Construction Works Schedule and Location Plans for

Intermodal Transfer Terminal – Bonded Vehicular Bridge and Associated Roads

(EP No. EP-560/2018)

October 2021

This Submission of Construction Works Schedule and Location Plans

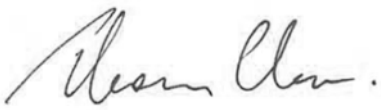
has been reviewed and certified by

the Environmental Team Leader (ETL) in accordance with

Conditions 1.9 and 2.6 of Environmental Permit No. EP-560/2018

of the Project.

Certified by:



Ir Thomas Chan
Environmental Team Leader (ETL)
Mott MacDonald Hong Kong Limited

Date 22 October 2021

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By Email

Airport Authority Hong Kong
HKIA Tower, 1 Sky Plaza Road,
Hong Kong International Airport,
Lantau, Hong Kong

Attn: Alan Chan (Manager, Civil)

22 October 2021

Dear Sir,

Contract C19C02 – Independent Environmental Checker Consultancy Services for Intermodal Transfer Terminal – Bonded Vehicular Bridge and Associated Roads Construction Works Schedule and Location Plans

Reference is made to the Environmental Team's submission of Construction Works Schedule and Location Plans in accordance with Condition 2.6 of the Environmental Permit (No: EP-560/2018) of the Project certified by the ET Leader on 22 October 2021.

We would like to inform you that we have no adverse comment on the captioned submission. Therefore we write to verify the captioned submission in accordance with the requirement stipulated in Condition 1.9 of EP-560/2018.

Should you have any queries, please feel free to contact the undersigned at 3922 9366.

Yours faithfully,
AECOM Asia Co. Ltd.

Y W Fung
Independent Environmental Checker

1.1 Project Description

On 23 August 2018, the Environment Impact Assessment (EIA) Report (Register No.: AEIAR-216/2018) for the Project was approved and an Environmental Permit (EP) (Permit No.: EP-560/2018) was issued for the construction and operation of the Project.

The Project site is situated between the Hong Kong-Zhuhai-Macao Bridge Boundary Crossing Facilities (HKBCF) Island and the Hong Kong International Airport (HKIA), at the south of the existing SkyPier on the Airport Island. The Bonded Vehicular Bridge serves as a land connection between the HKBCF Island and Intermodal Transfer Terminal (ITT) building next to the SkyPier to be built by AAHK. Part of the bridge is located in the marine area (marine section) and part on the HKBCF Island (land section). The marine section of the site is situated in a marine area between HKIA and HKBCF Island.

The Bonded Vehicular Bridge serves as a dedicated direct vehicular access connecting the ITT of HKIA and HKBCF Island. The Project scale is anticipated to be small, the bridge's marine section is approximately 360m in length, supported by bridge concrete piers. The Bridge's land section spans over the HKBCF Island with a total length of approximately 210m.

1.2 Purpose of this Submission

1.2.1 Associated EP Condition

As specified in Condition 2.6 of the EP:

"The Permit Holder shall, no later than 2 months before the commencement of construction of the Project, deposit 3 hard copies and 1 electronic copy of a work plan (The Plan) with the Director. The Plan shall include at least the following information/specifications:

i. a detailed phasing programme of all construction works including construction of the marine section in a marine area between the Airport Island and the HKBCF Island, and a land section on the HKBCF Island; and
ii. location plan of all construction works in appropriate scale showing the locations of cofferdams, the excavation areas and the proposed bridge piers and / or abutments of the Project."

1.2.2 Background and Purpose of the Submission

The Construction Works Schedule and Location Plans (the Plan) was first deposited to Environmental Protection Department (EPD) in December 2020 as per Condition 2.6 and EPD expressed no comment on the Plan in December 2020.

Subsequently, the construction method of the bridge deck has been changed, the Plan has been updated and was deposited to Environmental Protection Department (EPD) in June 2021 and EPD expressed no comment on the updated Plan in July 2021.

In August 2021, the Plan has been updated to reflect the latest proposed method for installation of temporary assess platform at Pier 1. See details in **Appendix D**.

1.3 Construction Works Schedule

The details of Construction Works Schedule are provided in **Appendix A**.

1.4 Location Plan

The location plan for the planned construction works of the Project based on the best available information is presented in **Appendix B**.

The major construction works involved substructure and superstructure works. Substructure consists of bored piles and pile caps; while superstructure consists of pier columns, deck surface and the rest of the road furniture. Graphical illustration of substructure and superstructure works involved are presented in **Appendix C**. The overall construction sequence starting from the substructure works to superstructure works. Major construction works are described below,

1.4.1 Substructure Works

Construction of bored piles and pile caps from Piers 1 to 7 will be carried out at marine section, while from Pier 8 to ramp section will be carried out at land section. Over the marine section, after installation of temporary access platform and deployment of silt curtain, bored piling works will be conducted which involving the use of Reverse Circulation Drill (RCD) and sediment excavation works. A funnel will be placed at the top of steel pile casing during sediment excavation. Upon completion of bored piles, cofferdams (i.e. pre-casted steel panels) will be installed for pile cap construction. A review of marine ecology (in terms of temporary marine habitat loss) and water quality (in terms of hydrodynamic and marine sediment displacement) impacts incurred by the installation of temporary access platforms and construction works (i.e. bored pilling and pile cap construction works) is shown in **Appendix D**.

There will be in maximum 6 marine work fronts working concurrently at the same time, which comprises 1 marine work front for preparation works (e.g. installation of temporary access platform and placing of steel pile casings), 3 marine work fronts for bored pilling works (which involving the use of RCD and sediment excavation works) and 2 marine work fronts for pile cap construction (with installation of cofferdams).

To minimize mobilization of working vessels (e.g. barge), working vessels may be shared by marine work fronts for material transport and construction means, and also through the following working vessels deployment arrangement:

- In general, preparation works of bored pilling could be completed within a short period of time in approximately 10 days,
- Working vessel is not required for a marine work front after installation of cofferdam until concreting, because a dry working environment have been provided by the cofferdam for works before concrete casting. Therefore, idling of working vessels in the vicinity of marine work front for pile cap construction for long period of time is not anticipated.

In the EIA, a maximum of 4 marine vessels (including flat barges and tug boats) per day would be required during the construction period, these marine vessels would maneurver around 4 times per day for material transport and construction means. With reference to the construction method prepared by the Contractor in October 2020, during the marine construction peak period, there are maximum number of 8 working vessels, 6 working vessels will remain within the works area during construction making occasionally transits into and out of the works area and 2 working vessels will move mainly for material delivery and disposal. Since the total no. of vessel travelling trips are almost the same as in EIA, therefore, it is considered that there is no additional environmental impact based on the EIA Report. A Barge Phasing Plan is given in **Appendix E**, where barge phasing programme of marine construction works peak period (i.e. from June 2021 to December 2021) are displayed.

While for land section, the substructure works involve construction of bored piles, followed by excavation for pile caps construction.

1.4.2 Superstructure Works

Hong Kong Airport Authority/ the contractor proposed to change from precast sediments installation (the EIA design scheme) to *in-situ* casting by travelling formwork to eliminate cross-border delivery/ transportation as much as possible. The potential impacts on the environment due to the proposed change were evaluated in the Environmental Review Report (ERR) attached in **Appendix F**. It was concluded that the current design scheme will not result in any adverse environmental impacts.

Construction of pier columns will be carried out right after each individual pile cap construction at both land and marine sections. Afterwards, hammer head will be constructed and followed by deck construction. Both hammer head and bridge deck, as well as Pier 9 and ramp structure of land section, will be constructed by *in-situ* casting method. Road furniture will then be installed to complete the entire bridge construction.

Appendices

Appendices

A. Construction Works Schedule
B. Location Plan
C. Graphical Illustration of Substructure and Superstructure Works
D. Review of Marine Ecology and Water Quality Impact Incurred by the Installation of Temporary Access Platforms
E. Barge Phasing Plan
F. Environmental Review Report for the Change of Construction Method for Bridge Deck

A. Construction Works Schedule

Gammon

Overall Phasing Programme

AAHK Contract No. C19W10

Intermodal Transfer Terminal - Bonded Vehicular Bridge and Associated Roads

Location	Activities	2020						2021												2022											
		7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Marine Side																															
Pier 5	Preparation works																														
	Piling Works																														
	Pile Cap																														
	Supersturcture																														
Pier 3	Preparation works																														
	Piling Works																														
	Pile Cap																														
	Supersturcture																														
Pier 4	Preparation works																														
	Piling Works																														
	Pile Cap																														
	Supersturcture																														
Pier 7	Preparation works																														
	Piling Works																														
	Pile Cap																														
	Supersturcture																														
Pier 6	Preparation works																														
	Piling Works																														
	Pile Cap																														
	Supersturcture																														
Pier 2	Preparation works																														
	Piling Works																														
	Pile Cap																														
	Supersturcture																														
Monopiles (Piers 1a to 1g)	Preparation works																														
	Piling Works																														
	Pile Cap																														
	Supersturcture																														
Land Side																															
Pier 8	Preparation works																														
	Piling Works																														
	Pile Cap																														
	Supersturcture																														
Pier 9	Preparation works																														
	Piling Works																														
	Pile Cap																														
	Supersturcture																														
Abutment & Up Ramp	Preparation works																														
	Piling Works																														
	Pile Cap																														
	Supersturcture																														

Gammon

Overall Phasing Programme

AAHK Contract No. C19W10
Intermodal Transfer Terminal - Bonded Vehicular Bridge and Associated Roads

Location	Activities	2020						2021												2022											
		7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
AAHK Kiosk 2	Foundation & Superstructure																														
	ABWF																														
	Building Services																														
	Airport System																														
AAHK Kiosk 1	Foundation & Superstructure																														
	ABWF																														
	Building Services																														
	Airport System																														
C&ED Kiosk 1	Foundation & Superstructure																														
	ABWF																														
	Building Services																														
	Airport System																														
ImmD Kiosk 1	Foundation & Superstructure																														
	ABWF																														
	Building Services																														
	Airport System																														
ImmD Kiosk 2	Foundation & Superstructure																														
	ABWF																														
	Building Services																														
	Airport System																														
C&ED Operation and Equipment Room	Foundation & Superstructure																														
	ABWF																														
	Building Services																														
	Airport System																														
Toilet A	Foundation & Superstructure																														
	ABWF																														
	Building Services																														
	Airport System																														
Toile B	Foundation & Superstructure																														
	ABWF																														
	Building Services																														
	Airport System																														
C&ED Mobile X-Ray Tent	Foundation & Superstructure																														
	Building Services																														
	Airport System																														
Plant Building	Foundation & Superstructure																														
	ABWF																														
	Building Services																														
	Airport System																														
Option A	Optical Fibre Connection																														
Option B	Roof Canopy at ITT Building																														

Gammon

Overall Phasing Programme

AAHK Contract No. C19W10
Intermodal Transfer Terminal - Bonded Vehicular Bridge and Associated Roads

Location	Activities	2020						2021												2022											
		7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
External Works	Fencing and Sign Ganties Modification																														
	Retaining Wall																														
	Roadworks																														
	Landscape Works																														
	Drainage Works																														
	Sewage Works																														
	Water Main Installation																														
	ELV Ducting Installation																														
	EL Cable & Ducting Installation																														
	TCSS Ducting Installation																														
	Telecom Ducting Installation																														
	Road Lighting Ducting Installatin																														
	Irrigation System																														
	Fire Hydrant																														
	E-Bus Charger Installation																														

Abbreviations:
ELV - Extra-low Voltage
EL - Electrical
TCSS - Traffic Control and Surveillance Systems

B. Location Plan

Ref No. ACM/C16C001/AAITTB/C/DR/0000500 A

XTFORM

HEAVY LOAD QUA

NOTE :

1. FOR THE FIRE HYDRANT MAIN DETAILS ON VIADUCT, REFER TO DRAWING NO. ACM/C16C001/AAITTB/C/DR/9021200.

LEGEND :

SITE BOUNDARY

PROPOSED FIRE HYDRANT ON VIADUCT

EXISTING SIGN GANTRY DS23 (TO BE MODIFIED)

AAHK KIOSK 2

IMMD KIOSK 2

IMMD KIOSK 1

C&ED BONDED BUS INSPECTION AREA CANOPY

C&ED KIOSK 2

EXISTING SEAWATER INTAKE PUMP HOUSE

AAHK KIOSK 1

C&ED KIOSK 1

EXISTING GENERATOR BUILDING

TOILET B

Area involve excavation

WATER PUMP AND TANK ROOM WITH CHECK METER FOR FIRE HYDRANT ON VIADUCT (28000mm(L) x 7000mm(W))

ELECTRICAL ROOM FOR FIRE HYDRANT ON VIADUCT (2500mm(L) x 2000mm(W) x 5900(H))

GENERATOR ROOM AND FUEL TANK ROOM (CAT 1) FOR FIRE HYDRANT ON VIADUCT (10000mm(L) x 7000mm(W) x 5900mm(H))

E-BUS PARKING

Abutment

TOILET A

C&ED MOBILE X-RAY TENT

PLANT BUILDING

Pier 9

C&ED OPERATION AND EQUIPMENT ROOM

EXISTING HMB SUBSTATION

EXISTING SKYPIER

Pre-casted steel panel for pile cap construction (i.e. cofferdam)

ITT BONDED VEHICULAR BRIDGE

Pier 1a

Pier 1b

Pier 1e

Pier 1f

Pier 1c

Pier 1d

Pier 1g

Pier 2

Pier 3

Pier 4

Pier 5

Pier 6

Pier 7

Pier 8

ITT BUILDING (UNDER SEPARATE WORKS CONTRACT)

EXISTING SIGN GANTRY FADS305 (TO BE MODIFIED)

0 10 20 30 40 50
METRES
1:1000

Notes :
1. Measurements are based on metric system.
2. All levels are in metres to Principal Datum (mPD) unless noted otherwise.
3. Do not scale drawing.
4. Figure dimensions are to be followed.
5. Do not use for construction unless expressly permitted.
6. The Contractor shall verify all conditions on the Site & notify the Employer's Representative of any variations from dimensions before construction.

Rev.	Date	Description	Checked
A	17FEB20	TENDER ADDENDUM NO.3	MICHELLE LAM

Rev.	Date	Description	Checked

Signatures for Approval

Drawn ERIC KWAN	Date 17FEB20	Design AARON POON	Date 17FEB20
Checkers TIM FUNG	Date 17FEB20	Plot Date 23-Mar-20	
Design Supervisor MICHELLE LAM			Date 17FEB20
Authorised Representative HELEN LEUNG			Date 17FEB20

Consultant
AECOM in association with Aedas
AECOM AEDAS OTHERS

Hong Kong International Airport
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Airport Authority HKIA Tower, 1 Sky Plaza Road, Hong Kong International Airport, Lantau, Hong Kong
Tel : (852) 2188 7111 Fax : (852) 2824 0707

Scale 1 : 1000 @ A0

Location

Hong Kong International Airport

Title: CONTRACT C19W10 INTERMODAL TRANSFER TERMINAL – BONDED VEHICULAR BRIDGE AND ASSOCIATED ROADS GENERAL ARRANGEMENT AND PROVISION OF FIRE HYDRANT ON VIADUCT

Originator	Design Ref.	Location	Discipline	Type	Number	Status	Revision
Drawing No. ACM/ C16C001/ AAITTB/	C	/DR/0000500				TENDER	A

File Name : P:\Projects\60515167\01_AECOM\02_DRAWINGS\CONTRACT\TENDER\04_CIV\ACM_C16C001_AAITTB_C_DR_0000500A.dgn

User Name : Kwanyme

Plot Date : 23-Mar-20

C. Graphical Illustration of Substructure and Superstructure Works

Marine Bridge Elements

Deck

Superstructure

Pier

Substructure

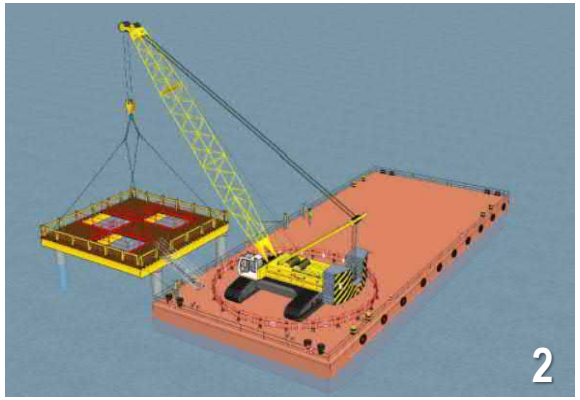
Pile cap

Bored Piles

Construction Sequence

Figure C1

Construction Method

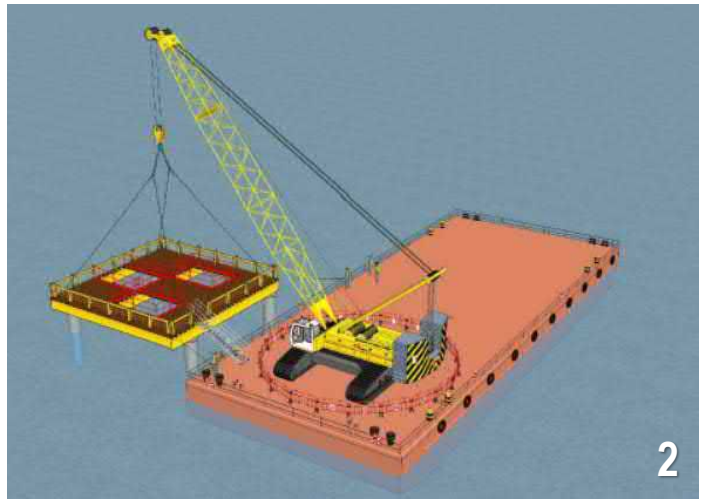


- Temporary supporting casings for Pier 1 access platform will be reinforced and in form of mini piles. Steps of supporting casing column installation are shown below,
  1. Silt curtain will be deployed to surround Pier 1 prior installation of temporary supporting casing column.
  2. Diver will collect sediment (max. 150mm thick) from the seabed by suitable container at the proposed casing column installation location.
  3. Install temporary casing by piling rig until reaching engineering rockhead.
  4. Form rock socket by piling rig.
  5. Flush the bored hole to remove materials inside the casing by compressed air.
  6. Install reinforcement into bored hole.
  7. Grout by tremie method.
- Access platform will be prefabricated on barge and lift to install on temporary supporting casings.
- All piling plants including crane will be set up on barge.

