LANTAU	2	27.52	WINTER	STANDARD36826	HKLR	P
25-Feb-19	NW LANTAU	3	5.53	WINTER	STANDARD36826	HKLR	P
25-Feb-19	NW LANTAU	2	11.35	WINTER	STANDARD36826	HKLR	S
25-Feb-19	NE LANTAU	1	4.41	WINTER	STANDARD36826	HKLR	P
25-Feb-19	NE LANTAU	2	15.20	WINTER	STANDARD36826	HKLR	P
25-Feb-19	NE LANTAU	1	6.35	WINTER	STANDARD36826	HKLR	S
25-Feb-19	NE LANTAU	2	5.24	WINTER	STANDARD36826	HKLR	S
26-Feb-19	NE LANTAU	3	12.70	WINTER	STANDARD36826	HKLR	P
26-Feb-19	NE LANTAU	4	3.51	WINTER	STANDARD36826	HKLR	P
26-Feb-19	NE LANTAU	5	1.64	WINTER	STANDARD36826	HKLR	P
26-Feb-19	NE LANTAU	3	8.80	WINTER	STANDARD36826	HKLR	S
26-Feb-19	NE LANTAU	4	0.55	WINTER	STANDARD36826	HKLR	S

Appendix II. HKLR03 Chinese White Dolphin Sighting Database (February 2019)

(Abberviations: STG# = Sighting Number; HRD SZ = Dolphin Herd Size; BEAU = Beaufort Sea State; PSD = Perpendicular Distance; BOAT ASSOC. = Fishing Boat Association; P/S: Sighting Made on Primary/Secondary Lines)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
1-Feb-19	1	1233	3	NW LANTAU	3	219	ON	HKLR	825495	808493	WINTER	NONE	P
14-Feb-19	1	1024	2	NW LANTAU	3	341	ON	HKLR	820043	804465	WINTER	NONE	S
14-Feb-19	2	1102	1	NW LANTAU	3	197	ON	HKLR	824826	805278	WINTER	NONE	P
14-Feb-19	3	1356	4	NW LANTAU	3	82	ON	HKLR	822050	808930	WINTER	NONE	S
20-Feb-19	1	1220	5	NW LANTAU	3	878	ON	HKLR	824548	805556	WINTER	NONE	P
25-Feb-19	1	1146	3	NW LANTAU	2	147	ON	HKLR	826584	806435	WINTER	NONE	P

Appendix III. Individual dolphins identified during HKLR03 monitoring surveys in February 2019

ID#	DATE	STG#	AREA
CH34	20/02/19	1	NW LANTAU
	25/02/19	1	NW LANTAU
NL98	25/02/19	1	NW LANTAU
NL123	01/02/19	1	NW LANTAU
	14/02/19	3	NW LANTAU
	20/02/19	1	NW LANTAU
NL136	20/02/19	1	NW LANTAU
	25/02/19	1	NW LANTAU
NL182	01/02/19	1	NW LANTAU
NL202	01/02/19	1	NW LANTAU
	20/02/19	1	NW LANTAU
NL321	14/02/19	3	NW LANTAU
NL331	14/02/19	1	NW LANTAU
WL17	14/02/19	3	NW LANTAU
WL243	14/02/19	1	NW LANTAU
WL281	20/02/19	1	NW LANTAU

Appendix IV. Photographs of Identified Individual Dolphins in February 2019 (HKLR03)

Appendix IV. (cont'd)

