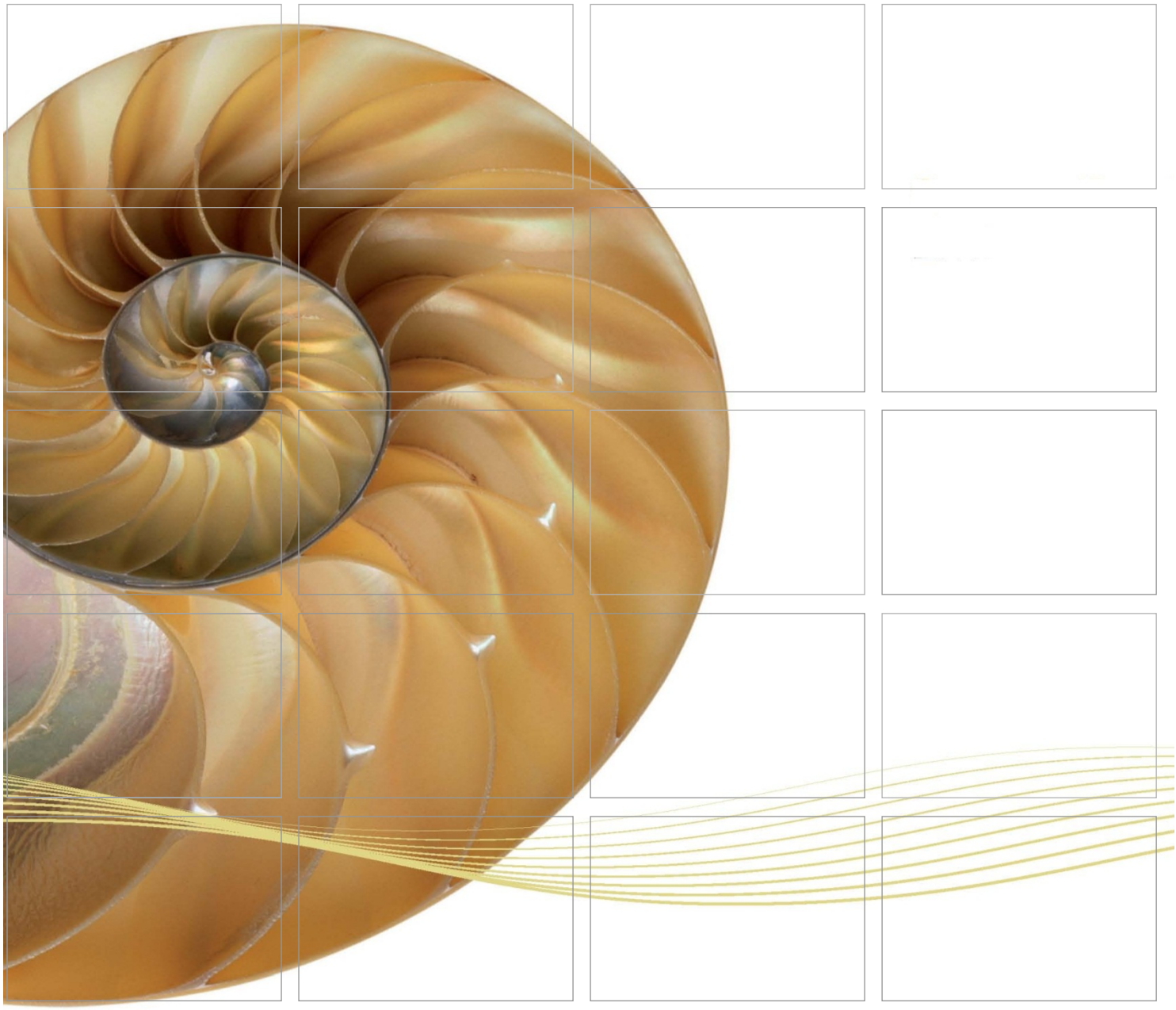
REPORT



Contract No. HY/2012/07
Tuen Mun – Chek Lap Kok Link – Southern Connection Viaduct Section

Environmental Review for the Temporary Staging for Construction of the Southern Connection

21 March 2014

Environmental Resources Management
16/F, DCH Commercial Centre
25 Westlands Road
Quarry Bay, Hong Kong
Telephone 2271 3000
Facsimile 2723 5660

www.erm.com

ERM

The world's leading sustainability consultancy

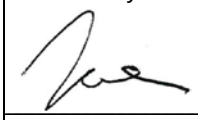
Contract No. HY/2012/07
Tuen Mun – Chek Lap Kok Link – Southern Connection Viaduct Section

Environmental Review for the Temporary Staging for Construction of the Southern Connection

Environmental Resources Management

16/F, DCH Commercial Centre
25 Westlands Road
Quarry Bay, Hong Kong
Telephone: (852) 2271 3000
Facsimile: (852) 2723 5660
E-mail: post.hk@erm.com
http://www.erm.com

Document Code: 0215660 Temp Platforms ER_v1_2014_03_21.docx

Client:	Project No:
Gammon	0215660
Summary: This document presents the Environmental Review for the Temporary Staging for Construction for Tuen Mun – Chek Lap Kok Link Southern Connection Viaduct Section.	Date: 21 March 2014
	Approved by:  *Mr Craig Reid* *Partner*
	Certified by:  *Mr Jovy Tam* *ET Leader*

Revision	Description	By	Checked	Approved	Date
V1	Temporary Staging Report	JT	JT	CAR	21/03/14

Distribution

☐ Internal

☒ Public

☐ Confidential

Ref.: HYDHZMBEEM00_0_1805L.14 25 March 2014

AECOM By Fax (2492 2057) and By Post
Supervising Officer Representative's Office
6 Hoi Kok Street,
Tsuen Wan, N.T.