Bored Piles

Figure C2

Construction Method

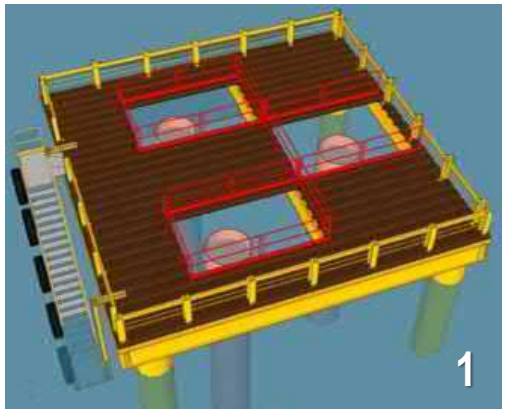


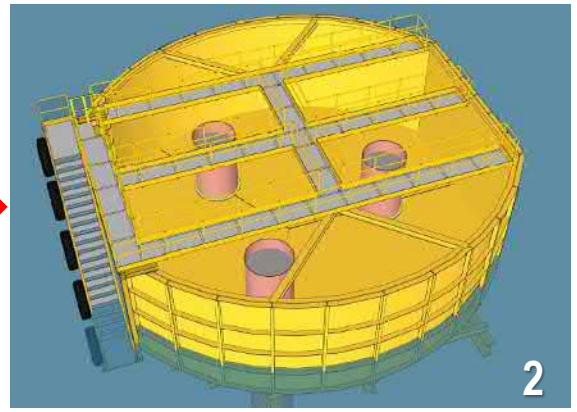
- For Pier 2 to 7, the temporary supporting casings for access platform will be installed by vibratory hammer.
- Access platform will be prefabricated on barge and lift to install on temporary supporting casings.
- All piling plants including crane will be set up on barge.
- Silt Curtain with indicators will be installed before bored piling commenced.

Bored Piles

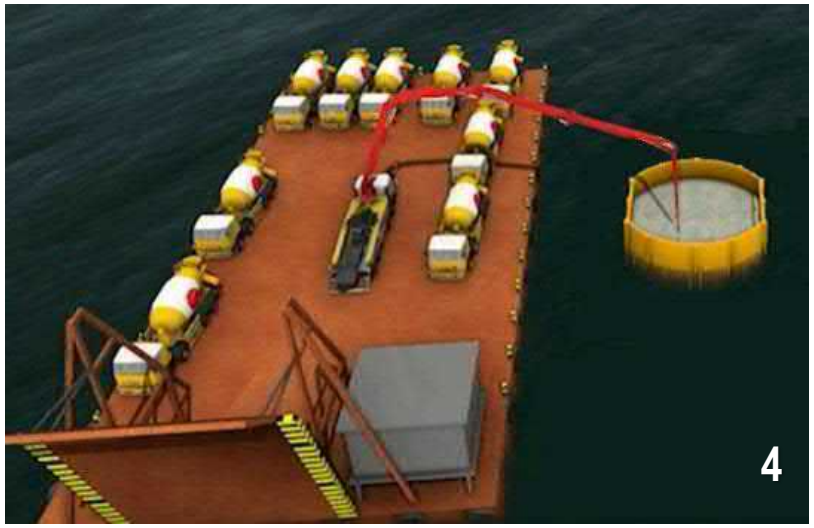
Figure C3

Construction Method





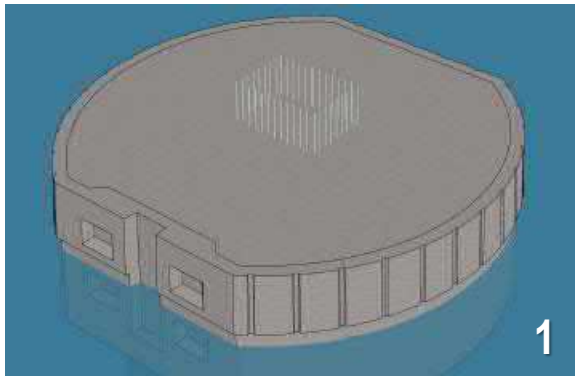
- Upon completion of bored piles, the access platform will be removed, and the steel cofferdams (i.e. pre-casted steel panels) will then be installed for pile cap construction .
- Rebar fixing and concreting will be carried out inside the cofferdam
- Concreting will be carried out by RoRo Barge and Concrete Pump Truck.

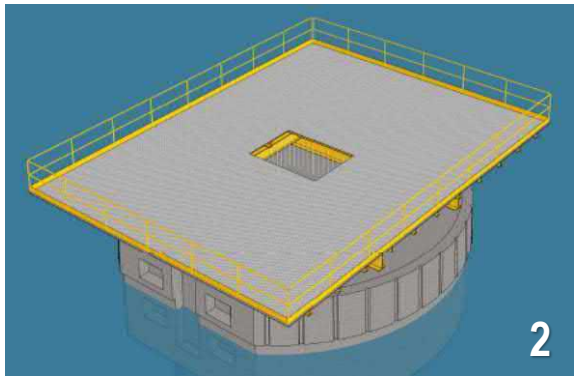


Pile cap

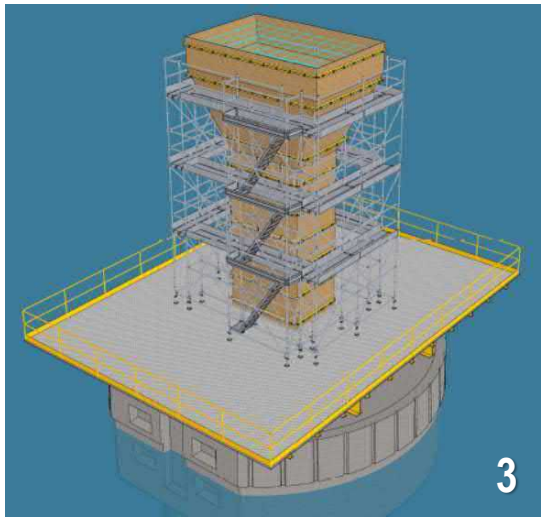
Figure C4

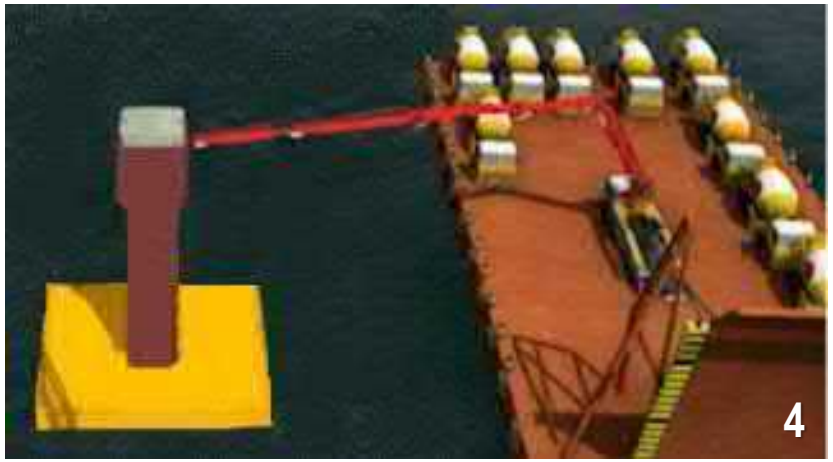
Construction Method





- A supporting platform will be installed on the pile cap formed (which is above the water level) for pier steel mould and scaffolding access tower.
- Concreting will be similar as Pile cap.

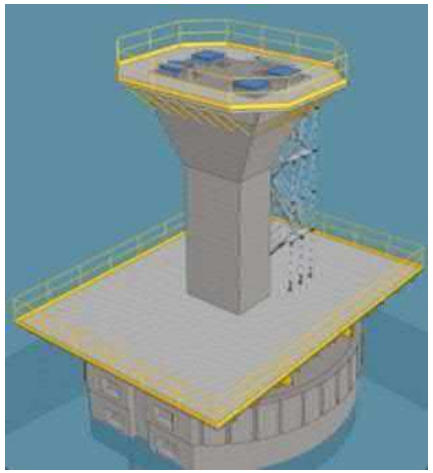




Pier

Figure C5

Construction Method



- An in-situ hammer head will be constructed using scaffolding or steel falsework on the pile cap.
- A prefabricated steel travelling form will then be installed at the end tips of the cantilever deck to in-situ cast the first segment of the deck.
- The travelling form will be moved onto the new cast segment and another travelling form will then be installed on the other end tip of the deck for construction of the new deck.

Deck

Figure C6

D. Review of Marine Ecology and Water Quality Impact Incurred by the Installation of Temporary Access Platforms

Overview

With reference to the construction method prepared by the Contractor in October 2020, installation of temporary access platforms is proposed, which is part of the temporary and preparation works due to the following reasons:

1) Providing safe working environment for construction workers
2) Facilitating permanent structures construction
3) Facilitating installation and deployment of silt curtain. Without the presence of temporary access platform, additional temporary support such as sheet pile or H-pile, more marine vessels/barges as well as anchors would be deployed to sufficiently weighted to hold the silt curtain in a vertical position above seabed. Additional hydrodynamic impact and temporary habitat loss are anticipated.

In the construction method prepared by the Contractor in October 2020, the 1m-diameter supporting casing column of temporary access platforms for Pier 1 to Pier 7 would be installed by vibratory hammer. However, refer to the updated site information provided by the Contractor in August 2021, the original proposal of installing the 1m-diameter casing by vibratory hammer was found to be impractical for Pier 1 due to the presence of boulder. To overcome this engineering difficulty, the temporary access platform for Pier 1 will be supported by reinforced supporting casing column in form of mini piles in diameter of 0.273m. The steps of installation of the reinforced supporting casing column at Pier 1 can be referred to **Figure C2 of Appendix C**.

Since Pier 1 located near to the shore which makes silt curtain anchoring possible, double layers silt curtain will be deployed to surround the Pier 1 piling area prior to the installation of reinforced supporting casing column and will be removed after cutting all reinforced supporting casing column below seabed level. Water generated during installation of reinforced supporting casing column at Pier 1 will be collected by pump for reuse or further treatment on barge prior to discharge to minimize the potential impacts on the water quality.

For Pier 1, it is anticipated that approximately 21m^3 inert construction and demolition (C&D) materials, 6m^3 non-inert C&D materials and less than 1m^3 sediment will be generated from installation of supporting casing columns, and removal of reinforced supporting casing columns upon completion of bored piling works. The generated C&D material and sediment will be handled with reference to Section 6.4 of the EIA Report. Considering the small amount of C&D waste and sediment will be generated making the overall waste generated quantities for the Project is nearly the same as estimated in the EIA, therefore, with the implementation of the mitigation measures recommended in the EIA Report, no unacceptable environmental impacts arising from handling of C&D wastes are expected.

A review on the potential impact of the 2 most prominent environmental aspects, marine ecology (in terms of temporary marine habitat loss) and water quality (in terms of hydrodynamic and marine sediment displacement) is provided.

D.1 Review on Temporary Marine Habitat Loss

The installation of temporary access platform for Pier 1 (with reinforced supporting casing column in form of mini piles in diameter of 0.273m) and temporary access platforms for Pier 2 to 7 (with supporting casing column in diameter of 1m) would lead to temporary loss of subtidal soft and hard bottom, and marine waters habitat, which are about 0.000112ha in maximum even during the marine construction works peak period (i.e. from June 2021 to December 2021). Upon the completion of bored pilling works, the whole supporting casing column of temporary access platforms for Pier 2 to 7 will be removed, while the reinforced supporting casing column of temporary access platforms for Pier 1 will be cut at 150mm below seabed level by diver and then lift away by crane barge/ derrick barge.

While taking into account the loss of temporary marine habitat leaded by installation of steel pile casings (with diameter of 2.2m) to create confined environment for excavation, which are about 0.000178ha in maximum even during the marine construction works peak period.

The total temporary marine habitat loss induced by installation of access platforms and steel pile casings is about 0.0003ha in maximum even during the marine construction works peak period.

Given the area affected is very small and scattered, also, in comparison with the estimation of temporary habitat loss during the EIA (i.e. about 0.0087ha in total), it is expected that the impact of temporary habitat loss is minor which is aligned with the EIA Report.

Mathematical calculations of temporary marine habitat loss and associated comparison are given in **Table D1.1** to **Table D1.7** respectively.

Calculation of Temporary Habitat Loss in EIA Report

Table D1.1 Total Temporary Habitat Loss Estimation in EIA Report

Type of Casing	Casing Parameters				Temporary Habitat Loss by Installation of Casing/ m^2	No. of Steel Pile Casing	Total Temporary Habitat Loss/ m^2	Total Temporary Habitat Loss/ ha
	Diameter/ m	Thickness/ m	Outer Area/ m^2	Inner Area/ m^2				
Steel Pile Casing	2.8	0.4	6.16	3.14	3.02	29	87.46	0.0087

Calculation of Temporary Habitat Loss According to Construction Method Prepared by the Contractor in October 2020 (further updated in August 2021) during the Marine Construction Works Peak Period

Table D1.2 Calculation of Temporary Habitat Loss by Each Casing

Type of Casing	Casing Parameters				Temporary Habitat Loss by Installation of Casing/ m^2
	Diameter/ m	Thickness/ m	Outer Area/ m^2	Inner Area/ m^2	
Supporting Casing of Access Platforms at Pier 1^	0.273	0.006	0.06	0.00	0.06
Supporting Casing of Access Platforms at Pier 2-7	1	0.012	0.79	0.75	0.04
Steel Pile Casing	2.2	0.020	3.80	3.66	0.14

Remarks:

^ Reinforced Supporting Casing of Access Platforms at Pier 1 is in form of mini piles

Table D1.3 Temporary Habitat Loss by Supporting Casing of Access Platforms & Steel Pile Casing during the Marine Construction Works Peak Period (Jun 2021)

Pier ID	No. of Access Platform	No. of Bored Pile	Temporary Habitat Loss by Access Platform/ m^2	Temporary Habitat Loss by Access Platform/ ha	Temporary Habitat Loss by Steel Pile Casing/ m^2	Temporary Habitat Loss by Steel Pile Casing/ ha	Total Temporary Habitat Loss/ m^2	Total Temporary Habitat Loss/ ha
Pier 3 *	1	3	0.15	0.000015	0.41	0.000041	0.56	0.000056
Pier 4 *	1	3	0.15	0.000015	0.41	0.000041	0.56	0.000056
Pier 6 *	1	3	0.15	0.000015	0.41	0.000041	0.56	0.000056
Pier 7 *	1	3	0.15	0.000015	0.41	0.000041	0.56	0.000056
		12.00	0.60	0.000060	1.64	0.000164	2.24	0.000224

Remarks:

* Each Access Platform of Pier 2 - 7 is with 4 Supporting Casings

Table D1.4 Temporary Habitat Loss by Supporting Casing of Access Platforms & Steel Pile Casing during the Marine Construction Works Peak Period (Jul - Oct 2021)

Pier ID	No. of Access Platform	No. of Bored Pile	Temporary Habitat Loss by Access Platform/ m^2	Temporary Habitat Loss by Access Platform/ ha	Temporary Habitat Loss by Steel Pile Casing/ m^2	Temporary Habitat Loss by Steel Pile Casing/ ha	Total Temporary Habitat Loss/ m^2	Total Temporary Habitat Loss/ ha
Pier 2 *	1	3	0.15	0.000015	0.41	0.000041	0.56	0.000056
Pier 6 *	1	3	0.15	0.000015	0.41	0.000041	0.56	0.000056
Pier 7 *	1	3	0.15	0.000015	0.41	0.000041	0.56	0.000056
		Total:	0.45	0.000045	1.23	0.000123	1.68	0.000168

Remarks:

* Each Access Platform of Pier 2 - 7 is with 4 Supporting Casings

Table D1.5 Temporary Habitat Loss by Supporting Casing of Access Platforms & Steel Pile Casing during the Marine Construction Works Peak Period (Nov 2021)

Pier ID	No. of Access Platform	No. of Bored Pile	Temporary Habitat Loss by Access Platform/ m^2	Temporary Habitat Loss by Access Platform/ ha	Temporary Habitat Loss by Steel Pile Casing/ m^2	Temporary Habitat Loss by Steel Pile Casing/ ha	Total Temporary Habitat Loss/ m^2	Total Temporary Habitat Loss/ ha
Pier 1 #	1	7	0.82	0.000082	0.96	0.000096	1.78	0.000178
Pier 2 *	1	3	0.15	0.000015	0.41	0.000041	0.56	0.000056
Pier 6 *	1	3	0.15	0.000015	0.41	0.000041	0.56	0.000056
		Total:	1.12	0.000112	1.78	0.000178	2.90	0.000290

Remarks:

The Access Platform of Pier 1 is with 14 Supporting Casings

* Each Access Platform of Pier 2 - 7 is with 4 Supporting Casings

Table D1.6 Temporary Habitat Loss by Supporting Casing of Access Platforms & Steel Pile Casing during the Marine Construction Works Peak Period (Dec 2021)

Pier ID	No. of Access Platform	No. of Bored Pile	Temporary Habitat Loss by Access Platform/ m^2	Temporary Habitat Loss by Access Platform/ ha	Temporary Habitat Loss by Steel Pile Casing/ m^2	Temporary Habitat Loss by Steel Pile Casing/ ha	Total Temporary Habitat Loss/ m^2	Total Temporary Habitat Loss/ ha
Pier 1 #	1	7	0.82	0.000082	0.96	0.000096	1.78	0.000178
Pier 2 *	1	3	0.15	0.000015	0.41	0.000041	0.56	0.000056
		Total:	0.97	0.000097	1.37	0.000137	2.34	0.000234

Remarks:

The Access Platform of Pier 1 is with 14 Supporting Casings

* Each Access Platform of Pier 2 - 7 is with 4 Supporting Casings

Comparison of Temporary Habitat Loss According to Construction Method Prepared by the Contractor in October 2020 (further updated in August 2021) with Estimation in EIA Stage

Table D1.7 Comparison of Total Temporary Habitat Loss

Scenario	Total Temporary Habitat Loss/ m^2	Total Temporary Habitat Loss/ ha
Total Temporary Habitat Loss According to Construction Method Prepared by the Contractor in October 2020 (further updated in August 2021) (for scenario in November 2021, which is the maximum case during the marine construction works peak period)	2.90	0.0003
Total Temporary Habitat Loss Estimation in EIA Report	87.00	0.0087

Given that the total number of bored piles for the latest design is 25 with diameter of steel pile casing 2.2m while the total number of bored piles in EIA assumption is 29 with diameter of steel pile casing 2.8m. The temporary habitat loss induced by construction method prepared by the Contractor in October 2020 (further updated in August 2021) (which involving reduced number of bored piles and installation of temporary access platforms) is estimated to be around 0.0003ha in maximum (refer to Table D1.5 presenting scenario in November 2021) even during the marine construction works peak period, which is less than the estimation during the EIA (i.e. about 0.0087ha in total). Therefore, it is expected that the impact of temporary habitat loss induced by the current construction method (which involving reduced number of bored piles and installation of temporary access platforms) is minor which is aligned with the EIA Report.