Appendix M. Wind Data

Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
01/02/2019	12:00 AM	0.4	SSE
01/02/2019	1:00 AM	0.4	S
01/02/2019	2:00 AM	0.9	N
01/02/2019	3:00 AM	0.4	NW
01/02/2019	4:00 AM	0.9	NNW
01/02/2019	5:00 AM	1.3	N
01/02/2019	6:00 AM	1.8	N
01/02/2019	7:00 AM	1.8	N
01/02/2019	8:00 AM	0.9	NE
01/02/2019	9:00 AM	1.8	NNE
01/02/2019	10:00 AM	0.9	NE
01/02/2019	11:00 AM	0.9	NE
01/02/2019	12:00 PM	1.3	NE
01/02/2019	1:00 PM	1.3	N
01/02/2019	2:00 PM	0.9	NE
01/02/2019	3:00 PM	0.9	NE
01/02/2019	4:00 PM	0.9	NE
01/02/2019	5:00 PM	0.9	NE
01/02/2019	6:00 PM	0.9	NE
01/02/2019	7:00 PM	0.9	NW
01/02/2019	8:00 PM	0.9	NW
01/02/2019	9:00 PM	1.3	NW
01/02/2019	10:00 PM	1.3	NW
01/02/2019	11:00 PM	1.3	SSE
02/02/2019	12:00 AM	1.8	E
02/02/2019	1:00 AM	2.2	E
02/02/2019	2:00 AM	2.2	E
02/02/2019	3:00 AM	2.2	E
02/02/2019	4:00 AM	2.7	E
02/02/2019	5:00 AM	3.1	ENE
02/02/2019	6:00 AM	2.2	ENE
02/02/2019	7:00 AM	1.3	E
02/02/2019	8:00 AM	0.9	SE
02/02/2019	9:00 AM	0.9	NW
02/02/2019	10:00 AM	1.3	NE
02/02/2019	11:00 AM	1.3	ENE
02/02/2019	12:00 PM	1.8	E
02/02/2019	1:00 PM	1.8	E
02/02/2019	2:00 PM	2.2	NW
02/02/2019	3:00 PM	2.2	NW
02/02/2019	4:00 PM	2.7	E
02/02/2019	5:00 PM	2.2	SE
02/02/2019	6:00 PM	3.1	ENE
02/02/2019	7:00 PM	1.8	ENE
02/02/2019	8:00 PM	1.3	NE
02/02/2019	9:00 PM	1.3	SE
02/02/2019	10:00 PM	1.3	SE
02/02/2019	11:00 PM	2.2	NW
03/02/2019	12:00 AM	2.2	NW
03/02/2019	1:00 AM	1.3	NE
03/02/2019	2:00 AM	0.9	NW
03/02/2019	3:00 AM	0.9	N
03/02/2019	4:00 AM	0.4	NW
03/02/2019	5:00 AM	0.4	ENE
03/02/2019	6:00 AM	0.4	SE
03/02/2019	7:00 AM	0	SE
03/02/2019	8:00 AM	0	E
03/02/2019	9:00 AM	0.4	N
03/02/2019	10:00 AM	0.4	WNW

Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
03/02/2019	11:00 AM	0.4	N
03/02/2019	12:00 PM	0.4	N
03/02/2019	1:00 PM	0.9	N
03/02/2019	2:00 PM	0.9	N
03/02/2019	3:00 PM	0.9	N
03/02/2019	4:00 PM	0.4	NE
03/02/2019	5:00 PM	0.9	ENE
03/02/2019	6:00 PM	0.4	ENE
03/02/2019	7:00 PM	0.4	ENE
03/02/2019	8:00 PM	0	SSE
03/02/2019	9:00 PM	0	SSW
03/02/2019	10:00 PM	0	SSW
03/02/2019	11:00 PM	0	SSW
04/02/2019	12:00 AM	0	SSW
04/02/2019	1:00 AM	0	S
04/02/2019	2:00 AM	0	SE
04/02/2019	3:00 AM	0	---
04/02/2019	4:00 AM	0	SE
04/02/2019	5:00 AM	0	---
04/02/2019	6:00 AM	0	---
04/02/2019	7:00 AM	0	---
04/02/2019	8:00 AM	0	---
04/02/2019	9:00 AM	0	ENE
04/02/2019	10:00 AM	0	ENE
04/02/2019	11:00 AM	0	ENE
04/02/2019	12:00 PM	0	---
04/02/2019	1:00 PM	0.4	WNW
04/02/2019	2:00 PM	0.9	N
04/02/2019	3:00 PM	0.9	N
04/02/2019	4:00 PM	0.9	WNW
04/02/2019	5:00 PM	1.8	E
04/02/2019	6:00 PM	2.2	NW
04/02/2019	7:00 PM	2.2	NW
04/02/2019	8:00 PM	1.8	NW
04/02/2019	9:00 PM	2.2	N
04/02/2019	10:00 PM	2.7	N
04/02/2019	11:00 PM	2.2	NW
05/02/2019	12:00 AM	2.2	NW
05/02/2019	1:00 AM	2.2	NW
05/02/2019	2:00 AM	1.8	N
05/02/2019	3:00 AM	1.8	NW
05/02/2019	4:00 AM	1.8	NW
05/02/2019	5:00 AM	1.8	NW
05/02/2019	6:00 AM	2.7	NW
05/02/2019	7:00 AM	1.8	NW
05/02/2019	8:00 AM	2.2	NW
05/02/2019	9:00 AM	1.3	NW
05/02/2019	10:00 AM	1.8	SE
05/02/2019	11:00 AM	1.8	N
05/02/2019	12:00 PM	1.3	SE
05/02/2019	1:00 PM	1.3	NW
05/02/2019	2:00 PM	1.3	NNW
05/02/2019	3:00 PM	0.9	SE
05/02/2019	4:00 PM	0.9	NE
05/02/2019	5:00 PM	0.4	NW
05/02/2019	6:00 PM	0.9	NW
05/02/2019	7:00 PM	0.4	NW
05/02/2019	8:00 PM	0.9	N
05/02/2019	9:00 PM	0.9	N

Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
05/02/2019	10:00 PM	0.9	N
05/02/2019	11:00 PM	0.9	N
06/02/2019	12:00 AM	0.9	N
06/02/2019	1:00 AM	0.9	NW
06/02/2019	2:00 AM	0.9	N
06/02/2019	3:00 AM	0	NE
06/02/2019	4:00 AM	0	ENE
06/02/2019	5:00 AM	0	ENE
06/02/2019	6:00 AM	0	ENE
06/02/2019	7:00 AM	0	SSE
06/02/2019	8:00 AM	0	WNW
06/02/2019	9:00 AM	0	---
06/02/2019	10:00 AM	0	---
06/02/2019	11:00 AM	0	WNW
06/02/2019	12:00 PM	0.9	NNE
06/02/2019	1:00 PM	1.3	NE
06/02/2019	2:00 PM	0.9	N
06/02/2019	3:00 PM	0.9	NW
06/02/2019	4:00 PM	0.9	NW
06/02/2019	5:00 PM	0.4	SSE
06/02/2019	6:00 PM	0.9	NE
06/02/2019	7:00 PM	1.3	N
06/02/2019	8:00 PM	1.3	N
06/02/2019	9:00 PM	1.3	NW
06/02/2019	10:00 PM	0.9	N
06/02/2019	11:00 PM	0.4	NNW
07/02/2019	12:00 AM	0.9	NNW
07/02/2019	1:00 AM	0.4	NNE
07/02/2019	2:00 AM	0.4	NE
07/02/2019	3:00 AM	0.4	SE
07/02/2019	4:00 AM	0.4	NW
07/02/2019	5:00 AM	0.4	NW
07/02/2019	6:00 AM	0.4	ENE
07/02/2019	7:00 AM	0.4	NW
07/02/2019	8:00 AM	0.4	SSE
07/02/2019	9:00 AM	0.4	ENE
07/02/2019	10:00 AM	0.9	SSE
07/02/2019	11:00 AM	0.9	NW
07/02/2019	12:00 PM	1.3	NW
07/02/2019	1:00 PM	1.3	SSE
07/02/2019	2:00 PM	1.3	SSE
07/02/2019	3:00 PM	0.9	NW
07/02/2019	4:00 PM	0.9	N
07/02/2019	5:00 PM	0.9	SSE
07/02/2019	6:00 PM	0.9	SSE
07/02/2019	7:00 PM	1.3	SSE
07/02/2019	8:00 PM	0.9	SE
07/02/2019	9:00 PM	1.3	NW
07/02/2019	10:00 PM	0.4	N
07/02/2019	11:00 PM	0.4	NNW
08/02/2019	12:00 AM	1.3	N
08/02/2019	1:00 AM	1.8	N
08/02/2019	2:00 AM	0	E
08/02/2019	3:00 AM	0	---
08/02/2019	4:00 AM	0	---
08/02/2019	5:00 AM	0	SSE
08/02/2019	6:00 AM	0	---
08/02/2019	7:00 AM	0	---
08/02/2019	8:00 AM	0	ENE

Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
08/02/2019	9:00 AM	0.4	NE
08/02/2019	10:00 AM	0.4	SSE
08/02/2019	11:00 AM	0.9	SSE
08/02/2019	12:00 PM	0.9	SSE
08/02/2019	1:00 PM	1.8	NW
08/02/2019	2:00 PM	2.2	NW
08/02/2019	3:00 PM	1.8	NE
08/02/2019	4:00 PM	2.7	NE
08/02/2019	5:00 PM	2.2	N
08/02/2019	6:00 PM	2.2	N
08/02/2019	7:00 PM	1.8	ENE
08/02/2019	8:00 PM	1.8	NE
08/02/2019	9:00 PM	1.8	ENE
08/02/2019	10:00 PM	2.2	N
08/02/2019	11:00 PM	2.2	N
09/02/2019	12:00 AM	3.1	NW
09/02/2019	1:00 AM	2.2	N
09/02/2019	2:00 AM	2.2	NW
09/02/2019	3:00 AM	2.7	NE
09/02/2019	4:00 AM	2.2	N
09/02/2019	5:00 AM	1.8	N
09/02/2019	6:00 AM	1.8	N
09/02/2019	7:00 AM	1.8	NE
09/02/2019	8:00 AM	2.2	N
09/02/2019	9:00 AM	1.8	N
09/02/2019	10:00 AM	3.1	N
09/02/2019	11:00 AM	3.1	N
09/02/2019	12:00 PM	2.2	N
09/02/2019	1:00 PM	2.2	N
09/02/2019	2:00 PM	2.7	N
09/02/2019	3:00 PM	4	ENE
09/02/2019	4:00 PM	3.1	NE
09/02/2019	5:00 PM	2.7	NE
09/02/2019	6:00 PM	3.1	E
09/02/2019	7:00 PM	3.1	ENE
09/02/2019	8:00 PM	2.2	N
09/02/2019	9:00 PM	2.7	N
09/02/2019	10:00 PM	2.2	N
09/02/2019	11:00 PM	2.2	N
10/02/2019	12:00 AM	2.2	N
10/02/2019	1:00 AM	2.2	N
10/02/2019	2:00 AM	2.7	N
10/02/2019	3:00 AM	2.7	N
10/02/2019	4:00 AM	2.2	N
10/02/2019	5:00 AM	2.2	NW
10/02/2019	6:00 AM	2.2	SE
10/02/2019	7:00 AM	2.7	E
10/02/2019	8:00 AM	2.2	NNE
10/02/2019	9:00 AM	2.7	E
10/02/2019	10:00 AM	2.2	N
10/02/2019	11:00 AM	2.2	NW
10/02/2019	12:00 PM	1.3	N
10/02/2019	1:00 PM	1.8	NW
10/02/2019	2:00 PM	2.2	N
10/02/2019	3:00 PM	2.2	N
10/02/2019	4:00 PM	3.6	E
10/02/2019	5:00 PM	3.6	E
10/02/2019	6:00 PM	1.8	N
10/02/2019	7:00 PM	0.9	NW

Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
10/02/2019	8:00 PM	0.4	NNW
10/02/2019	9:00 PM	0.4	NW
10/02/2019	10:00 PM	1.3	NW
10/02/2019	11:00 PM	1.3	NW
11/02/2019	12:00 AM	1.3	NW
11/02/2019	1:00 AM	0.9	NW
11/02/2019	2:00 AM	0.4	NW
11/02/2019	3:00 AM	0.4	NW
11/02/2019	4:00 AM	0	S
11/02/2019	5:00 AM	0	NE
11/02/2019	6:00 AM	0	SSE
11/02/2019	7:00 AM	0.4	SSE
11/02/2019	8:00 AM	0.4	S
11/02/2019	9:00 AM	0.9	NE
11/02/2019	10:00 AM	0.9	NE
11/02/2019	11:00 AM	0.4	NE
11/02/2019	12:00 PM	0.4	S
11/02/2019	1:00 PM	0.4	WNW
11/02/2019	2:00 PM	0.4	S
11/02/2019	3:00 PM	0.9	WNW
11/02/2019	4:00 PM	0.4	SSW
11/02/2019	5:00 PM	0.4	SE
11/02/2019	6:00 PM	0.4	NE
11/02/2019	7:00 PM	1.3	NE
11/02/2019	8:00 PM	1.3	NE
11/02/2019	9:00 PM	0.9	NE
11/02/2019	10:00 PM	0	ENE
11/02/2019	11:00 PM	0	NNW
12/02/2019	12:00 AM	0	NNW
12/02/2019	1:00 AM	0.4	NE
12/02/2019	2:00 AM	0.9	NE
12/02/2019	3:00 AM	1.3	NE
12/02/2019	4:00 AM	1.3	NE
12/02/2019	5:00 AM	0.9	NE
12/02/2019	6:00 AM	1.3	NNE
12/02/2019	7:00 AM	1.3	NNE
12/02/2019	8:00 AM	0.4	NNE
12/02/2019	9:00 AM	0.9	NE
12/02/2019	10:00 AM	0.9	NE
12/02/2019	11:00 AM	1.3	NE
12/02/2019	12:00 PM	1.3	NE
12/02/2019	1:00 PM	1.3	NE
12/02/2019	2:00 PM	0.9	NW
12/02/2019	3:00 PM	1.3	NW
12/02/2019	4:00 PM	0.9	NW
12/02/2019	5:00 PM	0.4	NNW
12/02/2019	6:00 PM	0.9	NE
12/02/2019	7:00 PM	0.4	NW
12/02/2019	8:00 PM	0	NW
12/02/2019	9:00 PM	0	SSW
12/02/2019	10:00 PM	0.4	SSW
12/02/2019	11:00 PM	1.8	NW
13/02/2019	12:00 AM	0.9	ENE
13/02/2019	1:00 AM	0.9	E
13/02/2019	2:00 AM	0	ENE
13/02/2019	3:00 AM	0	---
13/02/2019	4:00 AM	0	---
13/02/2019	5:00 AM	0	---
13/02/2019	6:00 AM	0	---

Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
13/02/2019	7:00 AM	0	---
13/02/2019	8:00 AM	0	---
13/02/2019	9:00 AM	0.4	ENE
13/02/2019	10:00 AM	0.9	NE
13/02/2019	11:00 AM	0.9	ENE
13/02/2019	12:00 PM	0.9	NE
13/02/2019	1:00 PM	0.9	NNE
13/02/2019	2:00 PM	0.4	NW
13/02/2019	3:00 PM	0.9	NNW
13/02/2019	4:00 PM	0.4	WNW
13/02/2019	5:00 PM	0.9	N
13/02/2019	6:00 PM	0.4	E
13/02/2019	7:00 PM	0.4	ENE
13/02/2019	8:00 PM	0	---
13/02/2019	9:00 PM	0.9	NW
13/02/2019	10:00 PM	1.3	NW
13/02/2019	11:00 PM	1.3	SE
14/02/2019	12:00 AM	1.8	NW
14/02/2019	1:00 AM	2.2	NW
14/02/2019	2:00 AM	1.8	NW
14/02/2019	3:00 AM	1.3	E
14/02/2019	4:00 AM	0.9	NW
14/02/2019	5:00 AM	1.8	NW
14/02/2019	6:00 AM	1.8	N
14/02/2019	7:00 AM	2.2	NW
14/02/2019	8:00 AM	1.8	NW
14/02/2019	9:00 AM	1.3	NW
14/02/2019	10:00 AM	1.8	NW
14/02/2019	11:00 AM	1.8	NW
14/02/2019	12:00 PM	1.3	NW
14/02/2019	1:00 PM	1.3	NW
14/02/2019	2:00 PM	1.3	NW
14/02/2019	3:00 PM	0.9	SSE
14/02/2019	4:00 PM	0.9	ENE
14/02/2019	5:00 PM	1.3	NNW
14/02/2019	6:00 PM	2.7	ENE
14/02/2019	7:00 PM	2.7	E
14/02/2019	8:00 PM	1.8	ENE
14/02/2019	9:00 PM	1.8	N
14/02/2019	10:00 PM	1.8	N
14/02/2019	11:00 PM	2.2	ENE
15/02/2019	12:00 AM	0.9	ENE
15/02/2019	1:00 AM	1.3	ENE
15/02/2019	2:00 AM	1.3	NE
15/02/2019	3:00 AM	1.3	NW
15/02/2019	4:00 AM	1.8	NW
15/02/2019	5:00 AM	1.8	E
15/02/2019	6:00 AM	2.7	NE
15/02/2019	7:00 AM	2.2	E
15/02/2019	8:00 AM	2.2	SE
15/02/2019	9:00 AM	1.8	NW
15/02/2019	10:00 AM	1.8	NW
15/02/2019	11:00 AM	1.8	NW
15/02/2019	12:00 PM	1.3	E
15/02/2019	1:00 PM	0.9	NE
15/02/2019	2:00 PM	2.2	ENE
15/02/2019	3:00 PM	1.3	E
15/02/2019	4:00 PM	1.8	E
15/02/2019	5:00 PM	1.3	SE

Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
15/02/2019	6:00 PM	0.9	NW
15/02/2019	7:00 PM	0.9	NW
15/02/2019	8:00 PM	0.9	WNW
15/02/2019	9:00 PM	0.4	SSE
15/02/2019	10:00 PM	1.3	NE
15/02/2019	11:00 PM	1.8	E
16/02/2019	12:00 AM	2.2	E
16/02/2019	1:00 AM	1.8	E
16/02/2019	2:00 AM	0.9	SE
16/02/2019	3:00 AM	1.3	E
16/02/2019	4:00 AM	0.4	NE
16/02/2019	5:00 AM	0	NNE
16/02/2019	6:00 AM	0	ENE
16/02/2019	7:00 AM	0	NE
16/02/2019	8:00 AM	0.4	NNW
16/02/2019	9:00 AM	0.9	NE
16/02/2019	10:00 AM	0.9	E
16/02/2019	11:00 AM	0.9	SE
16/02/2019	12:00 PM	1.3	NW
16/02/2019	1:00 PM	1.3	NW
16/02/2019	2:00 PM	1.3	NW
16/02/2019	3:00 PM	1.3	NW
16/02/2019	4:00 PM	0.9	NW
16/02/2019	5:00 PM	0.4	NW
16/02/2019	6:00 PM	0.9	SSE
16/02/2019	7:00 PM	2.2	NW
16/02/2019	8:00 PM	2.7	NW
16/02/2019	9:00 PM	1.8	NW
16/02/2019	10:00 PM	1.3	N
16/02/2019	11:00 PM	1.8	NE
17/02/2019	12:00 AM	1.8	NE
17/02/2019	1:00 AM	3.1	NE
17/02/2019	2:00 AM	2.7	ENE
17/02/2019	3:00 AM	1.8	NE
17/02/2019	4:00 AM	1.3	NW
17/02/2019	5:00 AM	1.3	NW
17/02/2019	6:00 AM	2.2	N
17/02/2019	7:00 AM	2.2	NW
17/02/2019	8:00 AM	1.8	NW
17/02/2019	9:00 AM	2.2	NW
17/02/2019	10:00 AM	2.7	NW
17/02/2019	11:00 AM	2.7	N
17/02/2019	12:00 PM	2.7	N
17/02/2019	1:00 PM	3.1	NW
17/02/2019	2:00 PM	2.7	NW
17/02/2019	3:00 PM	2.7	NNW
17/02/2019	4:00 PM	2.2	N
17/02/2019	5:00 PM	2.2	SE
17/02/2019	6:00 PM	2.2	SE
17/02/2019	7:00 PM	2.2	SE
17/02/2019	8:00 PM	2.2	NW
17/02/2019	9:00 PM	2.7	NW
17/02/2019	10:00 PM	2.2	ESE
17/02/2019	11:00 PM	2.7	E
18/02/2019	12:00 AM	2.7	SE
18/02/2019	1:00 AM	2.7	SE
18/02/2019	2:00 AM	2.7	N
18/02/2019	3:00 AM	2.7	N
18/02/2019	4:00 AM	2.7	N

Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
18/02/2019	5:00 AM	2.7	NW
18/02/2019	6:00 AM	3.1	NW
18/02/2019	7:00 AM	3.1	NW
18/02/2019	8:00 AM	4	NW
18/02/2019	9:00 AM	3.6	NW
18/02/2019	10:00 AM	3.1	NW
18/02/2019	11:00 AM	3.6	NW
18/02/2019	12:00 PM	2.7	N
18/02/2019	1:00 PM	2.2	NE
18/02/2019	2:00 PM	0.9	SSE
18/02/2019	3:00 PM	0.4	SSE
18/02/2019	4:00 PM	0.4	SSE
18/02/2019	5:00 PM	0.4	S
18/02/2019	6:00 PM	0	E
18/02/2019	7:00 PM	0	SSE
18/02/2019	8:00 PM	0	SSE
18/02/2019	9:00 PM	0.4	NW
18/02/2019	10:00 PM	0.4	S
18/02/2019	11:00 PM	0.4	S
19/02/2019	12:00 AM	1.8	NW
19/02/2019	1:00 AM	2.2	SE
19/02/2019	2:00 AM	2.2	E
19/02/2019	3:00 AM	2.7	ENE
19/02/2019	4:00 AM	2.2	E
19/02/2019	5:00 AM	1.8	E
19/02/2019	6:00 AM	2.2	E
19/02/2019	7:00 AM	1.3	E
19/02/2019	8:00 AM	1.3	NW
19/02/2019	9:00 AM	0.9	N
19/02/2019	10:00 AM	0.9	ENE
19/02/2019	11:00 AM	1.3	E
19/02/2019	12:00 PM	2.2	ENE
19/02/2019	1:00 PM	1.8	NE
19/02/2019	2:00 PM	1.8	NW
19/02/2019	3:00 PM	0.9	NW
19/02/2019	4:00 PM	0.9	NNW
19/02/2019	5:00 PM	0.4	NE
19/02/2019	6:00 PM	0.4	NE
19/02/2019	7:00 PM	0.4	NE
19/02/2019	8:00 PM	0.9	E
19/02/2019	9:00 PM	1.3	NW
19/02/2019	10:00 PM	1.3	NW
19/02/2019	11:00 PM	1.3	NNE
20/02/2019	12:00 AM	1.3	SE
20/02/2019	1:00 AM	1.8	SSE
20/02/2019	2:00 AM	1.3	NW
20/02/2019	3:00 AM	1.3	WNW
20/02/2019	4:00 AM	0.9	SE
20/02/2019	5:00 AM	0.9	SSE
20/02/2019	6:00 AM	0.4	NW
20/02/2019	7:00 AM	0.4	NE
20/02/2019	8:00 AM	0.4	N
20/02/2019	9:00 AM	0.9	NNE
20/02/2019	10:00 AM	0.4	WNW
20/02/2019	11:00 AM	0.9	NW
20/02/2019	12:00 PM	0.9	NE
20/02/2019	1:00 PM	0.9	E
20/02/2019	2:00 PM	0.9	ENE
20/02/2019	3:00 PM	0.9	SE

Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
20/02/2019	4:00 PM	1.3	SE
20/02/2019	5:00 PM	0.9	ESE
20/02/2019	6:00 PM	0.9	SSE
20/02/2019	7:00 PM	0.4	NW
20/02/2019	8:00 PM	0.4	SE
20/02/2019	9:00 PM	0.9	NE
20/02/2019	10:00 PM	0.9	NE
20/02/2019	11:00 PM	0.9	ENE
21/02/2019	12:00 AM	0.9	ENE
21/02/2019	1:00 AM	0.9	NW
21/02/2019	2:00 AM	0.9	NW
21/02/2019	3:00 AM	1.3	NW
21/02/2019	4:00 AM	1.3	NW
21/02/2019	5:00 AM	1.8	NW
21/02/2019	6:00 AM	1.8	NW
21/02/2019	7:00 AM	1.3	NW
21/02/2019	8:00 AM	0.9	NE
21/02/2019	9:00 AM	1.3	ENE
21/02/2019	10:00 AM	0.9	NW
21/02/2019	11:00 AM	1.8	NW
21/02/2019	12:00 PM	1.8	NW
21/02/2019	1:00 PM	1.3	NW
21/02/2019	2:00 PM	1.8	NW
21/02/2019	3:00 PM	2.2	NW
21/02/2019	4:00 PM	1.8	NW
21/02/2019	5:00 PM	1.8	NW
21/02/2019	6:00 PM	1.3	NW
21/02/2019	7:00 PM	1.3	N
21/02/2019	8:00 PM	1.3	NNW
21/02/2019	9:00 PM	1.3	N
21/02/2019	10:00 PM	0.9	NNW
21/02/2019	11:00 PM	0.4	NNE
22/02/2019	12:00 AM	1.3	S
22/02/2019	1:00 AM	0.9	SSW
22/02/2019	2:00 AM	0.9	S
22/02/2019	3:00 AM	0.9	SSW
22/02/2019	4:00 AM	0.9	SSW
22/02/2019	5:00 AM	0.9	SW
22/02/2019	6:00 AM	0.9	S
22/02/2019	7:00 AM	0.4	SSW
22/02/2019	8:00 AM	0.9	S
22/02/2019	9:00 AM	0.4	SSE
22/02/2019	10:00 AM	0.9	S
22/02/2019	11:00 AM	0.9	NW
22/02/2019	12:00 PM	0.9	NW
22/02/2019	1:00 PM	0.4	SSW
22/02/2019	2:00 PM	0.9	NW
22/02/2019	3:00 PM	0.9	NW
22/02/2019	4:00 PM	0.9	SSW
22/02/2019	5:00 PM	0.9	S
22/02/2019	6:00 PM	0.4	S
22/02/2019	7:00 PM	0	SE
22/02/2019	8:00 PM	0.4	S
22/02/2019	9:00 PM	0	SSE
22/02/2019	10:00 PM	0.4	ENE
22/02/2019	11:00 PM	0.9	ENE
23/02/2019	12:00 AM	0.4	NNE
23/02/2019	1:00 AM	0.9	NW
23/02/2019	2:00 AM	1.3	ENE

Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
23/02/2019	3:00 AM	1.8	NW
23/02/2019	4:00 AM	2.7	E
23/02/2019	5:00 AM	1.8	NW
23/02/2019	6:00 AM	2.2	NW
23/02/2019	7:00 AM	2.2	NW
23/02/2019	8:00 AM	2.7	NW
23/02/2019	9:00 AM	3.1	NW
23/02/2019	10:00 AM	3.1	NW
23/02/2019	11:00 AM	3.1	NW
23/02/2019	12:00 PM	2.7	NW
23/02/2019	1:00 PM	2.2	E
23/02/2019	2:00 PM	0.4	NE
23/02/2019	3:00 PM	0.4	WSW
23/02/2019	4:00 PM	1.8	SSE
23/02/2019	5:00 PM	0.9	SSW
23/02/2019	6:00 PM	0.4	S
23/02/2019	7:00 PM	0.4	SW
23/02/2019	8:00 PM	0.9	SSE
23/02/2019	9:00 PM	0.9	WNW
23/02/2019	10:00 PM	1.3	N
23/02/2019	11:00 PM	1.8	E
24/02/2019	12:00 AM	0.4	WNW
24/02/2019	1:00 AM	0.9	NE
24/02/2019	2:00 AM	0.9	NE
24/02/2019	3:00 AM	0.4	NW
24/02/2019	4:00 AM	1.3	N
24/02/2019	5:00 AM	0.4	N
24/02/2019	6:00 AM	0.9	WNW
24/02/2019	7:00 AM	1.3	NE
24/02/2019	8:00 AM	1.3	N
24/02/2019	9:00 AM	1.8	N
24/02/2019	10:00 AM	0.9	NNW
24/02/2019	11:00 AM	0.9	NE
24/02/2019	12:00 PM	0.4	N
24/02/2019	1:00 PM	0.4	WNW
24/02/2019	2:00 PM	0.4	WNW
24/02/2019	3:00 PM	0.9	WNW
24/02/2019	4:00 PM	0.9	WNW
24/02/2019	5:00 PM	0.9	SSW
24/02/2019	6:00 PM	0.4	SSW
24/02/2019	7:00 PM	0.4	SSE
24/02/2019	8:00 PM	0	SSE
24/02/2019	9:00 PM	0.4	NNW
24/02/2019	10:00 PM	0.9	NE
24/02/2019	11:00 PM	0.4	NE
25/02/2019	12:00 AM	0.4	NE
25/02/2019	1:00 AM	0.9	NE
25/02/2019	2:00 AM	1.3	ENE
25/02/2019	3:00 AM	1.3	NE
25/02/2019	4:00 AM	0.9	NE
25/02/2019	5:00 AM	1.8	N
25/02/2019	6:00 AM	0.9	NE
25/02/2019	7:00 AM	0.9	NE
25/02/2019	8:00 AM	0.9	ENE
25/02/2019	9:00 AM	0.4	NNE
25/02/2019	10:00 AM	0.4	NE
25/02/2019	11:00 AM	0.9	NE
25/02/2019	12:00 PM	0.9	NE
25/02/2019	1:00 PM	0.4	N

Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
25/02/2019	2:00 PM	0.4	NW
25/02/2019	3:00 PM	0.4	WNW
25/02/2019	4:00 PM	0.4	WNW
25/02/2019	5:00 PM	0.4	NW
25/02/2019	6:00 PM	0	SSE
25/02/2019	7:00 PM	0	WSW
25/02/2019	8:00 PM	0.4	SSE
25/02/2019	9:00 PM	0	SSE
25/02/2019	10:00 PM	0.4	SSE
25/02/2019	11:00 PM	0.4	SSE
26/02/2019	12:00 AM	0.4	SSE
26/02/2019	1:00 AM	0	SSE
26/02/2019	2:00 AM	0	S
26/02/2019	3:00 AM	0	WSW
26/02/2019	4:00 AM	0.4	ENE
26/02/2019	5:00 AM	1.3	NW
26/02/2019	6:00 AM	1.8	SSE
26/02/2019	7:00 AM	2.2	NW
26/02/2019	8:00 AM	2.2	NW
26/02/2019	9:00 AM	2.7	NW
26/02/2019	10:00 AM	3.1	NW
26/02/2019	11:00 AM	2.2	NW
26/02/2019	12:00 PM	1.8	NW
26/02/2019	1:00 PM	1.8	NW
26/02/2019	2:00 PM	1.3	NW
26/02/2019	3:00 PM	2.7	NW
26/02/2019	4:00 PM	2.7	E
26/02/2019	5:00 PM	2.2	ENE
26/02/2019	6:00 PM	1.3	ENE
26/02/2019	7:00 PM	1.3	E
26/02/2019	8:00 PM	0.9	ENE
26/02/2019	9:00 PM	0.9	ENE
26/02/2019	10:00 PM	0.9	NW
26/02/2019	11:00 PM	0.9	WNW
27/02/2019	12:00 AM	2.2	NW
27/02/2019	1:00 AM	1.8	NW
27/02/2019	2:00 AM	0.9	NW
27/02/2019	3:00 AM	1.3	ENE
27/02/2019	4:00 AM	1.3	NW
27/02/2019	5:00 AM	1.3	NW
27/02/2019	6:00 AM	1.3	SSE
27/02/2019	7:00 AM	1.8	NW
27/02/2019	8:00 AM	1.3	NW
27/02/2019	9:00 AM	2.2	E
27/02/2019	10:00 AM	1.8	SE
27/02/2019	11:00 AM	1.3	SE
27/02/2019	12:00 PM	1.8	NW
27/02/2019	1:00 PM	1.8	NW
27/02/2019	2:00 PM	2.2	NW
27/02/2019	3:00 PM	1.8	NW
27/02/2019	4:00 PM	0.9	SSE
27/02/2019	5:00 PM	0.9	SSE
27/02/2019	6:00 PM	0.9	NW
27/02/2019	7:00 PM	0.4	NW
27/02/2019	8:00 PM	0.4	ENE
27/02/2019	9:00 PM	0.9	NE
27/02/2019	10:00 PM	0.4	NE
27/02/2019	11:00 PM	0	NE
28/02/2019	12:00 AM	0.4	ENE

Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
28/02/2019	1:00 AM	0	NE
28/02/2019	2:00 AM	0	NE
28/02/2019	3:00 AM	0	SE
28/02/2019	4:00 AM	0	SE
28/02/2019	5:00 AM	0	SSE
28/02/2019	6:00 AM	0.4	NE
28/02/2019	7:00 AM	0	NW
28/02/2019	8:00 AM	0.4	NE
28/02/2019	9:00 AM	0.9	ENE
28/02/2019	10:00 AM	0.9	ENE
28/02/2019	11:00 AM	0.4	ENE
28/02/2019	12:00 PM	0.9	WNW
28/02/2019	1:00 PM	0.9	N
28/02/2019	2:00 PM	0.9	NE
28/02/2019	3:00 PM	0.9	NE
28/02/2019	4:00 PM	0.9	NE
28/02/2019	5:00 PM	0.4	SSE
28/02/2019	6:00 PM	0.4	N
28/02/2019	7:00 PM	0.4	NE
28/02/2019	8:00 PM	0.4	NNE
28/02/2019	9:00 PM	0.4	S
28/02/2019	10:00 PM	0.9	SE
28/02/2019	11:00 PM	0.9	NW