Attention: Mr. Daniel Ip

Dear Sir,

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

Contract No. HY/2012/07 TM-CLKL Southern Connection Viaduct Section
Environmental Review for the Temporary Staging for Construction of the Southern Connection

Reference is made to the provision of a report entitled "Environmental Review for the Temporary Staging for Construction of the Southern Connection" by the ET Leader (ERM's ref: "0215660 Temp Platforms ER_v1_2014_03_21.docx" dated on 21 March 2014) received via email on 24 March 2014.

We are pleased to inform you that we have no adverse comments on the captioned report.

Thank you for your kind attention. Please do not hesitate to contact the undersigned or the ENPO Leader Mr. Y H Hui should you have any queries.

Yours sincerely,

Tony Cheng
Independent Environmental Checker
Tuen Mun – Chek Lap Kok Link

c.c. HyD – Mr. Stephen Chan (By Fax: 3188 6614)
HyD – Mr. Matthew Fung (By Fax: 3188 6614)
AECOM – Mr. Conrad Ng (By Fax: 3922 9797)
ERM – Mr. Jovy Tam (By Fax: 2723 5660)
Gammon – Mr. Roy Leung (By Fax: 2750 0922)

Internal: DY, YH, PL, ENPO Site

T:\Projects\HYDHZMBEEM00\02_Proj_Mgt\02_Corr\HYDHZMBEEM00_0_1805L.14.doc

ENVIRON Hong Kong Limited 英環香港有限公司
Room 2403 Jubilee Centre, 18 Fenwick Street, Wan Chai, Hong Kong. Tel: 852 3465 2888 Fax: 852 3465 2899
www.environcorp.com

CONTENTS

1 INTRODUCTION

1.1 BACKGROUND

The "Tuen Mun - Chek Lap Kok Link" Project (hereinafter referred to as "the Project") comprises a dual 2-lane highway connecting the proposed Tuen Mun Western Bypass at the southern coast of Tuen Mun Area 40 and the Hong Kong International Airport (HKIA) and Tung Chung. The Project comprises the following key components:

(i) Construction of a dual 2-lane road tunnel (in two tubes) of approximately 5.0km long between Tuen Mun and the proposed Hong Kong Boundary Crossing Facility (HKBCF) located at northeast of the HKIA;

(ii) Construction of approximately 4.2 km of seawalls and reclamation of approximately 35.6 ha of the Government foreshore and seabed at Tuen Mun Area 40 and Lantau for the tunnel portals and the associated roads;

(iii) Construction of an approximately 1.6km long dual 2-lane viaduct between HKBCF and North Lantau Highway (NLH) and the associated roads at Tai Ho;

(iv) Construction of a toll plaza at Tuen Mun Area 46 and the associated roads at Tuen Mun;

(v) Construction of administration building, ventilation buildings and other ancillary buildings to facilitate ventilation and tunnel control operation serving the proposed road tunnel and toll plaza above; and

(vi) Ancillary works including site formation, slope drainage, utilities, footbridge, noise barriers, retaining walls, berths and temporary pontoon.

An Environmental Impact Assessment (EIA) study for the Project was conducted in accordance with the EIA Study Brief No. ESB-175/2007 and was based on the available information obtained during preliminary design stage. The EIA study concluded that the Project would be environmentally acceptable with the implementation of recommended mitigation measures.

The EIA Report (Register No.: AEIAR-146/2009) was approved on 23 October 2009 under the Environmental Impact Assessment Ordinance (EIAO). Following the approval of the EIA Report, an Environmental Permit (EP) was granted on 4 November 2009 (EP No: EP-354/2009) for the construction and operation of the Project. A variation of environmental permit was approved with an Environmental Permit (EP No: EP-354/2009/A) issued by the Director of Environmental Protection (DEP) on 8 December 2010. Another application for variation of environmental permit (VEP) (*EP-354/2009/B*) was granted on 28 January 2014.

The need for temporary staging for the construction of the Southern Connection viaducts, which has not been taken into account during the investigation phase EIA, arose during the Design and Construction Stage of the Project. An Environmental Assessment for the Temporary Staging for Construction for the Southern Connection was prepared (1) and the Environmental Protection Department (EPD) has confirmed no adverse comments on the reference scheme in October 2012. The reference scheme comprises a temporary access bridge parallel to the alignment of the permanent bridge and viaducts structure.

During the construction design, the scheme for the temporary staging was revised under which 38 isolated staging platforms with one temporary landing platform will be constructed. This Environmental Review (ER) serves to assess the environmental consequence during the installation, operation and removal of the current temporary staging scheme and to identify additional mitigation measures necessary for the minimisation of the associated impacts. It should be noted that the scheme of temporary staging is not classified as a Designated Project under *Schedule 2* of the *EIAO*. It is also not being considered as material change to a Designated Project under *Item 6* of the *EIAO-TM*.

1.2 PURPOSE OF THIS REPORT

This ER aims to assess the potential environmental impacts caused by the current temporary staging scheme and to recommend additional mitigation measures and EM&A works for the temporary staging work, if necessary.