D.2 Review on Water Quality Impact

D.2.1 Hydrodynamic Impact

Assumption was made during the EIA that the construction of bridge piers will not be constructed at the same time, so that, it is expected that the hydrodynamic impact during operational phase is worse than at the interim construction stages. To reaffirm the above assumption, the worst-case scenario of the total width of marine piles, pile caps, access platform supporting casings and cofferdam during the marine construction works peak period (i.e. from June 2021 to December 2021) is estimated and would be 63.40m under the prevailing tidal flow (i.e. north-south direction). Since that is still below the EIA estimation of 65m, therefore, the above assumption is still valid. Mathematical calculations are given in **Table D.2**.

As the above assumption is still valid during construction phase, hydrodynamic impacts are within the EIA prediction according to Sections 5.7.14 to 5.7.17 of the EIA Report.

Table D.2 Calculation of The Worst-Case Scenario for Total Width[(1)] of Marine Bored Piles, Pile Caps, Access Platform Supporting Casings and Cofferdam during the Marine Construction Works Peak Period (i.e. from June 2021 to December 2021)

Pier ID	Pile Cap Width[(1)] Assumption during EIA Stage/ m	Pile Cap Width[(1)] under Detailed Design in Oct 2020 / m	Cofferdam Width[(1)] under Detailed Design in Oct 2020 / m
1a	5	2.60	5.89
1b	5	2.60	5.89
1c	5	2.60	5.89
1d	5	2.60	5.89
1e	5	2.60	5.89
1f	5	2.60	5.89
1g	5	2.60	5.89
1h	5	N/A	N/A
2	5	8.00	11.29
3	5	8.00	11.29
4	5	8.00	11.29
5	10	10.46	13.75
6	10	10.46	13.75
7	5	8.00	11.29

Remark:
[(1)] Width under the prevailing tidal flow (i.e. north-south direction)

The Peak Marine Construction Works to be carried out in June 2021

Pier ID	Pile Cap Width[(1)] Assumption during EIA Stage/ m	Width[(1)]of Structure under Detailed Design in Oct 2020 (further updated in Aug 2021) / m					
		Access Platform	Bored Piles	Cofferdam	Pile Cap		
1 [(2)] (including 1a, 1b, 1c, 1d, 1e, 1f, 1g & 1h)	25	N/A	N/A	N/A	N/A		
2	5	N/A	N/A	N/A	N/A		
3	5	N/A	N/A	11.29	N/A		
4	5	2	4.40	N/A	N/A		
5	10	N/A	N/A	N/A	10.46		
6	10	2	4.40	N/A	N/A		
7	5	2	4.40	N/A	N/A		
Total width[(1)]	65	6	13.20	11.29	10.46	Total width[(1)] during the marine construction works peak period/ m	40.95

Remark:
[(1)] Width under the prevailing tidal flow (i.e. north-south direction)
[(2)] Assumption of the total pile cap width of Pier 1 during EIA stage was made according to the pier (i.e. Pier 1a, 1b, 1c, 1d, 1e, 1f, 1g & 1h) location design during the EIA stage under the prevailing tidal flow (i.e. north-south direction)

The Peak Marine Construction Works to be carried out in July 2021

Pier ID	Pile Cap Width[(1)] Assumption during EIA Stage/ m	Width[(1)]of Structure under Detailed Design in Oct 2020 (further updated in Aug 2021) / m					
		Access Platform	Bored Piles	Cofferdam	Pile Cap		
1 [(2)] (including 1a, 1b, 1c, 1d, 1e, 1f, 1g & 1h)	25	N/A	N/A	N/A	N/A		
2	5	2	N/A	N/A	N/A		
3	5	N/A	N/A	11.29	N/A		
4	5	N/A	4.40	N/A	N/A		
5	10	N/A	N/A	N/A	10.46		
6	10	2	4.40	N/A	N/A		
7	5	2	4.40	N/A	N/A		
Total width[(1)]	65	6	13.20	11.29	10.46	Total width[(1)] during the marine construction works peak period/ m	40.95

Remark:
[(1)] Width under the prevailing tidal flow (i.e. north-south direction)
[(2)] Assumption of the total pile cap width of Pier 1 during EIA stage was made according to the pier (i.e. Pier 1a, 1b, 1c, 1d, 1e, 1f, 1g & 1h) location design during the EIA stage under the prevailing tidal flow (i.e. north-south direction)

The Peak Marine Construction Works to be carried out in August 2021

Pier ID	Pile Cap Width[(1)] Assumption during EIA Stage/ m	Width[(1)]of Structure under Detailed Design in Oct 2020 (further updated in Aug 2021) / m					
		Access Platform	Bored Piles	Cofferdam	Pile Cap		
1 [(2)] (including 1a, 1b, 1c, 1d, 1e, 1f, 1g & 1h)	25	N/A	N/A	N/A	N/A		
2	5	2	4.40	N/A	N/A		
3	5	N/A	N/A	N/A	8.00		
4	5	N/A	4.40	N/A	N/A		
5	10	N/A	N/A	N/A	10.46		
6	10	2	4.40	N/A	N/A		
7	5	2	4.40	N/A	N/A		
Total width[(1)]	65	6	17.60	0.00	18.46	Total width[(1)] during the marine construction works peak period/ m	42.06

Remark:
[(1)] Width under the prevailing tidal flow (i.e. north-south direction)
[(2)] Assumption of the total pile cap width of Pier 1 during EIA stage was made according to the pier (i.e. Pier 1a, 1b, 1c, 1d, 1e, 1f, 1g & 1h) location design during the EIA stage under the prevailing tidal flow (i.e. north-south direction)

The Peak Marine Construction Works to be carried out in September 2021

Pier ID	Pile Cap Width[(1)] Assumption during EIA	Width[(1)]of Structure under Detailed Design in Oct 2020 (further updated in Aug 2021) / m					
		Access Platform	Bored Piles	Cofferdam	Pile Cap		
1 [(2)] (including 1a, 1b, 1c, 1d, 1e, 1f, 1g & 1h)	25	N/A	N/A	N/A	N/A		
2	5	2	4.40	N/A	N/A		
3	5	N/A	N/A	N/A	8.00		
4	5	N/A	4.40	N/A	N/A		
5	10	N/A	N/A	N/A	10.46		
6	10	2	4.40	N/A	N/A		
7	5	N/A	N/A	11.29	N/A		
Total width[(1)]	65	4	13.20	11.29	18.46	Total width[(1)] during the marine construction works peak period/ m	46.95

Remark:

[(1)] Width under the prevailing tidal flow (i.e. north-south direction)

[(2)] Assumption of the total pile cap width of Pier 1 during EIA stage was made according to the pier (i.e. Pier 1a, 1b, 1c, 1d, 1e, 1f, 1g & 1h) location design during the EIA stage under the prevailing tidal flow (i.e. north-south direction)

The Peak Marine Construction Works to be carried out in October 2021

Pier ID	Pile Cap Width[(1)] Assumption during EIA	Width[(1)]of Structure under Detailed Design in Oct 2020 (further updated in Aug 2021) / m					
		Access Platform	Bored Piles	Cofferdam	Pile Cap		
1 [(2)] (including 1a, 1b, 1c, 1d, 1e, 1f, 1g & 1h)	25	N/A	N/A	N/A	N/A		
2	5	2	4.40	N/A	N/A		
3	5	N/A	N/A	N/A	8.00		
4	5	N/A	N/A	11.29	N/A		
5	10	N/A	N/A	N/A	10.46		
6	10	2	4.40	N/A	N/A		
7	5	N/A	N/A	11.29	N/A		
Total width[(1)]	65	4	8.80	22.58	18.46	Total width[(1)] during the marine construction works peak period/ m	53.84

Remark:

[(1)] Width under the prevailing tidal flow (i.e. north-south direction)

[(2)] Assumption of the total pile cap width of Pier 1 during EIA stage was made according to the pier (i.e. Pier 1a, 1b, 1c, 1d, 1e, 1f, 1g & 1h) location design during the EIA stage under the prevailing tidal flow (i.e. north-south direction)

The Peak Marine Construction Works to be carried out in November 2021

Pier ID	Pile Cap Width[(1)] Assumption during EIA	Width[(1)]of Structure under Detailed Design in Oct 2020 (further updated in Aug 2021) / m					
		Access Platform	Bored Piles	Cofferdam	Pile Cap		
1 [(2)] (including 1a, 1b, 1c, 1d, 1e, 1f, 1g & 1h)	25	2.184	6.60	N/A	N/A		
2	5	2	4.40	N/A	N/A		
3	5	N/A	N/A	N/A	8.00		
4	5	N/A	N/A	11.29	N/A		
5	10	N/A	N/A	N/A	10.46		
6	10	2	4.40	N/A	N/A		
7	5	N/A	N/A	N/A	8.00		
Total width[(1)]	65	6.184	15.40	11.29	26.46	Total width[(1)] during the marine construction works peak period/ m	59.34

Remark:

[(1)] Width under the prevailing tidal flow (i.e. north-south direction)

[(2)] Assumption of the total pile cap width of Pier 1 during EIA stage was made according to the pier (i.e. Pier 1a, 1b, 1c, 1d, 1e, 1f, 1g & 1h) location design during the EIA stage under the prevailing tidal flow (i.e. north-south direction)

The Peak Marine Construction Works to be carried out in December 2021

Pier ID	Pile Cap Width[(1)] Assumption during EIA	Width[(1)]of Structure under Detailed Design in Oct 2020 (further updated in Aug 2021) / m					
		Access Platform	Bored Piles	Cofferdam	Pile Cap		
1 [(2)] (including 1a, 1b, 1c, 1d, 1e, 1f, 1g & 1h)	25	2.184	6.60	N/A	N/A		
2	5	2	4.40	N/A	N/A		
3	5	N/A	N/A	N/A	8.00		
4	5	N/A	N/A	N/A	8.00		
5	10	N/A	N/A	N/A	10.46		
6	10	N/A	N/A	13.75	N/A		
7	5	N/A	N/A	N/A	8.00		
Total width[(1)]	65	4.184	11.00	13.75	34.47	Total width[(1)] during the marine construction works peak period/ m	63.40

Remark:

[(1)] Width under the prevailing tidal flow (i.e. north-south direction)

[(2)] Assumption of the total pile cap width of Pier 1 during EIA stage was made according to the pier (i.e. Pier 1a, 1b, 1c, 1d, 1e, 1f, 1g & 1h) location design during the EIA stage under the prevailing tidal flow (i.e. north-south direction)

D.2.2 Marine Sediment Displacement

With reference to the approved EIA report S.5.6.1 and S.5.7.3, installation of steel pile casing would only cause minor displacement of marine sediment, which will quickly settle without significant increase in suspended solids. The installation of supporting casings of temporary access platforms could be compared with the installation steel pile casings of bored piles in three major aspects so as to review the level of marine sediment displacement due to installation of access platforms.

Table D.3 Comparison of Major Aspects for Installation of Temporary Supporting Casings of Access Platforms and Installation Steel Pile Casings of Bored Piles

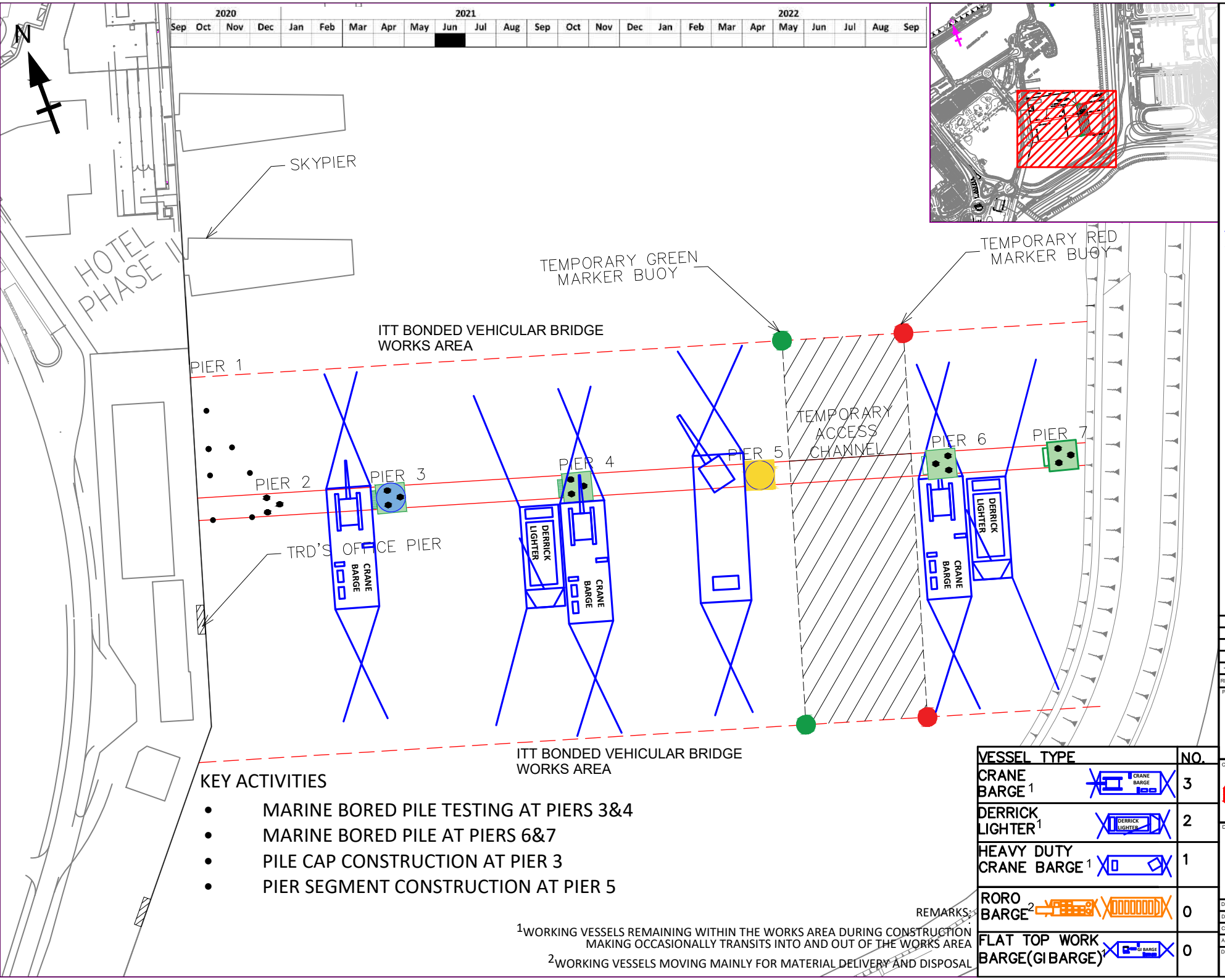
	Temporary access platform supported by reinforced supporting casing column in form of mini piles	**Temporary supporting casings of access platform at Pier 2 - 7**	**Steel pile casings of bored pile**
Diameter, m	0.273	1	2.2
Duration of installation, day(s)	1-1.5 (for each casing)	1-1.5 (for each casing)	14 (for each casing)
Depth of casing	From -14.3mPD to -23.6mPD	From -15mPD to -36mPD	From -19.21mPD to -66.86mPD

Given the diameter, duration of installation and depth of temporary supporting casings of access platforms are substantially smaller and shorter than the steel pile casings of bored pile, it is expected that the marine sediment displacement impact of supporting casings due to installation of temporary access platform is minor which is aligned with the EIA Report.

D.2.3 Conclusion

In view of the result given in **Section D.2.1** and **Section D.2.2**, it is considered that there is no additional environmental impact due to installation of temporary access platform based on the EIA Report.

E. Barge Phasing Plan



KEY ACTIVITIES

- MARINE BORED PILE TESTING AT PIERS 3&4
- MARINE BORED PILE AT PIERS 6&7
- PILE CAP CONSTRUCTION AT PIER 3
- PIER SEGMENT CONSTRUCTION AT PIER 5

VESSEL TYPE	NO.
CRANE BARGE [1]	3
DERRICK LIGHTER [1]	2
HEAVY DUTY CRANE BARGE [1]	1
RORO BARGE [2]	0
FLAT TOP WORK BARGE(GI BARGE) [1]	0

REMARKS:

[1] WORKING VESSELS REMAINING WITHIN THE WORKS AREA DURING CONSTRUCTION MAKING OCCASIONALLY TRANSITS INTO AND OUT OF THE WORKS AREA

[2] WORKING VESSELS MOVING MAINLY FOR MATERIAL DELIVERY AND DISPOSAL

Legend:

- ACCESS PLATFORM
- CRANE BARGE
- DERRICK LIGHTER
- RORO BARGE FOR CONCRETE TRUCKS
- RORO BARGE FOR MATERIALS
- HEAVY CRANE BARGE
- PREDRILLING MACHINE
- WORKS STATION (JACKUP BARGE)
- BORED PILE
- PILE CAP
- PIER
- PIERHEAD
- WORKS STATION (VESSEL)
- FLAT TOP WORK BARGE(GI BARGE)

REV	DESCRIPTION	DATE	DGN	CHK	APP
-	FIRST ISSUE	17 Aug 2020	ML	SW	JF

PROJECT TITLE

CONTRACT C19W10 INTERMODAL TRANSFER TERMINAL - BONDED VEHICULAR BRIDGE AND ASSOCIATED ROADS

CONTRACTOR

Gammon

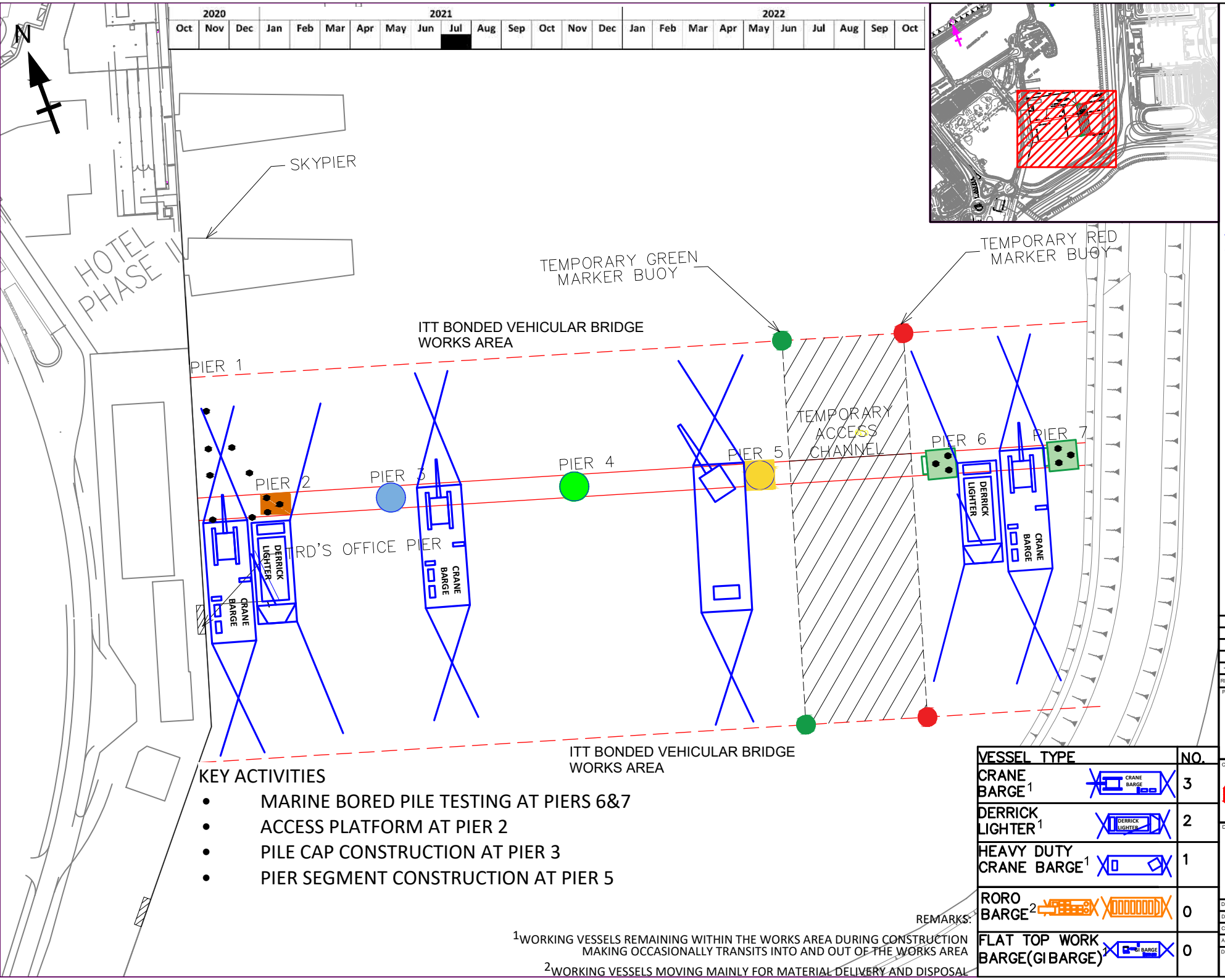
DRAWING TITLE

BARGE PHASING PLAN
JUN 2021

DESIGN	SCALE
DRAWN ML	
CHECKED SW	STATUS
APPROVED JF	

DRAWING NO. J3888-BPP-011

REV -



KEY ACTIVITIES

- MARINE BORED PILE TESTING AT PIERS 6&7
- ACCESS PLATFORM AT PIER 2
- PILE CAP CONSTRUCTION AT PIER 3
- PIER SEGMENT CONSTRUCTION AT PIER 5

Legend:

- ACCESS PLATFORM
- CRANE BARGE
- DERRICK LIGHTER
- RORO BARGE FOR CONCRETE TRUCKS
- RORO BARGE FOR MATERIALS
- HEAVY CRANE BARGE
- PREDRILLING MACHINE
- WORKS STATION (JACKUP BARGE)
- BORED PILE
- PILE CAP
- PIER
- PIERHEAD
- WORKS STATION (VESSEL)
- FLAT TOP WORK BARGE(GI BARGE)
- BORED PILE (COMPLETED)

VESSEL TYPE	NO.
CRANE BARGE[1]	3
DERRICK LIGHTER[1]	2
HEAVY DUTY CRANE BARGE[1]	1
RORO BARGE[2]	0
FLAT TOP WORK BARGE(GI BARGE)[1]	0

REMARKS:

[1]WORKING VESSELS REMAINING WITHIN THE WORKS AREA DURING CONSTRUCTION MAKING OCCASIONALLY TRANSITS INTO AND OUT OF THE WORKS AREA

[2]WORKING VESSELS MOVING MAINLY FOR MATERIAL DELIVERY AND DISPOSAL

REV	DESCRIPTION	DATE	DGN	CHK	APP
-	FIRST ISSUE	17 Aug 2020	ML	SW	JF

PROJECT TITLE

CONTRACT C19W10 INTERMODAL TRANSFER TERMINAL - BONDED VEHICULAR BRIDGE AND ASSOCIATED ROADS

CONTRACTOR

Gammon

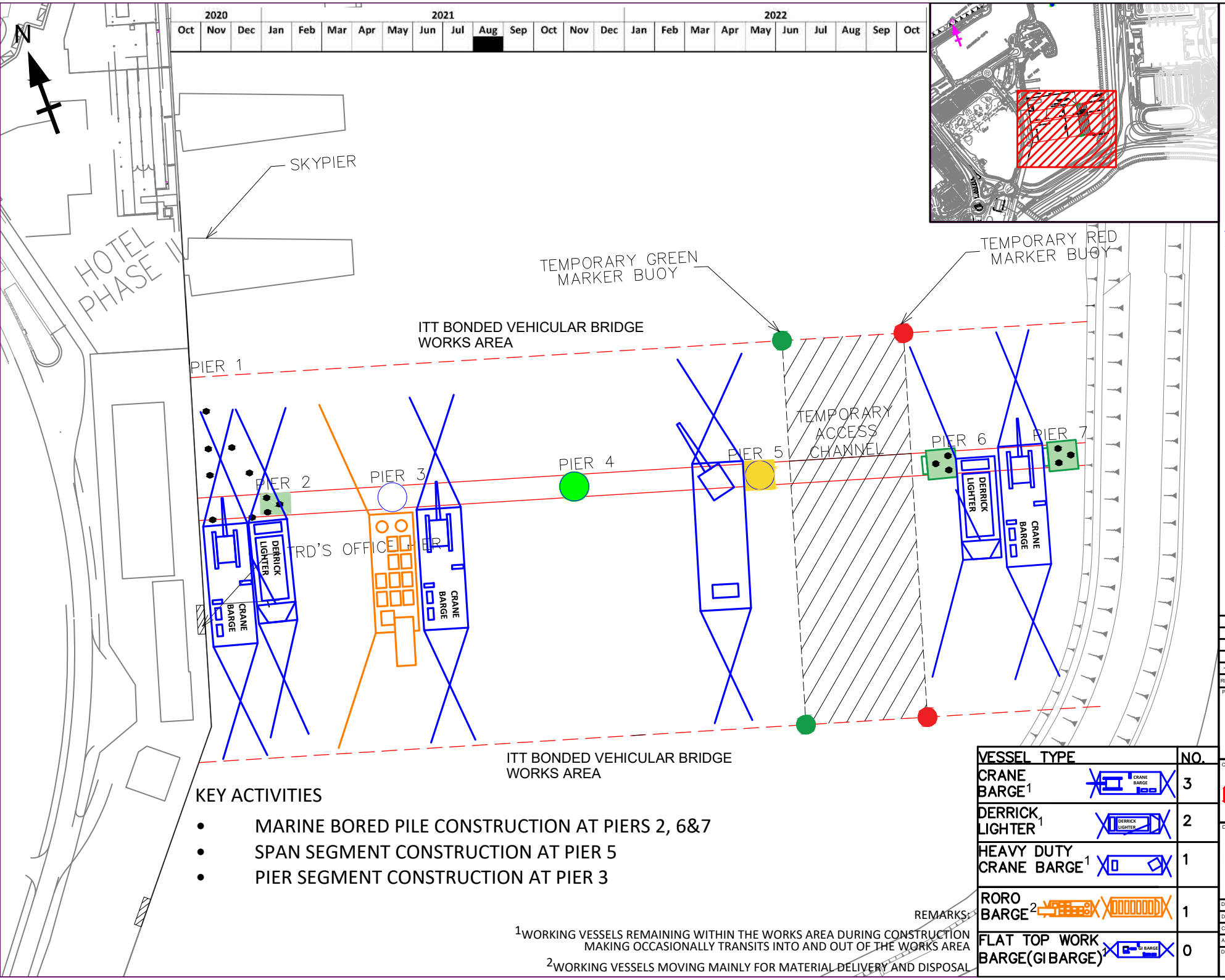
DRAWING TITLE

BARGE PHASING PLAN
JUL 2021

DESIGN	SCALE
DRAWN ML	
CHECKED SW	STATUS
APPROVED JF	

DRAWING NO. J3888-BPP-012

REV -



KEY ACTIVITIES

- MARINE BORED PILE CONSTRUCTION AT PIERS 2, 6&7
- SPAN SEGMENT CONSTRUCTION AT PIER 5
- PIER SEGMENT CONSTRUCTION AT PIER 3

Legend:

- ACCESS PLATFORM
- CRANE BARGE
- DERRICK LIGHTER
- RORO BARGE FOR CONCRETE TRUCKS
- RORO BARGE FOR MATERIALS
- HEAVY CRANE BARGE
- PREDRILLING MACHINE
- WORKS STATION (JACKUP BARGE)
- BORED PILE
- PILE CAP
- PIER
- PIERHEAD
- WORKS STATION (VESSEL)
- FLAT TOP WORK BARGE(GI BARGE)
- BORED PILE (COMPLETED)

VESSEL TYPE	NO.
CRANE BARGE[1]	3
DERRICK LIGHTER[1]	2
HEAVY DUTY CRANE BARGE[1]	1
RORO BARGE[2]	1
FLAT TOP WORK BARGE(GI BARGE)[1]	0

REMARKS:

[1]WORKING VESSELS REMAINING WITHIN THE WORKS AREA DURING CONSTRUCTION MAKING OCCASIONALLY TRANSITS INTO AND OUT OF THE WORKS AREA

[2]WORKING VESSELS MOVING MAINLY FOR MATERIAL DELIVERY AND DISPOSAL

REV	DESCRIPTION	DATE	DGN	CHK	APP
-	FIRST ISSUE	17 Aug 2020	ML	SW	JF

PROJECT TITLE

CONTRACT C19W10 INTERMODAL TRANSFER TERMINAL - BONDED VEHICULAR BRIDGE AND ASSOCIATED ROADS

CONTRACTOR

Gammon

DRAWING TITLE

BARGE PHASING PLAN
AUG 2021

DESIGN	SCALE
DRAWN ML	
CHECKED SW	STATUS
APPROVED JF	

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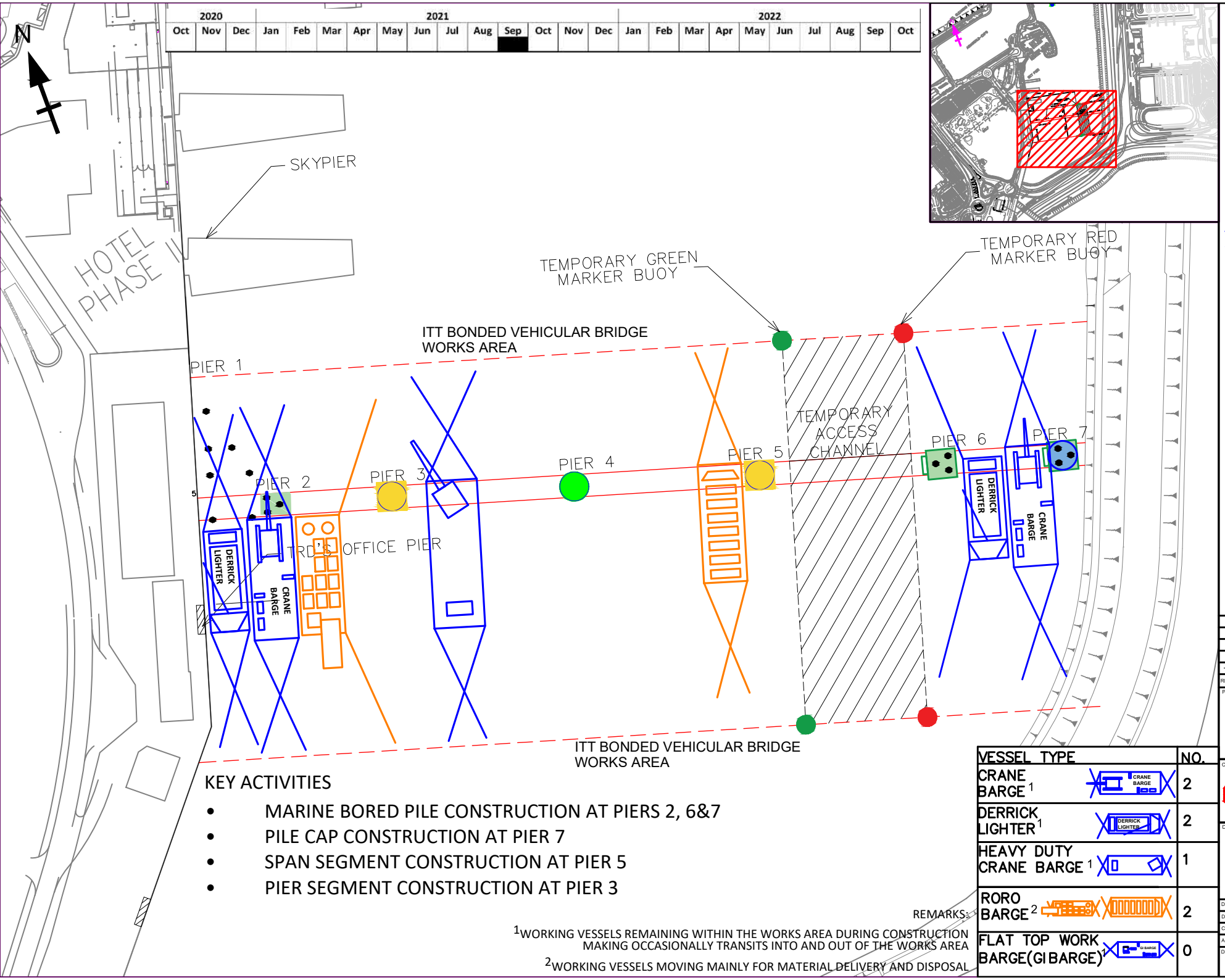
REV -



KEY ACTIVITIES

- MARINE BORED PILE CONSTRUCTION AT PIERS 2, 6&7
- PILE CAP CONSTRUCTION AT PIER 7
- SPAN SEGMENT CONSTRUCTION AT PIER 5
- PIER SEGMENT CONSTRUCTION AT PIER 3

Legend:

- ACCESS PLATFORM
- CRANE BARGE
- DERRICK LIGHTER
- RORO BARGE FOR CONCRETE TRUCKS
- RORO BARGE FOR MATERIALS
- HEAVY CRANE BARGE
- PREDRILLING MACHINE
- WORKS STATION (JACKUP BARGE)
- BORED PILE
- PILE CAP
- PIER
- PIERHEAD
- WORKS STATION (VESSEL)
- FLAT TOP WORK BARGE(GI BARGE)
- BORED PILE (COMPLETED)