1.3 ORGANISATION OF THIS REPORT

The remainder of the report is organized as follows:

- Section 2 discusses the need for the temporary staging as well as the preliminary design and scale of the temporary staging.
- Section 3 reviews the relevant environmental baseline, investigation as well as assessment carried out for the approved EIA. The potential environmental impacts for each of the relevant environmental aspects covered under the approved EIA are identified and evaluated. Additional mitigation measures and environmental monitoring and audit (EM&A) would be proposed, if necessary.
- Section 4 provides a summary of the ER findings on the current temporary staging scheme.
- Section 5 provides a comparison of environmental impacts of the reference scheme and the currently proposed scheme.

(1) AECOM (October 2012) Environmental Assessment for the Temporary Staging for Construction of the Southern Connection. Prepared under Agreement No. CE 7/2011 (HY) – TM-CLKL Design and Construction.

2 THE TEMPORARY STAGING

2.1 NEED FOR THE TEMPORARY STAGING

Temporary staging is required to provide a stable working platform and transfer of materials for the piling work in connection of the viaduct construction between HKBCF and North Lantau. The proposed temporary staging scheme comprises a series of isolated staging platforms. Such design scheme can facilitate the transfer of material and hence save time for the construction work. In addition, the use of isolated working platforms can minimise obstructions to the navigation channel/marine traffic around the works area and minimise propeller wash in shallow waters offshore.

The temporary staging works also require construction of one temporary landing platform along the seawall as temporary storage and for transfer of material from land to the isolated staging platforms. The temporary landing platform will also be used as the yard for the fabrication of reinforcement cages for bored piling works.

2.2 PRELIMINARY LAYOUT OF TEMPORARY STAGING AND PILE CONFIGURATION

The preliminary layout plan of the proposed temporary staging platforms is shown in *Figure 2.1*, which corresponds to the permanent bridge pile layout. The temporary staging consists of 38 isolated staging platforms (spaced from approximately 35m to approximately 195m apart, centre to centre) with one landing platform near the North Lantau Highway. It should be noted that the staging platforms will be constructed in stages as shown in *Figures 2.2-6* so that the 38 staging platforms will not be present at the site together at any one time. The typical pile configurations and details of the isolated staging platforms are provided in *Figure 2.7*. The isolated platforms would be supported by pipe piles of 1,168 to 1,200mm in diameter with a truss of 3,000mm tall between the piles on both sides of the isolated platforms. The width of the pile deck for the isolated platforms ranges from ~21m to ~80 m wide and supported by pairs of parallel arrays of pipe piles on both sides and/or in the middle. The pipe piles would be the only structures which are submerged underwater in any occasion while the bottom of the truss may also be submerged underwater during high tide.

The landing point of the isolated platforms comprises one temporary landing platform to be formed along the seawall near the NLH as shown in *Figure 2.8*. Design drawings of the landing platform are shown in *Figures 2.9-10* . This platform will be removed and the seawall will be reinstated upon completion of the TM-CLKL construction works.