VESSEL TYPE	NO.
CRANE BARGE [1]	2
DERRICK LIGHTER [1]	2
HEAVY DUTY CRANE BARGE [1]	1
RORO BARGE [2]	2
FLAT TOP WORK BARGE(GI BARGE) [1]	0

REMARKS:

[1] WORKING VESSELS REMAINING WITHIN THE WORKS AREA DURING CONSTRUCTION MAKING OCCASIONALLY TRANSITS INTO AND OUT OF THE WORKS AREA

[2] WORKING VESSELS MOVING MAINLY FOR MATERIAL DELIVERY AND DISPOSAL

REV	DESCRIPTION	DATE	DGN	CHK	APP
-	FIRST ISSUE	17 Aug 2020	ML	SW	JF

PROJECT TITLE

CONTRACT C19W10 INTERMODAL TRANSFER TERMINAL - BONDED VEHICULAR BRIDGE AND ASSOCIATED ROADS

CONTRACTOR

Gammon

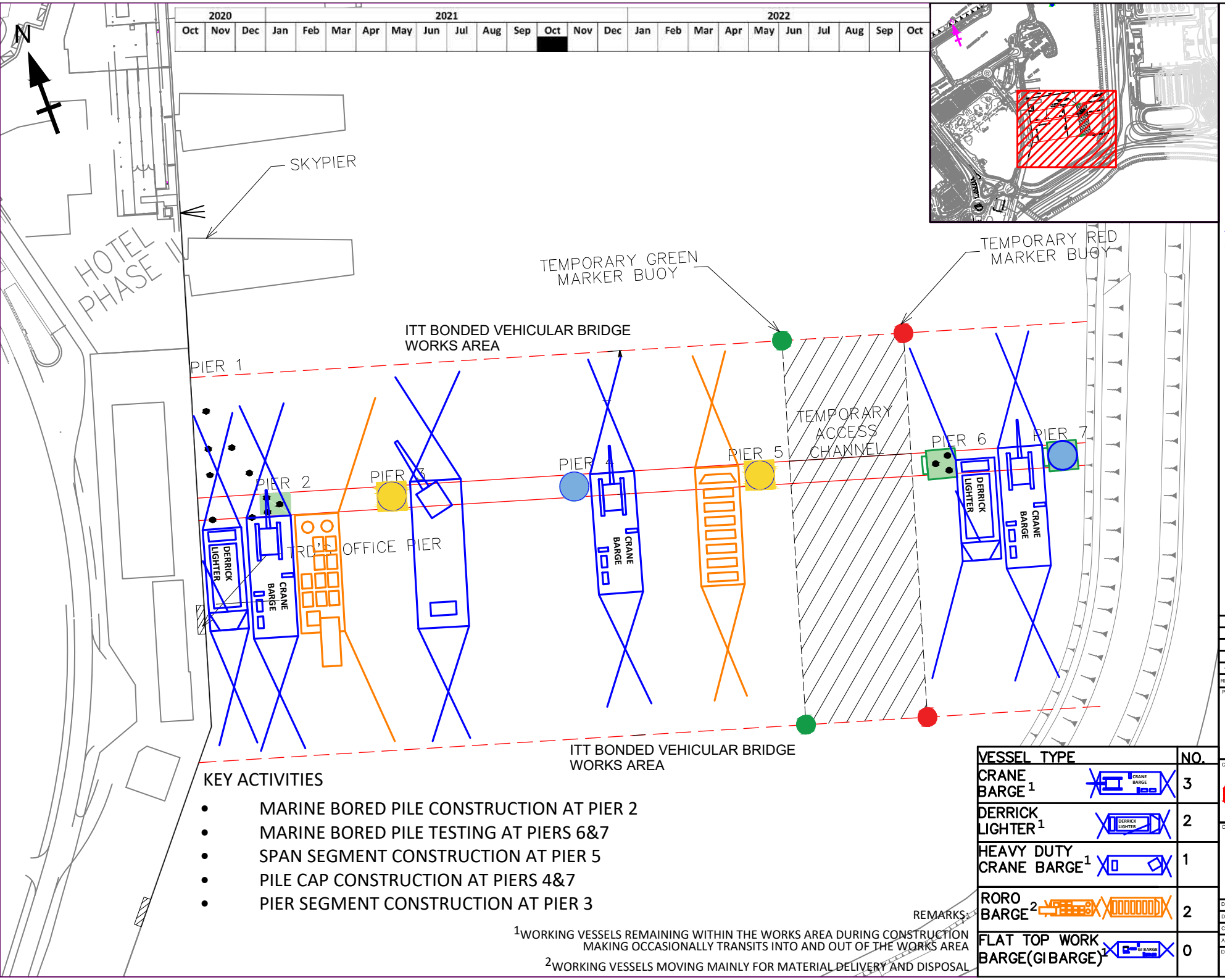
DRAWING TITLE

BARGE PHASING PLAN
SEP 2021

DESIGN	SCALE
DRAWN ML	
CHECKED SW	STATUS
APPROVED JF	

DRAWING NO. J3888-BPP-014

REV -



KEY ACTIVITIES

- MARINE BORED PILE CONSTRUCTION AT PIER 2
- MARINE BORED PILE TESTING AT PIERS 6&7
- SPAN SEGMENT CONSTRUCTION AT PIER 5
- PILE CAP CONSTRUCTION AT PIERS 4&7
- PIER SEGMENT CONSTRUCTION AT PIER 3

Legend:

- ACCESS PLATFORM
- CRANE BARGE
- DERRICK LIGHTER
- RORO BARGE FOR CONCRETE TRUCKS
- RORO BARGE FOR MATERIALS
- HEAVY CRANE BARGE
- PREDRILLING MACHINE
- WORKS STATION (JACKUP BARGE)
- BORED PILE
- PILE CAP
- PIER
- PIERHEAD
- WORKS STATION (VESSEL)
- FLAT TOP WORK BARGE(GI BARGE)

VESSEL TYPE	NO.
CRANE BARGE [1]	3
DERRICK LIGHTER [1]	2
HEAVY DUTY CRANE BARGE [1]	1
RORO BARGE [2]	2
FLAT TOP WORK BARGE(GI BARGE) [1]	0

REMARKS:

[1] WORKING VESSELS REMAINING WITHIN THE WORKS AREA DURING CONSTRUCTION MAKING OCCASIONALLY TRANSITS INTO AND OUT OF THE WORKS AREA

[2] WORKING VESSELS MOVING MAINLY FOR MATERIAL DELIVERY AND DISPOSAL

REV	DESCRIPTION	DATE	DGN	CHK	APP
-	FIRST ISSUE	17 Aug 2020	ML	SW	JF

PROJECT TITLE

CONTRACT C19W10 INTERMODAL TRANSFER TERMINAL - BONDED VEHICULAR BRIDGE AND ASSOCIATED ROADS

CONTRACTOR

Gammon

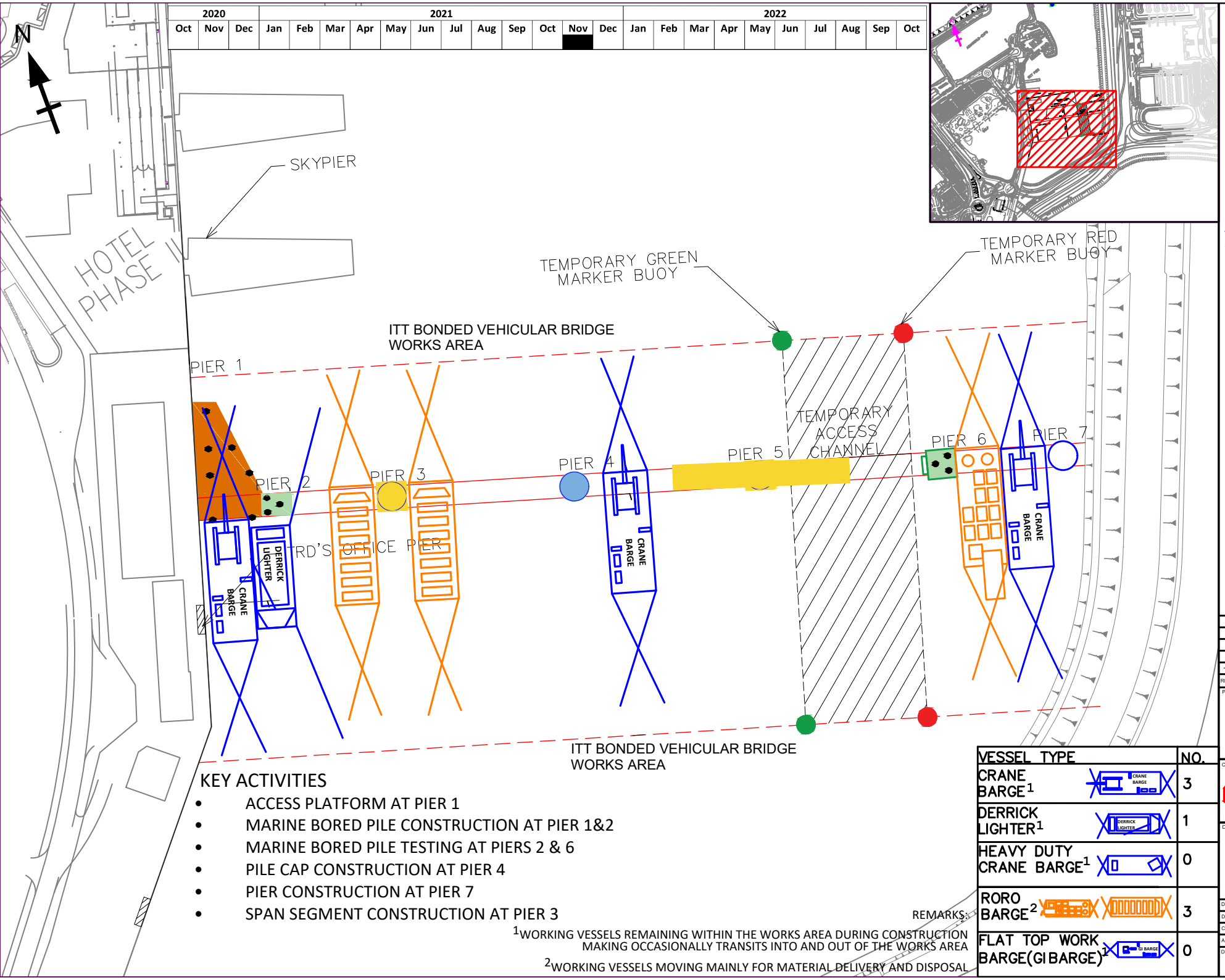
DRAWING TITLE

BARGE PHASING PLAN
OCT 2021

DESIGN	SCALE
DRAWN ML	
CHECKED SW	STATUS
APPROVED JF	

DRAWING NO. J3888-BPP-015

REV -



Legend:

- ACCESS PLATFORM
- CRANE BARGE
- DERRICK LIGHTER
- RORO BARGE FOR CONCRETE TRUCKS
- RORO BARGE FOR MATERIALS
- HEAVY CRANE BARGE
- PREDRILLING MACHINE
- WORKS STATION (JACKUP BARGE)
- BORED PILE
- PILE CAP
- PIER
- PIERHEAD
- WORKS STATION (VESSEL)
- FLAT TOP WORK BARGE(GI BARGE)

KEY ACTIVITIES

- ACCESS PLATFORM AT PIER 1
- MARINE BORED PILE CONSTRUCTION AT PIER 1&2
- MARINE BORED PILE TESTING AT PIERS 2 & 6
- PILE CAP CONSTRUCTION AT PIER 4
- PIER CONSTRUCTION AT PIER 7
- SPAN SEGMENT CONSTRUCTION AT PIER 3

VESSEL TYPE	NO.
CRANE BARGE[1]	3
DERRICK LIGHTER[1]	1
HEAVY DUTY CRANE BARGE[1]	0
RORO BARGE[2]	3
FLAT TOP WORK BARGE(GI BARGE)[1]	0

REMARKS:

[1]WORKING VESSELS REMAINING WITHIN THE WORKS AREA DURING CONSTRUCTION MAKING OCCASIONALLY TRANSITS INTO AND OUT OF THE WORKS AREA

[2]WORKING VESSELS MOVING MAINLY FOR MATERIAL DELIVERY AND DISPOSAL

REV	DESCRIPTION	DATE	DGN	CHK	APP
-	FIRST ISSUE	17 Aug 2020	ML	SW	JF

PROJECT TITLE

CONTRACT C19W10 INTERMODAL TRANSFER TERMINAL - BONDED VEHICULAR BRIDGE AND ASSOCIATED ROADS

CONTRACTOR

Gammon

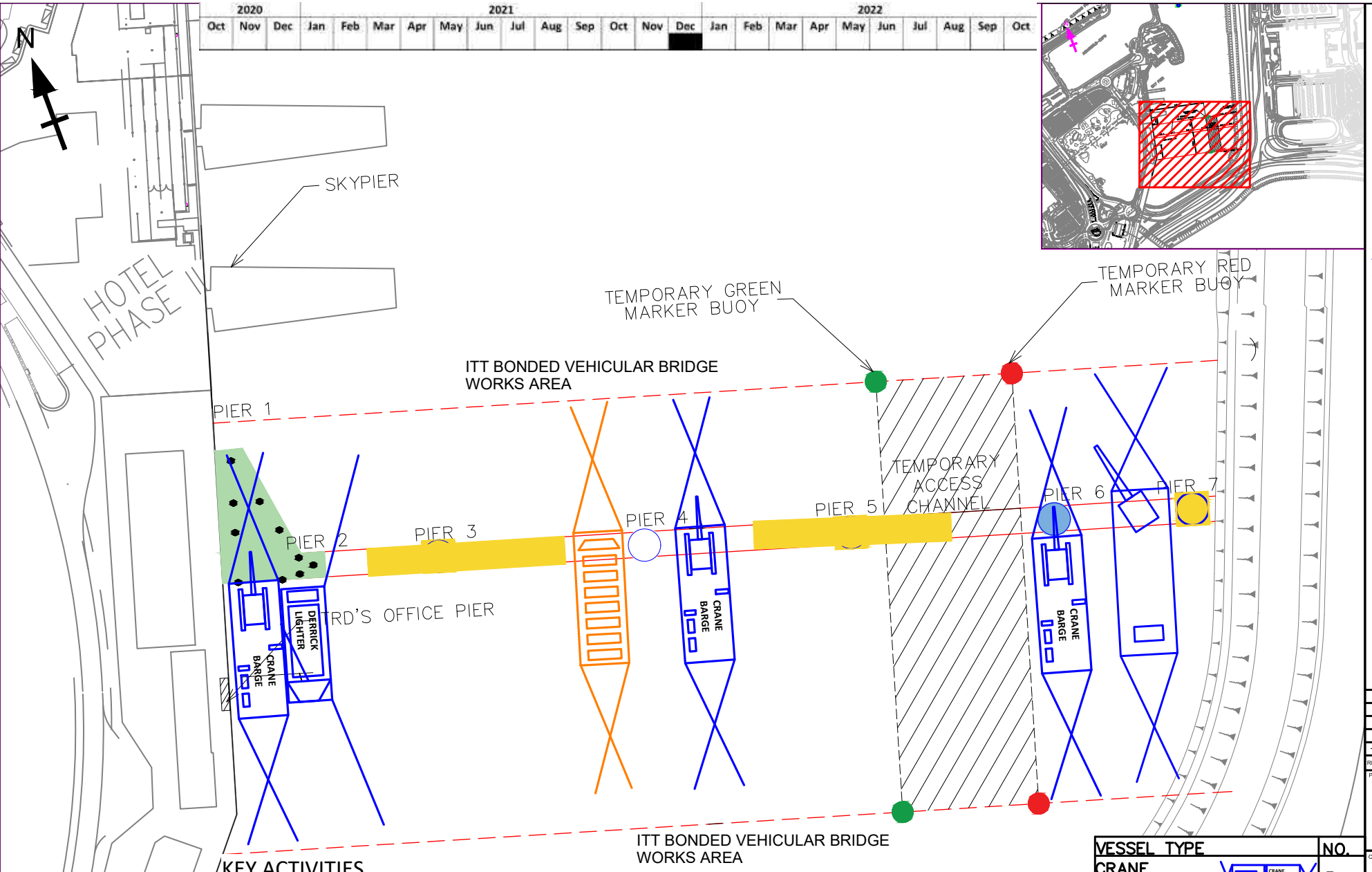
DRAWING TITLE

BARGE PHASING PLAN
NOV 2021

DESIGN	SCALE
DRAWN ML	
CHECKED SW	STATUS
APPROVED JF	

DRAWING NO. J3888-BPP-016

REV -



KEY ACTIVITIES

- MARINE BORED PILE TESTING AT PIERS 1&2
- SPAN SEGMENT CONSTRUCTION AT PIER 3
- PILE CAP CONSTRUCTION AT PIER 6
- PIER CONSTRUCTION AT PIER 4
- PIER SEGMENT CONSTRUCTION AT PIER 7

REMARKS:

[1]WORKING VESSELS REMAINING WITHIN THE WORKS AREA DURING CONSTRUCTION MAKING OCCASIONALLY TRANSITS INTO AND OUT OF THE WORKS AREA

[2]WORKING VESSELS MOVING MAINLY FOR MATERIAL DELIVERY AND DISPOSAL

VESSEL TYPE	NO.
CRANE BARGE[1]	3
DERRICK LIGHTER[1]	1
HEAVY DUTY CRANE BARGE[1]	1
RORO BARGE[2]	1
FLAT TOP WORK BARGE(GI BARGE)[1]	0

Legend:

- ACCESS PLATFORM
- CRANE BARGE
- DERRICK LIGHTER
- RORO BARGE FOR CONCRETE TRUCKS
- RORO BARGE FOR MATERIALS
- HEAVY CRANE BARGE
- PREDRILLING MACHINE
- WORKS STATION (JACKUP BARGE)
- BORED PILE
- PILE CAP
- PIER
- PIERHEAD
- WORKS STATION (VESSEL)
- FLAT TOP WORK BARGE(GI BARGE)

REV	DESCRIPTION	DATE	DGN	CHK	APP
-	FIRST ISSUE	17 Aug 2020	ML	SW	JF

PROJECT TITLE

CONTRACT C19W10 INTERMODAL TRANSFER TERMINAL - BONDED VEHICULAR BRIDGE AND ASSOCIATED ROADS

CONTRACTOR

Gammon

DRAWING TITLE

BARGE PHASING PLAN
DEC 2021

DESIGN	SCALE
DRAWN ML	
CHECKED SW	STATUS
APPROVED JF	

DRAWING NO. J3888-BPP-017

REV -

F. Environmental Review Report for the Change of Construction Method for Bridge Deck

Gammon

Intermodal Transfer Terminal - Bonded Vehicular Bridge and Associated Roads

Environmental Review Report

9 April 2021

Project No.: 0560223

The business of sustainability

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Document details	
Document title	Intermodal Transfer Terminal - Bonded Vehicular Bridge and Associated Roads
Document subtitle	Environmental Review Report
Project No.	0560223
Date	9 April 2021
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Author	Pako Yu
Client Name	Gammon Engineering & Construction Company Limited

Document history

				ERM approval to issue		
Version	Revision	Author	Reviewed by	Name	Date	Comments
Draft	1.0	Pako Yu	Mandy To	Jovy Tam	10.9.2020	-
Revised	2.0	Pako Yu	Mandy To	Jovy Tam	30.11.2020	Comments from EPD on 17 September 2020
Revised	3.0	Pako Yu	Mandy To	Jovy Tam	19.1.2021	Comments from EPD on 22 December 2020
Revised	4.0	Pako Yu	Mandy To	Jovy Tam	10.3.2021	Comments from EPD on 11 February 2020
Revised	5.0	Pako Yu	Mandy To	Jovy Tam	9.4.2021	Comments from EPD on 24 March 2020

This Submission of Environmental Review Report on 9 April 2021

has been reviewed and certified by

the Environmental Team Leader (ETL) in accordance with

Condition 1.9 of the Environmental Permit No. EP-560/2018

of the Project.

Certified by:

Ir Thomas Chan
Environmental Team Leader (ETL)
Mott MacDonald Hong Kong Limited

Date 9 April 2021

AECOM
12/F, Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, Hong Kong
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Our Ref: 60610093/C/FYW2104091

By Email

Airport Authority Hong Kong
HKIA Tower, 1 Sky Plaza Road,
Hong Kong International Airport,
Lantau, Hong Kong

Attn: Alan Chan (Manager, Civil)

9 April 2021

Dear Sir,

Contract C19C02 – Independent Environmental Checker Consultancy Services for Intermodal Transfer Terminal – Bonded Vehicular Bridge and Associated Roads
Environmental Review Report

Reference is made to the submission of Environmental Review Report by the Gammon Engineering & Construction Company Limited on 9 April 2021.

We would like to inform you that we have no adverse comment on the captioned submission. Therefore we write to verify the captioned submission in accordance with the requirement stipulated in Condition 1.9 of EP-560/2018.

Should you have any queries, please feel free to contact the undersigned at 3922 9366.

Yours faithfully,
AECOM Asia Co. Ltd.

Y W Fung
Independent Environmental Checker

Signature Page

9 April 2021

Intermodal Transfer Terminal - Bonded Vehicular Bridge and Associated Roads

Environmental Review Report

Jovy Tam
Partner

ERM-Hong Kong, Limited
2507, 25/F One Harbourfront
18 Tak Fung Street
Hung Hom, Kowloon
Hong Kong

CONTENTS

List of Figures

1. INTRODUCTION

1.1 Background

The Airport Authority Hong Kong (AAHK) is committed to construct the Intermodal Transfer Terminal (ITT) in order to introduce a hassle-free bonded vehicle services between the existing Hong Kong International Airport (HKIA) and the Pearl River Delta (PRD) West through Hong Kong Boundary Crossing Facilities (HKBCF) and to enhance the accessibility between HKIA and PRD.

After thorough planning and consideration, AAHK decided to construct a bridge, namely Intermodal Transfer Terminal – Bonded Vehicular Bridge (ITT-BVB), for direct land connection between the ITT and the HKBCF. An Environmental Impact Assessment (EIA) Report for *ITT-BVB and Associated Roads* (Register No.: AEIAR-216/2018) (the EIA Report) was prepared to evaluate the potential environmental impacts of the *ITT-BVB* and was submitted under the *Environmental Impact Assessment Ordinance* (EIAO) for the application of an Environmental Permit (EP). The EIA Report was approved by the Environmental Protection Department (EPD) with an EP (EP–560/2018) granted on 23 August 2018.

Gammon Engineering & Construction Company Limited (GECCL) has been awarded to undertake the construction of the bridge foundation for the *ITT-BVB* and Associated Roads (hereinafter referred to as "the Project") as presented in *Figure 1.1*. The major construction works have been scheduled to commence in October 2020 and expected to be completed in 2022 tentatively.

Due to the outbreak of COVID-19 in Hong Kong since late of January 2020, AAHK would like to change the construction method of the Project from precast segments installation (the EIA design scheme) to *in-situ* casting by travelling formwork (the proposed design scheme) to eliminate cross-border delivery/transportation as much as possible. Details of the proposed design scheme are presented in *Section 2*.

ERM-Hong Kong, Limited (ERM) is commissioned by GECCL to conduct an environmental review of the proposed design scheme of the Project in accordance with the requirements of the *EIAO*.

1.2 Purpose of this Report

This *Report* presents and evaluates the potential impacts on the environment due to the proposed design scheme and reviews whether the Project may constitute a Material Change with respect to Section 6 of the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM).

1.3 Report Structure

The remainder of this *Report* is set out as follows:

- *Section 2* describes the proposed design scheme;
- *Section 3* describes the possible environmental impacts due to proposed design scheme;
- *Section 4* provides a review of potential material change; and
- *Section 5* provides the conclusion of the environmental review.

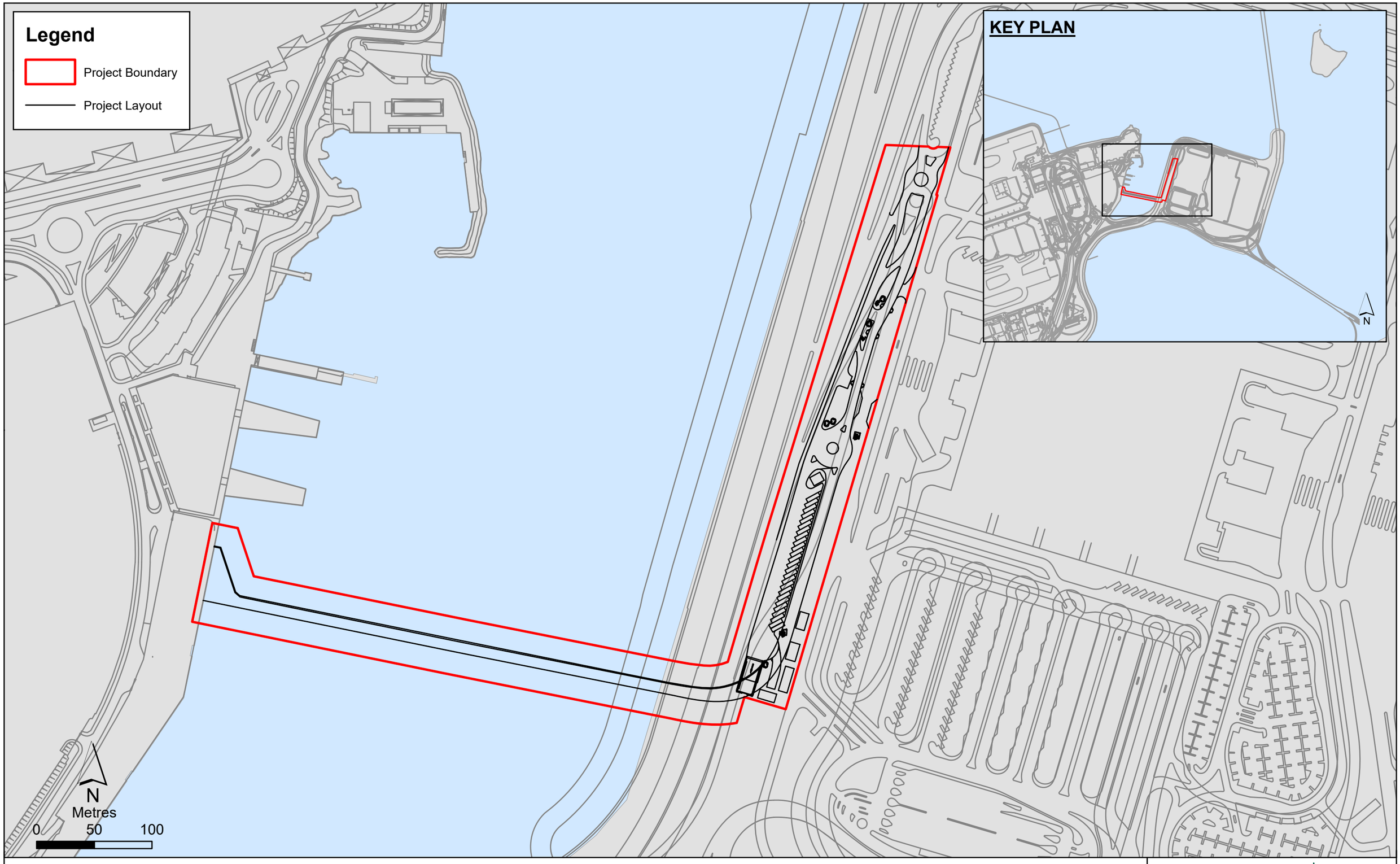

Figure 1.1

Location of the Project

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Date: 3/9/2020

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2. PROPOSED VARIATIONS AND ASSOCIATED ENVIRONMENTAL ISSUES

2.1 Key Challenges and Reason of the Proposed Variations

As mentioned in *Section 1*, due to the current situation of the outbreak of COVID-19, some challenges have been identified and summarised in *Table 2.1*.

Table 2.1: Key Challenges of the Current Situation

	Key Challenges	Description
1.	Health and Safety	■ Practically, manufacture of segment will be located at Mainland China due to land area is critical for massive construction plant and storage of manufactured segments which is limited in Hong Kong. It is unavoidable to choose manufacturer in Mainland China where is the nearest location to Hong Kong. Segments will then be delivered by vessels to the Project Site. ■ To ensure the quality during the manufacturing of segments, staffs from AAHK & GECCL from Hong Kong will travel between Mainland China and Hong Kong to undertake supervision as part of the quality assurance (QA) process. Moreover, pre-stressing specialists coming from foreign country will also involve in the Project. They will also travel to the manufacturer in Mainland China to inspect the segments. ■ If the EIA design scheme is adopted, i.e. deck installation by pre-casted segments, it is unavoidable for the crew members to carry out cross-border travelling between Mainland China and Hong Kong which will increase the potential risk of COVID-19 infection. Therefore, it is proposed to change the construction method from the EIA design scheme to *in-situ* casting by travelling formworks for the deck construction to eliminate the potential risk of COVID-19 infection due to travelling across the border as far as possible.
2.	Construction Programme	■ AAHK is also planning to construct another vehicular bridge, Airport City Link (ACL), which is located adjacent to the Project. In accordance with the current programme, the construction of the Project should be completed and some of the works areas will then be returned to AAHK for commencing the construction of the ACL. Due to the current situation of the outbreak of COVID-19, compulsory quarantine is required during cross-border travelling between Mainland China and Hong Kong under the EIA design scheme and this will cause delay of the programme. The proposed variations in the construction method would allow the construction of the Project to complete on schedule to avoid and minimise any adverse cumulative environmental impacts brought by marine works in the proximity, and hence not delaying the commencement of the ACL construction, tentatively in end of 2021.

In view of the reasons mentioned-above, it is proposed to change the construction method for the Project from segments installation (the EIA design scheme) to *in-situ* casting by travelling formwork (the proposed design scheme). An *in-situ* hammer head of 5m long will firstly be constructed using scaffolding or steel falsework on the pile cap. A prefabricated steel travelling form will then be installed at the end tips of the cantilever deck to cast the first segment of the deck, and hence, wooden formworks are not required for the construction of the bridge deck *in-situ*. Concrete will be delivered by concrete lorry mixers off-site and will be pumped to the travelling formwork by the concrete pump truck from the Ro-Ro barges. The travelling form will be moved onto the new cast segment by a launching jack and tie-down system, and another travelling form will then be installed on the other end tip of the deck for construction of the new deck. The cast-in items, ie external post tensioning anchors, grout vents, drainage pipes, etc., will be installed while fixing the reinforcement with surveyor support to provide the design setting-out. Permanent cantilever tendons (C-tendon) will also be installed. The bridge deck will then be constructed by moving these two forms forwards simultaneously for the balanced cantilever deck construction until the deck is at the mid-span of the bridge deck. In order to enhance the construction progress, segmentation of the deck by *in-situ*

casting was redesigned to a typical 4.2 m section to reduce the number of travelling form launching. This will also reduce the total casting cycle and C-tendon stressing number. The details of the setup of the travelling formwork are presented in *Figure 2.1*.

A comparison of the assumptions between the EIA design scheme and the proposed design scheme is provided in *Table 2.2*.

Table 2.2: Comparison of the Assumptions between the EIA Design Scheme and the Proposed Design Scheme

Assumption	EIA Design Scheme	Proposed Design Scheme
Project Alignment	■ Approximately 570 m in length (Marine section = ~360m, land section =~210m)	■ No change
Deck Construction	■ Precast segment. ■ Precast segmentation is designed around 3.5 m per section. ■ Local barge will be used to store and deliver the segments to the marine erection point within Hong Kong waters, while land transportation for segment delivery to the land erection point at night with necessary temporary traffic arrangement. ■ Night works for transferring segment by heavy crane barge. ■ Supervisory staffs from AAHK and GECCL will require to travel across border between Mainland China and Hong Kong to inspect the segments during the QA process. Due to current situation of the outbreak of the COVID-19, 14-day compulsory quarantine is required in both Mainland China and Hong Kong (ie total 28 days quarantine per trip). This may increase potential risk of COVID-19 infection and delay of construction programme.	■ *In-situ* concreting by travelling formwork. ■ Segmentation by *in-situ* casting will be redesigned to a typical 4.2 m per section to reduce the number of travelling form launching. ■ No segment delivery by marine and land transportation will be required. ■ No night works for transferring segment will be required. Application of Construction Noise Permit (CNP) for this works can be avoided. ■ Logistical dependence on the Mainland China will be eliminated.
Parapet Construction	■ Cast *in-situ* (parapet form traveller) requires a cantilever working platform on the deck for fixing and casting of the parapet after the bridge deck pre-stressing.	■ Precast parapet is proposed by stitching it to the bridge deck with *in-situ* concrete. The parapet will be temporary sitting on the deck with push and pull prop (turnbuckle) or similar for adjustment of alignment. Due to small size of the precast parapet panel, the manufacture will be carried out in Hong Kong precast yard. The production rate compared to *in-situ* casting may increase up to 20% per day.
Reinforcement Earth (RE) Structure	■ It will be constructed by precast reinforcement panels produced locally including geogrid tie back to the soil filling behind the panel. Granular fill will be used for filling and soil friction is developed between the tie back and the soil to stabilise the panels. On-grade structures of the U-trough, reinforcement concrete (RC) box and RE wall all require shallow excavation of less than 2m for construction. The	■ No change

Figure 2.1

Setup of Travelling Formwork Method

DATE: 08/01/2021

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Assumption	EIA Design Scheme	Proposed Design Scheme
	base slab of RC structures will be directly casted on the ground and scaffolding will be used for the construction of the superstructure.	
Total Number of Vessel	■ A total of ~60 trips for material delivery during construction of Project (a total of ~45 trips by four (4) flattop barges to deliver the 178 precast units from Mainland China to the Project site; a total of ~15 trips by one (1) Ro-Ro barge to deliver concrete for *in-situ* stitching of segment at Project site within Hong Kong)	■ A total of ~40 trips by two (2) Ro-Ro barges to deliver concrete for *in-situ* concreting at Project site from MTR Siu Ho Wan (SHW) Depot/ River Trade Terminal (RTT) in Tuen Mun during construction of Project. MTR SHW Depot will be used mostly in order to minimise travelling distance. RTT in Tuen Mun will be only used for back up when MTR SHW Depot is not available. Since there is no change on general material delivery and no oversea delivery, i.e. no precast unit is delivered from Mainland China to the Project Site, and the total no. of vessel travelling trips are decreased from 60 to 40, therefore, environmental impact is considered no worse than that assessed in EIA Report. ■ The reduction on the number of marine travelling trips will lower air emission and the direct impacts to the Chinese White Dolphins (CWD). Also, it will save energy consumption. Details on the benefit of reducing the number of marine travelling trips will be discussed in *Section 3*.

2.2 Key Environmental Issues Associated with the Proposed Design Scheme

Table 2.3 identifies the potential environmental impacts associated with the variations due to the proposed design scheme. As the proposed change only touches on construction method, no change to long term impact as predicted in EIA Report is anticipated. Details of the possible impacts on the environment are presented in *Section 3*.