Figure 2.1

Layout of Temporary Staging Platforms

FILE: 0215660p
DATE: 12/02/2014

Environmental Resources Management

ERM

Figure 2.2

Construction Stages of Temporary Staging Platforms – Stage 1

FILE: 0215660p1
DATE: 12/02/2014

Environmental Resources Management

ERM

Figure 2.3

Construction Stages of Temporary Staging Platforms – Stage 2

FILE: 0215660p2
DATE: 12/02/2014

Environmental Resources Management

ERM

Figure 2.4

Construction Stages of Temporary Staging Platforms – Stage 3

FILE: 0215660p3
DATE: 12/02/2014

Environmental Resources Management

ERM

Figure 2.5

Construction Stages of Temporary Staging Platforms – Stage 4

FILE: 0215660p4
DATE: 12/02/2014

Environmental Resources Management

ERM

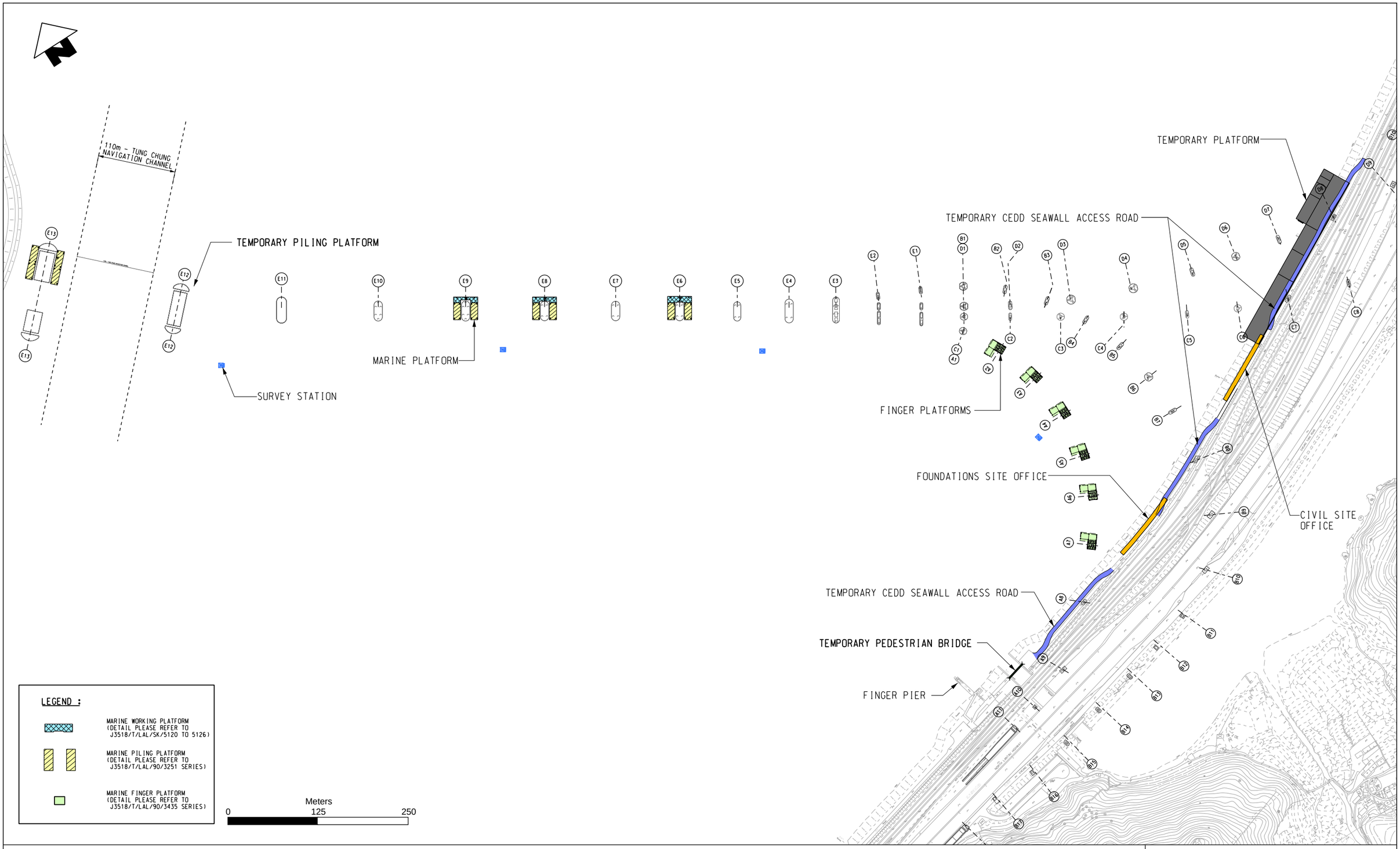


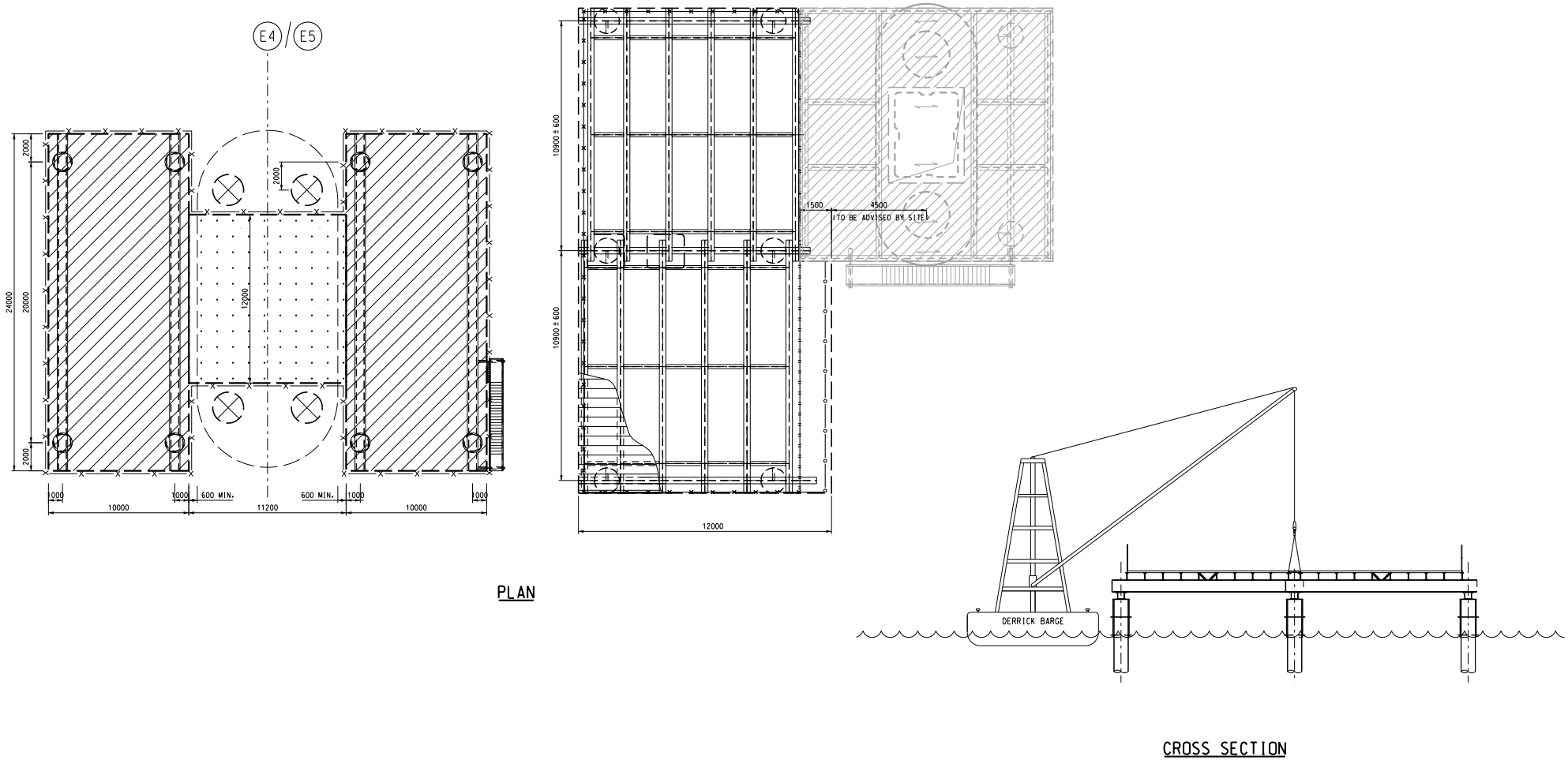
Figure 2.6

Construction Stages of Temporary Staging Platforms – Stage 5

FILE: 0215660p5
DATE: 12/02/2014

Environmental Resources Management

ERM



PLAN

CROSS SECTION

Figure 2.7