Table 2.3: Potential Environmental Issues

Potential Impact	Construction	Operation
Gaseous Emission	✓	-
Dust	✓	-
Odour	-	-
Noise	✓	-
Night-time Operations	-	-
Traffic (Land)	-	-
Liquid Effluents, Discharge or Contaminated Runoff	✓	-
Generation of Waste or By-products	✓	-
Manufacture, Storage, Use, Handling, Transportation, or Disposal of Dangerous Goods	-	-
Hazard to life	-	-
Disposal of Spoil Material	-	-
Unsightly Visual Appearance	-	-
Cultural Heritage	-	-
Marine Ecology	✓	-
Cumulative Impacts	-	-

Potential Impact	Construction	Operation
Note: '✓'=Possible, '-' = Not Expected		

3. POSSIBLE IMPACTS ON THE ENVIRONMENT

3.1 Air Quality

As mentioned in *Section 2.1, in-situ* casting by travelling formwork will be adopted under the proposed design scheme. A prefabricated steel travelling form will be used to install deck segment. Wooden formworks are not required for the construction of the bridge deck by *in-situ* casting. Concrete will be delivered by concrete lorry mixers off-site and will be pumped to the travelling formworks by the concrete pump truck on the Ro-Ro barges. No concrete batching activity will be carried out on-site. Therefore, with the implementation of the recommended mitigation measures as presented in the EIA Report, no additional adverse dust impact is anticipated due to *in-situ* casting of the Project.

Under the proposed design scheme, no precast units will be delivered from Mainland China using flattop barges as no more precast units will be required. Approximately a total of 40 trips by two (2) Ro-Ro barges would be required for delivering concrete during construction of Project, which either from the River Trade Terminal (RTT) in Tuen Mun or the MTR SHW Depot, for *in-situ* concreting on-site. With the arrangement, the total of vessel travelling trips will be significantly reduced from ~60 trips under EIA design scheme to ~40 trips under proposed design scheme. It should be noted that MTR SHW Depot will be used mostly in order to minimise travelling distance and RTT in Tuen Mun will be only used for back up when MTR SHW Depot is not available. Hence, the total of travelling vessels trips and travelling distance will be reduced. With the latest arrangement under proposed design scheme, delivery of general material will not be changed and night works for transferring segment will no longer be required. Air emission from the vessel travelling will be considered no worse than that assessed in the EIA Report.

As confirmed by GECCL, the barges/ PME used for the proposed design scheme would be slightly adjusted to that for the EIA design scheme for the construction of deck segment as presented in *Table 3.1*. Under the proposed design scheme, the total quantities of barges/ PME will be significantly reduced, i.e. 8 nos. of barges/ PME decrease. For the barges used for deck construction, the numbers of Ro-Ro barge and derrick barge will remain the same for the proposed design scheme. Due to the segment transportation is no longer required under the proposed design scheme, three (3) flattop barges and one (1) crane barge (450T) will no longer be required. Also, it should be noted that both crane barges (200T and 450T) will be working remaining within the works area during construction making transits into and out of the works area occasionally. Therefore, the overall emission generated from the barges will be expected less than the EIA design scheme. Besides, it is noted that the use of bogie is not required as segment transportation is no longer required under the proposed design scheme, and the land mobile crane (500T) required in EIA design scheme will be replaced by land mobile crane (200T). The quantity of concrete pump truck will remain the same. Under this arrangement, it is anticipated that the emissions from PMEs will further be minimised.

Furthermore, the combustion of fuel of the PMEs is another emission source. Regarding the fuel to be used by vessels, the Air Pollution Control (Fuel Restriction) Regulations, which was enacted in 1990 and amended in 2008, imposes a legal control on the type of fuels allowed for use and their sulphur contents in commercial and industrial processes to reduce SO_2 emission. Under this regulations, the liquid fuel with a sulphur content of less than 0.005% by weight is permitted to be used to control SO_2 emission. In addition, with the effect of the Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation, the extensive use of Non-road Mobile Machineries (NRMM) is not anticipated. In this regard, the number of NRMM used would be limited and the emissions from the PMEs due to the basic operation of the barges and from the additional PMEs are therefore considered as no worse than that assessed in the EIA Report.

In accordance with the EIA Report, ITT is the nearest identified Air Sensitive Receiver (ASR) for the Project, which are located adjacent to the ITT-BVB. Since the major works for marine deck construction will be completed in August 2022 and the planned ITT will be in operation in the end of 2022 tentatively, the adverse air quality impact from the marine deck construction to the planned ITT is therefore not expected. Given that the small scale of dusty construction works, limited nos. of

NRMM and implementation of the recommended mitigation measures for controlling dust emissions in accordance with the EIA Report, the construction air quality impacts on the ASRs due to the proposed variations would not be worse than that assessed in the EIA Report.

Table 3.1: Barges/ PME Used for Deck Construction under EIA Design Scheme and Proposed Design Scheme

Barges/ PME Used for Deck Construction	EIA Design Scheme		Proposed Design Scheme		No. of Difference in terms of Barges/ PME Used for Deck Construction between Two Schemes (+/-)
	Description	Quantity	Description	Quantity	
Flattop Barge	Segment delivery from Mainland China	2	Provision of wastewater treatment facility	1	-3
	Segment storage and delivery locally	2			
Derrick Barge	Storage of stockpiles, and sedimentation and temporary storage tanks	1	Storage of stockpiles, and sedimentation and temporary storage tanks	1	/
Crane Barge (450T)	Lift precast element including transfer deck [(a)]	2	Only for transfer deck [(a)]	1	-1
Crane Barge (200T)	General material delivery of foundation materials, i.e. rebar and timber [(a)]	2	General material delivery of foundation materials, i.e. rebar and timber [(a)]	2	/
Ro-Ro Barge	*In-situ* stitching	2	*In-situ* deck concreting	2	/
Bogie	Land segment transportation	4	N/A	N/A	-4
Concrete Pump Truck	*In-situ* stitching	2	*In-situ* deck concreting	2	/
Land Mobile Crane (500T)	Deck erection at Piers 8 and 9	2	N/A	N/A	-2
Land Mobile Crane (200T)	N/A	N/A	Material delivery to deck	2	+2

Note:
(a) Both crane barge (200T) and crane barge (450T) will be working remaining within the works area during construction making occasionally transits into and out of the works area.

3.2 Noise

In accordance with the EIA Report, the offices of the existing SkyPier and the planned ITT were identified as the nearest Noise Sensitive Receivers (NSRs). However, all the identified NSRs are not rely on openable windows for ventilation, i.e. no NSRs that are rely on openable windows for ventilation were identified within the assessment area.

No night works for transferring segment will be required as presented in *Table 2.2*. GECCL confirmed that the barges/ PME used for the proposed design scheme will be similar to the EIA design scheme as presented in *Table 3.1*. As mentioned in *Section 3.1*, use of bogie is not required as segment transportation is no longer required under the proposed design scheme. Based on this, the construction noise impacts due to the proposed variations would not be worse than that assessed in the EIA Report.

3.3 Water Quality

As discussed in the EIA Report, this construction method under EIA scheme could minimise the release of contaminant into the water column and hence reduce the risk of disturbance to the seabed and the adjacent marine environment. Open sea dredging of seabed will not be required and thus no unacceptable water quality impact would be expected. The same bored piling method would be adopted so no unacceptable water quality impact would be expected from the installation.

Cast *in-situ* will be adopted for bridge deck for the land-based construction. Appropriate drainage would also be provided on-site to ensure concrete washing or other related wastewater would not be discharged into the communal drains or sewers and sea directly without treatment. After the piling for marine construction, the construction of marine pile caps above high-tide level will be conducted within a cofferdam. The construction of deck has been changed from the recommended precast segment in the EIA Report to onsite concreting with travelling formwork to avoid the need for personnel movement as per described in *Section 2.1* above. This would require concreting and setting onsite, as well as the generation of associated wastewater. As discussed in *Section 2.1,* concrete will be delivered by concrete lorry mixers and by concrete pump trucks from Ro-Ro barges. No concrete batching activity will be carried out on-site. During bridge deck concreting, tarpaulin plastic sheet will be mounted at the bottom of the *in-situ* deck segment and temporary working platform for concreting to prevent concrete from falling down to the sea. Concrete washing will be carried out on a water storage tank on Ro-Ro barge. For instance, wastewater generated from the Ro-Ro barge, including handling concrete washing, will be pumped into sedimentation tanks and temporary storage tanks at derrick barge for on-site recirculation and reuse, or proper treatment by wastewater treatment facility setup at the flattop barge before discharge into the sea. The exposed area of concrete above the travelling formwork structure is relatively small. Concrete curing could be completed by covering with impervious sheeting, such that, no water will be required during the curing process and no wastewater will be generated on the bridge. Therefore, the proposed design scheme could achieve comparable environmental performance as the EIA design scheme with the implementation of general good site practices and mitigation measures in place as discussed in the EIA Report. No unacceptable water quality impact would be expected.

3.4 Waste Management

Similar to the EIA design scheme, the types of waste generated from the construction of the Project under the proposed design scheme would include construction and demolition (C&D) materials, general refuse, chemical waste, and excavated marine-based and land-based sediments.

C&D materials will be generated from minor excavation and site clearance. It is estimated that approximately 12,160 m^3 of inert C&D materials and 1,000 m^3 of non-inert C&D materials will be generated from the proposed design scheme which remain the same as those presented in Table 6.1 of the EIA Report. With the implementation of the mitigation measures recommended in the EIA Report, no unacceptable environmental impacts (including potential hazards, air and odour emissions, noise and wastewater discharge) arising from handling of C&D wastes are expected during construction phase.

Construction workers will generate general refuse which will be required regular collection for disposal at landfill. Based on the proposed design scheme, it is expected that the same number of construction workers, i.e. around 30 – 40 staffs presented in Section 6.4.7 of the EIA Report, will be required for the construction works. As such, the amount of general refuse produced (about 19-26kg per day) (1) remains the same. No unacceptable waste management implications arising from the handling of general refuse is expected with the proper implementation of waste management practices in the EIA Report.

There will also be no change in the amount of chemical waste that will be generated from the on-site maintenance of construction plant and equipment during the construction of the Project with the

(1) Assuming a general refuse generation rate of 0.65 per worker per day.

proposed design scheme. Chemical waste will be collected by licenced chemical waste collector for disposal. Requirements specified in the *Waste Disposal (Chemical Waste)(General) Regulation* and the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes* under the *Waste Disposal Ordinance* (WDO) should be followed. With proper housekeeping measures and implementation of good site practices and recommended mitigation measures in the EIA Report and relatively small amount of chemical waste will be generated, no unacceptable waste management implications associated with the handling, storage and disposal of chemical wastes are anticipated.

Change in quantity of marine-based and land-based sediment is not expected due to no changes in the marine construction method (bored pile within steel pile casing) under the proposed design scheme for the construction of the deck segment. The excavated marine-based sediment is recommended to be disposed of at the designated marine disposal sites allocated by the Marine Fill Committee (MFC) in accordance with *PNAP No. 252 (ADV-21) – Management Framework for Disposal of Dredged/Excavated Sediment*. The disposal options for the excavated marine-based sediment should follow the procedures in PNAP No. 252 (ADV-21). The transportation routing and frequency for marine disposal to designated disposal outlets shall be agreed with EPD/CEDD during the construction phase before any marine disposal. The excavated land-based sediment will be reused on-site as backfilling materials in order to minimise off-site disposal. No adverse waste management implications are anticipated with the implementation of mitigation measures as recommended in the EIA Report.

3.5 Marine Ecology

According to Section 7.6.1 to Section 7.6.15 of the EIA Report, the following potential marine ecological impacts were identified and assessed for the EIA design scheme which were considered as minor and acceptable:

Direct Impact

- Direct injury / mortality of Chinese White Dolphins (CWDs).

Indirect Impact

- Potential disturbance to recognised sites of conservation importance; and
- Noise disturbance to species of conservation importance.

As presented in *Section 2.2*, the marine construction method (bored piling within steel pile casing) remains unchanged under the proposed design scheme when compared to the EIA design scheme. As such, the types of potential marine ecological impacts during the construction phase would be the same between the proposed and EIA design schemes.

Table 3.2 below presents a preliminary comparison of potential impacts between the proposed and EIA design schemes, with the objective to identify the types of marine ecological impacts that may vary in significance between the two schemes and would require to be further evaluated.

Table 3.2: Preliminary Comparison of Marine Ecological Impacts between the Proposed and EIA Design Schemes

Potential Impact	EIA Design Scheme (Assessment information extracted from the EIA Report)	Proposed Design Scheme
Direct Impacts [(a)]		
Direct Injury / Mortality of Chinese White Dolphins (CWDs)	According to the EIA Report, vessel strike impact is not likely to be critical to Chinese White Dolphins as most construction vessels for the transportation of precast units are large-sized and slow-moving. Mitigation measure of ship speed control is recommended.	Under the proposed design scheme, there will be no construction vessels for the transportation of pre-cast unit from Mainland China. Ro-Ro barge will be used to transport concrete to the Project Site for *in-situ* deck concreting with more trips when compared to the EIA design scheme. ***Further evaluation is required and presented in Section 3.5.1 below.***
Indirect Impacts		
Potential Disturbance to Recognised Sites of Conservation Importance	The Sha Chau and Lung Kwu Chau Marine Park (SCLKCMP) is 5 km away from the Assessment Area. Direct impact of habitat loss is not anticipated while potential indirect impact of water quality and underwater noise to the marine habitat and wildlife within the Marine Park is predicted to be insignificant given the far distance. The Brothers Marine Park (BMP) is 1.5 km away from the proposed Project Site. Habitat loss to the Marine Park is not anticipated, whereas indirect impact of reduced prey resources for CWDs within the BMP as a result of underwater noise is possible. Since this site of conservation importance is less frequently used by dolphins in recent years while bored piling instead of percussive piling is adopted to reduce strong noise disturbance to marine wildlife, the indirect impact on this dolphin hotspot is estimated to be minor and acceptable	Under the proposed design scheme, there are no changes in the locations of the Project Site and thus the Assessment Area. As such, the impact to SCLKCMP is expected to be minor and not worse than that in the EIA Report given the far distance. No direct impact is anticipated for the BMP given the Project Site location and the marine construction method remains unchanged. The 3RS Marine Park is expected to be designated in 2024 [(2)] which will not overlapped with the construction phase of the Project which will be completed in 2022. As such, potential impacts to the 3RS Marine Park are not expected to occur. ***No further evaluation is required.***
Noise Disturbance to Species of Conservation Importance	According to the EIA Report, majority of noise associated with development and construction activities (e.g. pile casing, large-sized vessel noise) is at low frequency (<5 kHz), while CWDs mostly produce high frequency sounds (>5 kHz) for communication and echolocation. Given that bored piling with lower noise and vibration levels would be adopted for the construction of bridge piles, the impact of acoustic masking and disturbance to CWDs by low frequency construction noise is estimated to be minor.	Under the proposed design scheme, there will be no construction vessels for the transportation of pre-cast unit from Mainland China. Ro-Ro barge will be used to transport concrete to the Project Site for *in-situ* deck concreting with more trips when compared to the EIA design scheme. ***Further evaluation is required and presented in Section 3.5.2 below for noise disturbance from construction vessels.***

Note:
(a) As there is no change in the marine construction method, no evaluation is required for loss of marine habitats and direct injury/mortality of wildlife (corals).

(2) ACE Paper 8/2020. Accessed via https://www.epd.gov.hk/epd/sites/default/files/epd/english/boards/advisory_council/files/ACE_Paper%208_2020-3RS.pdf.

According to *Table 3.2*, given the changes in marine traffic volume and routes between the EIA and proposed design schemes, potential impacts to CWDs arising from these changes are further evaluated in the following sections.

Changes in operational phase impacts are not expected given no changes to operation of the Project and thus not discussed further.

3.5.1 Direct Injury / Mortality of Chinese White Dolphins

According to Section 7.6.6 of the EIA Report, collision with construction vessels of the Project was identified as direct potential impacts to CWDs, leading to injury or mortality of individuals. It was considered that vessel strike impact is not likely to be critical as most construction vessels for the transportation of precast units are large-sized and slow-moving. Nevertheless, the following mitigation measures are recommended in the EIA Report which will be adopted for both the EIA and proposed design schemes:

- A speed limit of 10 knots would be strictly enforced on all construction-related vessels.

In order to compare the significance of potential direct impacts to CWDs due to collision with construction vessels between the EIA and proposed design schemes, marine traffic routes and volume of different types of vessels are estimated for the two schemes. Given the construction method of bored pile and pile cap remains unchanged, the types and quantity of construction vessels adopted for these construction activities, as well as the potential direct impacts to CWDs from these vessels, would remain unchanged under the EIA and proposed design schemes.

Table 3.3: Types and Quantity of Construction Vessels under the EIA and Proposed Design Schemes for Deck Construction

Vessel Type	EIA Design Scheme		Proposed Design Scheme	
	Description	Quantity	Description	Quantity
Flattop Barge	Segment delivery from Mainland China	2	Provision of wastewater treatment facility	1
	Segment storage and delivery locally	2		
Derrick Barge	Storage of stockpiles, and sedimentation and temporary storage tanks	1	Storage of stockpiles, and sedimentation and temporary storage tanks	1
Crane Barge (450T)	Lift precast element including transfer deck [(a)]	2	Only for transfer deck [(a)]	1
Crane Barge (200T)	General material delivery of foundation materials, ie rebar and timber [(a)]	2	General material delivery of foundation materials, ie rebar and timber [(a)]	2
Ro-Ro Barge	*In-situ* stitching	2	*In-situ* deck concreting	2

Note:
(a) Both crane barge (200T) and crane barge (450T) will be working remaining within the works area during construction making occasionally transits into and out of the works area.

For the deck segment, a total of ~45 trips by four (4) flattop barges would be required to deliver the 178 precast units from Mainland China to the Project Site under the EIA design schemes (*Table 3.3*), following the marine traffic route as indicated in *Figure 3.1*. In addition, a total of ~15 trips by two (2) Ro-Ro barge would be required for delivery of concrete within Hong Kong for *in-situ* stitching of segments following the marine traffic route as indicated in *Figure 3.2*. These barges would follow one of the two potential marine traffic routes as indicated in *Figure 3.2*, which is either from the River Trade Terminal (RTT) in Tuen Mun or the MTR SHW Depot.