Typical Pile Configuration of Isolated Platforms

FILE: 0215660d
DATE: 12/02/2014

Environmental Resources Management

ERM

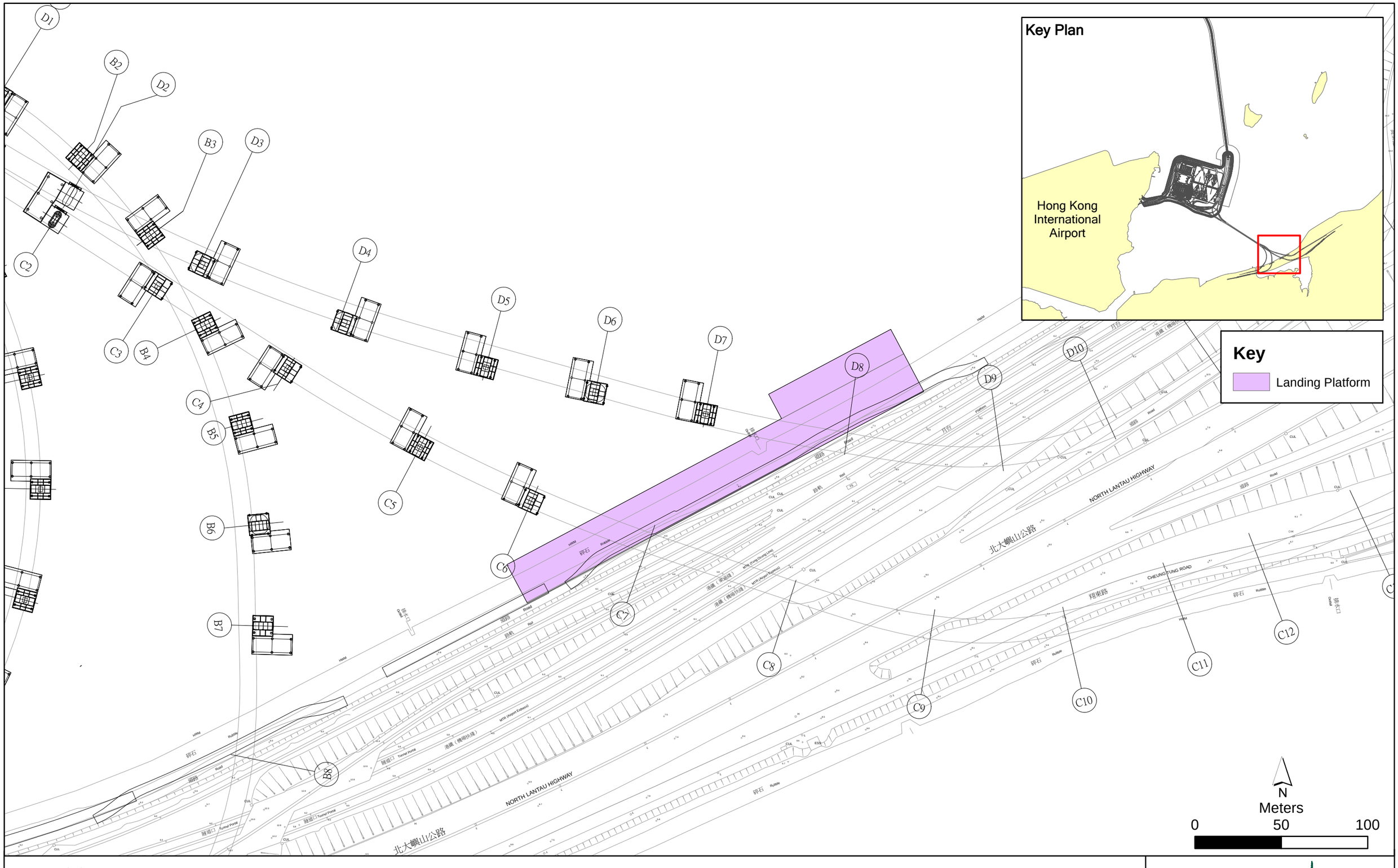


Figure 2.8

Location of Landing Platform

File: T:\GIS\CONTRACT\0215660\Mxd\0215660_Landing_Platform.mxd
Date: 12/2/2014

Environmental Resources Management

ERM

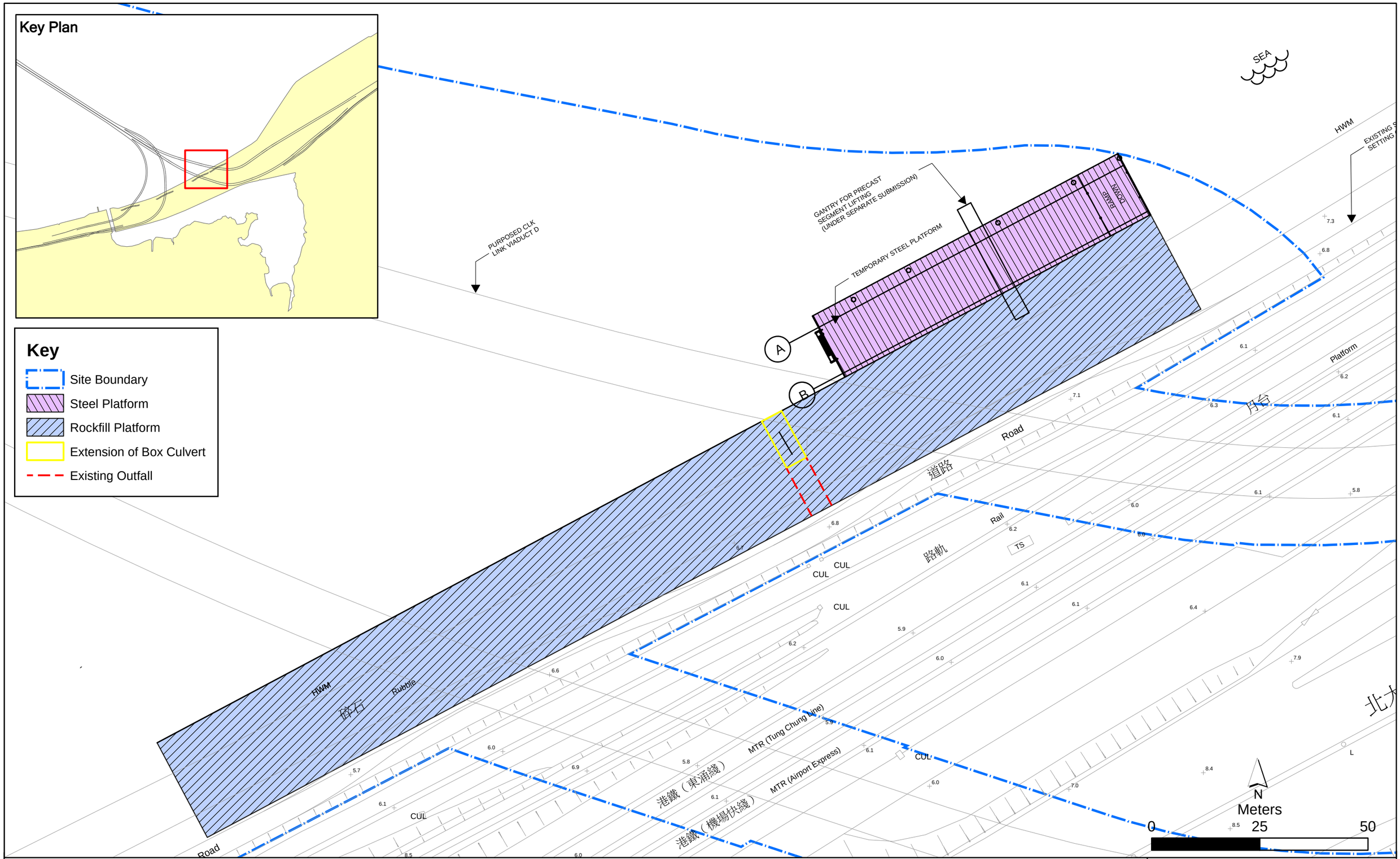


Figure 2.9

Design of Landing Platform at Viaduct D - Plan View

File: T:\GIS\CONTRACT\0215660\Mxd\0215660_Landing_Platform_Viaduct_D.mxd
Date: 21/3/2014

Environmental Resources Management

ERM

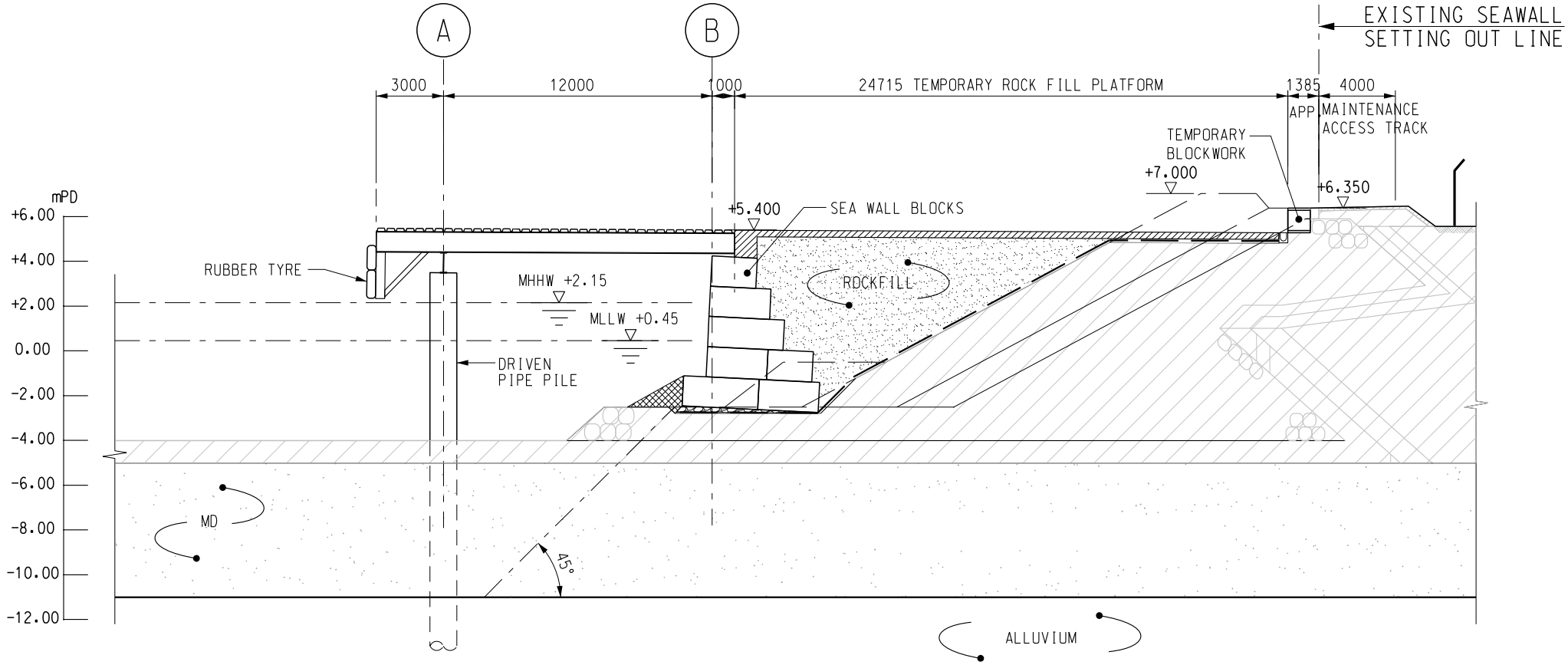


Figure 2.10

Design of Landing Platform at Viaduct "D" - Section View

FILE: 0215660e5
DATE: 04/10/2013

Environmental
Resources
Management

ERM

2.3 METHOD AND SEQUENCE OF CONSTRUCTION / REMOVAL OF THE TEMPORARY STAGING

In general, works will start from both sides of the Southern Connection, ie from the HKBCF reclaimed area and the NLH. Construction of the temporary staging has commenced in early November 2013 in stages [1] and will be maintained for operation until the construction of the permanent bridge structure is completed in around mid-2016 (ie around 31 months). The removal of the temporary staging will take another 2 months.

2.3.1 *Method of Construction*

Method of Construction (Isolated Staging Platform for Marine Bored Pile / Pier Columns Construction) (At Piers of Viaducts A, B, C, D and E)

The isolated staging platforms are planned to be constructed in five stages as shown in *Figures 2.2-6*. The 38 isolated platforms will not be present at the same time. The actual number of isolated platforms will range from 10 to 24 during the five stages.

1. Flat-top barge mounted with 120 / 150 tons crawler crane will be towed by tug boat to the proposed pipe pile locations.

2. Drive the pipe piles down into the seabed by vibratory hammer lifted by crawler crane until the termination criteria are reached according to working drawings.

3. Pre-fabricated structural components of temporary working platform will be transported either by flat-top barge or derrick lighter to pier locations.

4. Pairs of prefabricated steel trusses will be installed on top of driven pipe piles.

5. Prefabricated deck panels will be placed on top of steel trusses.

6. Upon completion of temporary staging platform of individual piers, the flat-top barge and derrick lighter will move to another pier location for temporary platform erection with repeated procedures from 1 to 5.

Method of Construction (Temporary Landing Platform at Viaduct D near NLH)

One temporary landing platform will be constructed at Viaduct D near NLH which comprises onshore rockfill platform retained by seawall blocks/*in-situ* concrete and offshore steel platform supported on driven pipe piles into seabed.

1. Onshore rock amours on top of sloping seawall which conflict with the proposed platform will be temporarily removed.

[1] It should be noted that the construction of temporary staging is currently being undertaken according to the revised 2013 design for which EPD has confirmed no comment on.

2. 4 layers of sea wall blocks will be placed underneath water on the toe of the existing Grade 700 rockfill at onshore area to acts as retaining structure for later on backfilling of rockfill on top of sloping seawall.

3. Cast *in-situ* concrete block on top of sea wall blocks for both retaining structure and supports for steel platform towards the sea side.

4. Laying geotextile on top of the existing rock surface.

5. Backfill the sloping seawall with rockfill materials up to circa +5.1 mPD.

6. 300mm thick of reinforced concrete pavement will be constructed on top of the backfilled rockfill materials.

7. A crawler crane mounted with vibratory hammer will position near edge of aforesaid rockfill platform and a row of 25nos. 1000mm diameter pipe piles at 6m c/c will be driven down into seabed to support the steel deck on top.