The above contributes to a total of six (6) barges with a total of ~60 trips for segment and concrete delivery under the EIA design scheme.

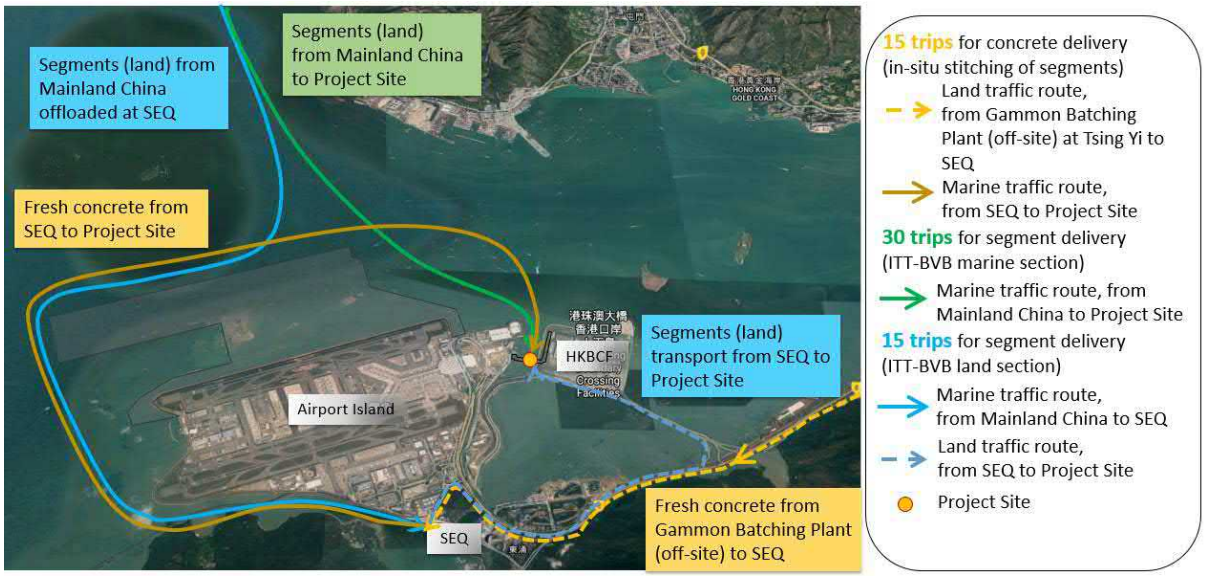

Figure 3.1: Marine Traffic Routes for Flattop Barge under the EIA Design Scheme

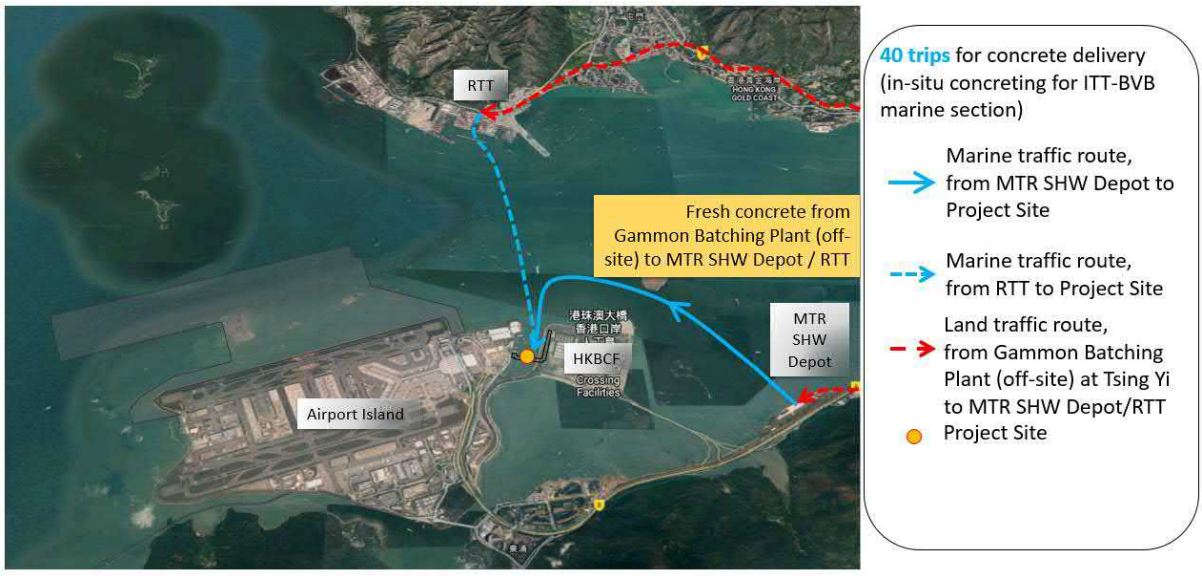

Figure 3.2: Marine Traffic Routes of Ro-Ro Barge under the Proposed Design Scheme

Under the proposed design scheme, there will be no delivery of precast units from Mainland China using flattop barges. Approximately a total of 40 trips by two (2) Ro-Ro barges would be required to deliver concrete for *in-situ* concreting at the Project Site (*Table 3.3*). These barges would follow one of the two potential marine traffic routes as indicated in *Figure 3.2*, which is either from the RTT in Tuen Mun or the MTR SHW Depot.

Given the above, the number of barges and number of trips for delivery of materials would be lower under the proposed design scheme (2 barges and ~40 trips) when compared to the EIA design scheme (6 barges and 60 trips). The distance travel would be shorter for the proposed design

scheme given no cross-boundary marine traffic is involved. In addition, according to recent 2019-2020 findings of the long-term monitoring of CWDs by the Agriculture, Fisheries and Conservation Department (AFCD) (3) , both marine traffic routes adopted by the EIA and proposed design schemes do not appear to overlap with important habitats of CWDs, with Sightings Per Survey Effort (SPSE) value and Density Per Survey Effort (DPSE) value of the marine waters along the marine traffic routes of both the EIA and proposed design schemes generally not higher than 5.0 and 20.0, respectively (*Figure 3.3*). Considering the above, with less number of vessels and less vessel trips under the proposed design scheme, it is expected that the likelihood of vessel strike with CWDs will be lower under the proposed design scheme. As such, potential direct impacts to CWDs from construction vessels used for materials delivery, including injury or mortality of individuals caused by potential vessel strikes, under the proposed design scheme would not be worse than those predicted in the EIA Report, and thus remain to be minor.

Crane barge (200T) will also be used under both the EIA and proposed design schemes for general material delivery of foundation materials, i.e. rebar and timber, (except concrete and deck segment) which is supposed to follow the same route with no change in number of trips. Both the crane barge (200T) and crane barge (450T) will be working remaining within the works area during construction making occasionally transits into and out of the works area for both the EIA and proposed design scheme. Crane barge (450T) will support the construction works.

Flattop barge and derrick barge will be used under the proposed design schemes for wastewater collection and treatment. These barges will be working within the works area only during construction and followed the same route with no change in number of trips.

The total quantity, including the crane barge (200T), crane barge (450T), flattop barge and derrick barge, of the proposed design scheme will not be higher than the total quantity in the EIA design scheme (*Table 3.3*). Given crane barge, flattop barge and derrick barge will be slow moving, it is considered that the potential direct impacts to CWDs from these barges under the proposed design scheme would not be worse than those predicted in the EIA Report.

Overall, assuming proper implementation of mitigation measure recommended in the EIA Report, adoption of a speed limit of 10 knots on all construction-related vessels, it is expected that potential direct impacts to CWDs due to collision with construction vessels under the proposed design scheme would not be worse than those predicted in the EIA Report.

(3) AFCD (2020). Monitoring of Marine Mammals in Hong Kong Waters (2019-2020). Prepared by Hong Kong Cetacean Research Project: https://www.afcd.gov.hk/english/conservation/con_mar/con_mar_chi/con_mar_chi_chi/files/Final_Report_2019_20.pdf

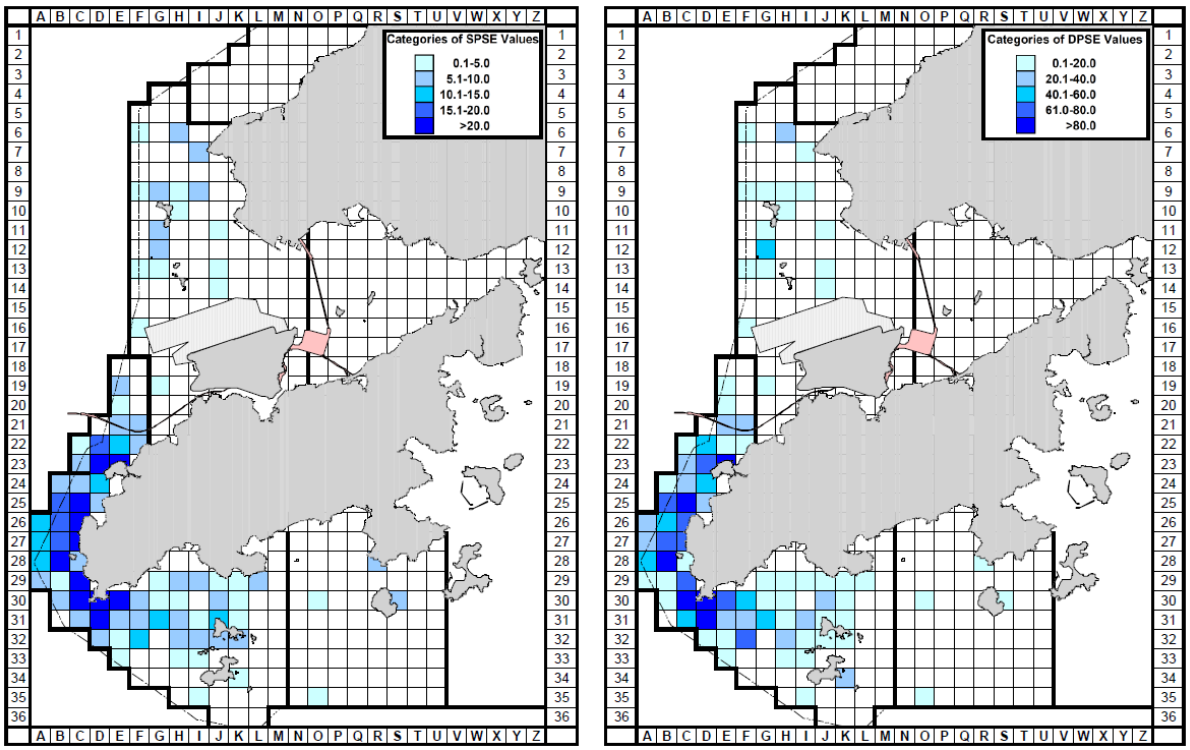

Figure 3.3: (Left) SPSE Value Calculated Using Data from January - December 2019;
(Right) DPSE Value Calculated Using Data from January - December 2019 (Extracted Directly from AFCD (2020) Monitoring of Marine Mammals in Hong Kong Waters (2019-2020). Prepared by Hong Kong Cetacean Research Project)

3.5.2 Noise Disturbance to Chinese White Dolphins

According to Section 7.6.11 of the EIA Report, noise disturbance from construction vessel traffic and marine construction works of the Project was identified as potential indirect impacts to CWDs, leading to their placement from preferred habitats or behavioural changes. Given majority of noise associated with development and construction activities (e.g. pile casing, large-sized vessel noise) is at low frequency (<5 kHz) while CWDs mostly produce high frequency sounds (>5 kHz) for communication and echolocation, and bored piling with lower noise and vibration levels would be adopted for the construction of bridge piles, the impact of acoustic masking and disturbance by low frequency construction noise was estimated to be minor under the EIA Report.

Under the proposed design scheme, method of marine construction remains unchanged with bored piling adopted. As presented in *Section 3.5.1* above, the quantity of construction vessels and number of trips required for delivery of materials under the proposed design scheme would not be higher than those under the EIA design scheme. The marine traffic routes utilized by both schemes do not overlap with important CWDs habitat. Given the above and proper implementation of mitigation measures for construction vessels as recommended in the EIA Report, it is expected that potential indirect impacts to CWDs due to noise disturbance from marine construction activities of the Project under the proposed design scheme would not be worse than those predicted in the EIA Report, and thus remain to be minor.

3.6 Landscape and Visual

There is no change on the Project layout under the proposed design scheme. As the sources of landscape and visual impacts remain the same as that identified in the EIA Report, no change in the landscape and visual impacts with the proposed design scheme with the implementation of the mitigation measures proposed in the EIA Report.

3.7 Cultural Heritage

As there is no change on the Project layout due to proposed changes and no cultural heritage resource of marine archaeological, terrestrial archaeology and built heritage within the Project boundary are identified in the EIA Report, the assessment presented in the EIA Report remains valid. Based on the above, cultural heritage impact is not expected during construction of the Project with the proposed variations.

4. REVIEW OF POTENTIAL MATERIAL CHANGE

In accordance with *A Guide to the Environmental Impact Assessment Ordinanc*e published by EPD, a material change is defined as a physical addition or alteration which results in an adverse impact as described in Section 6.1 of the EIAO-TM. Section 6.1 of the EIAO-TM further elaborated the five circumstances which can be considered as material change.

The following presents the analysis of whether the proposed design scheme, based on the information and assessment as presented in *Sections 2* and *3,* constitutes a material change.

a) a change to physical alignment, layout or design of the project causing an environmental impact likely to affect existing or planned community, ecologically important areas or sites of cultural heritage

As mentioned in *Section* 2, the reason of the proposed changes in the construction method is to minimise cross-border delivery/transportation in order to minimise the potential risk of COVID-19 infection. There is no change in the Project alignment, layout or design based on the proposed design scheme.

As discussed in *Section 3*, no adverse environmental impacts including air quality, water quality, noise, waste management, ecology, landscape and visual, cultural heritage are anticipated to affect existing or planned community, marine ecological important areas or sites of cultural heritage due to the proposed design scheme during construction and operational phases.

Hence, the Project will not constitute a material change under EIAO-TM Section 6.1(a).

b) a physical change resulting in an increase in the extent of reclamation or dredging affecting water flow or quality likely to affect ecologically important areas, or disrupting sites of cultural heritage;

As mentioned in *Sections 2* and *3*, the Project layout including works areas remains no change. No reclamation or dredging is required for the proposed changes in the construction method. There is no change in the marine construction method. No unacceptable environmental impacts to the water flow or quality likely to affect ecologically important areas or disrupting sites of cultural heritage would be expected.

Hence, the Project will not constitute a material change under EIAO-TM Section 6.1(b).

c) an increase in pollution emissions or discharges or waste generation likely to violate guidelines or criteria in this technical memorandum without mitigation measures in place;

The proposed design scheme will not have any increase in air emissions during construction phase. Therefore, no adverse dust impact is anticipated during construction phase.

In terms of waste generation, the proposed design scheme will generate C&D materials, general refuse, chemical waste and excavated sediment as mentioned in *Section 3.4*. The quantities of C&D materials, general refuse, chemical waste and excavated sediment generated from the proposed design scheme will remain the same. No unacceptable waste implications associated with the handling storage and disposal are anticipated with the implementation of waste management practices in the EIA Report.

Other potential environmental impacts including water quality, noise, marine ecology, landscape and visual, and cultural heritage have been discussed in *Section 3*. There is no increase in pollution emissions or discharges from the proposed design scheme that would violate the guidelines or criteria in EIAO-TM.

Hence, the Project will not constitute a material change under Item EIAO-TM Section 6.1(c).

d) an increase in throughput or scale of the project leading to physical additions or alterations that are likely to violate the guidelines or criteria in this technical memorandum without mitigation measures in place; or

Under the proposed design scheme, there is no increase in throughput or scale of the Project. Based on this, there is no physical additions or alterations that will violate guidelines or criteria in this EIAO-TM.

Hence, the Project should not be considered as a material change under EIAO-TM Section 6.1(d).

e) a change resulting in physical works that are likely to affect a rare, endangered or protected species, or an important ecological habitat, or a site of cultural heritage."

All construction works will be carried out within the Project boundary. No cultural heritage resource of marine archaeological, terrestrial archaeology and built heritage within the Project boundary are identified in the EIA Report. Potential impacts to marine ecology are assessed in *Section 3.5* and considered as remain minor and acceptable and not worse that those predicted in the EIA Report. Based on this, there will not be adverse impacts to any rare, endangered or protected species, important ecological habitats or site of cultural heritage.

Hence, the Project will not constitute a material change under EIAO-TM Section 6.1(e).

Also, in accordance with Section 6.2 of the EIAO-TM:

"The environmental impact of a designated project, for which an environmental permit has been issued, is considered to be materially changed if the environmental performance requirements set out in the EIA report for this project may be exceeded or violated, even with the mitigation measures in place."

The potential environmental impacts associated with the proposed changes of the Project have been assessed as presented in *Section 3* of this Report. It is demonstrated that the potential environmental impacts will be no worse than that assessed in the EIA Report, and therefore, are not considered to be materially changed as the environmental performance requirements set out in the EIA Report for this Project are not exceeded or violated, with the implementation of the mitigation measures proposed in the EIA Report, and the potential environmental impacts comply with the requirements and criteria stipulated in the EIAO-TM.

According to the information presented above, the Project will not constitute a material change according to the EIAO-TM.

5. CONCLUSION

An environmental review has been conducted for the Project and the results shows that the proposed design scheme will not result in any adverse environmental impacts. Changes under the circumstances specified in Sections 6.1 and 6.2 of the EIAO-TM regarding material changes to a designated project have been evaluated and it is confirmed that the Project will not constitute a material change.

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