8. Structural steel members will be placed on top of pipe piles and welded in position.

9. Type III sheetpile to be placed on top of supporting members with welding connections.

Construction Sequence for Removal of Temporary Staging Platforms

1. Remove all welding connections between sheetpile deck and supporting structural members

2. Lift the sheet pile deck unit piece by piece

3. Sheet pile deck units to be delivered off site via staging platforms and seawall access track.

4. Remove welding joints between open frames and pipe piles.

5. Cut the frame and lift it up by crawler crane and place it on either flat-top barge or the temporary staging platforms.

6. Frame will be dismantled into manageable pieces and delivered off site via marine routes or land access via access track at Siu Ho Wan.

7. All pipe piles will be extracted by vibratory hammer.

Construction Sequence for Removal of Onshore Landing Platform

1. Demolish the 300mm thick reinforced concrete pavement by backhoe with breaker and delivery of the inert debris off site for reuse in other construction site via marine routes by derrick lighter or via land access by dump truck.

2. Remove the rockfill material and delivery off-site by derrick lighter with grab.

3. Remove the geotextile placed on the top of the existing rock surface.

4. Lifting the cast-in and seawall block and delivery off-site by derrick lighter.

5. Reinstate the seawall profile as per the original.

3 ASSESSMENT OF POTENTIAL ENVIRONMENTAL IMPACTS

3.1 GENERAL

This section provides an assessment of the potential environmental impacts from the construction, operation and removal of the temporary staging platforms, based on the findings of the approved EIA as well as the latest update design for the temporary staging. This section covers most aspects under the approved EIA, except for the aspects described in *Table 3.1* which are deemed irrelevant / negligible for the temporary staging works.

Table 3.1 Environmental Aspects Included/Excluded in this Assessment

Environmental Aspects	Included/ Excluded	Justifications
Air Quality	Included	• Potential impact from the temporary staging works, including fugitive dust and gaseous emissions.
Noise	Included	• Potential construction noise impacts due to installation, operation and removal of the temporary staging platforms
Water Quality	Included	• Potential impact from the temporary staging works, including sediment plume impacts from the installation, change in flow regime and propeller wash during operation etc.
Marine Ecology	Included	• Potential impact from the temporary staging works, including direct loss of habitats and indirect impacts caused by changes in water quality, underwater noise and marine traffic etc.
Fisheries	Included	• Potential impact due to temporary loss of seabed habitat and fishing grounds as well as indirect impacts caused by changes in water quality.
Landscape and Visual	Included	• Potential impact from the temporary staging works due to potential blockage of view.
Terrestrial Ecology	Excluded	• Marine Works • At least 300m away from nearby woodland, shrubland and grassland
Cultural Heritage	Excluded	• Marine Works • No area of marine archaeological potential was identified in the approved EIA • At least 330 m away from the nearest cultural resources; the nearest cultural resources are a shrine (TH-1) and a grave (G5) on the hillside of the NLH

Environmental Aspects	Included/ Excluded	Justifications
Waste Management	Excluded	• Marine works • No excavation/dredging required • No marine mud disposal is required • Material for temporary staging platforms will be reused in other construction site after removal
Land Contamination	Excluded	• Marine works • No excavation required
Landfill Gas Hazard	Excluded	• Marine works far away from any landfill sites

It is anticipated that the works for the temporary staging platforms will be carried out concurrently with the construction of the Southern Connection as well as the other section of the TM-CLKL project and the HKBCF reclamation. Cumulative environmental impacts, in particular on water quality, marine ecology, fisheries and landscape and visual, are expected.

3.2 AIR QUALITY

3.2.1 Review of Approved EIA

Fugitive dust impact is one of the major concerns during the construction of the TM-CLKL in the approved EIA. The approved EIA states that no significant dust impact from the cumulative effect of the TM-CLKL, HKBCF and HKLR is expected at the air sensitive receivers (ASRs) around the Southern Connection viaducts during the construction of the TM-CLKL. Standard mitigation measures for construction sites specified in the Air Pollution Control (Construction Dust) Regulation would be implemented. Construction phase EM&A is recommended as well. The gaseous emission from construction plant is considered minor and was not elaborated in detail in the approved EIA.

3.2.2 Identification and Evaluation of Potential Impacts

It is anticipated that the construction and operation of temporary staging platforms would be concurrent with the nearby bridge and piles construction for the Southern Connection. The installation of the temporary staging platforms would not involve any open excavation. Therefore, a significant fugitive dust issue is not expected from the installation of the temporary staging platforms. During the use of the temporary staging platforms for construction of the Southern Connection viaducts, potential fugitive dust impact is expected to be minimal since the surface of the temporary staging platforms would be mostly consisted of metal. Additional cumulative fugitive dust impact is not anticipated. It is thus anticipated that impacts related to the temporary staging works would be no greater than those considered to be acceptable within the approved EIA Report and as such no additional nor different mitigation measures would be considered necessary than those presented within the approved EM&A Manual.

The use of vessels and plant for the installation and removal of temporary staging platforms as well as the construction of the Southern Connection viaducts may induce minor gaseous emission near the works area. The increase in the numbers of vessels and plant involved only contribute to a small portion of plant and equipment needed for the construction of the Southern Connection and the HKBCF reclamation. The proposed plant inventory is given in the *Table 3.2*. It is worth to note that plant which work at the navigation channel along bridge section E are generally over 800 m away from the nearest ASR (ASR8 Pak Mong Village House) (see *Figure 3.1*), while the rest of the plant would be in most of the time over 450m away from this ASR. In view of such separation distance from the nearest ASR and the small increase in the proportion of the number of vessels and plant required, the potential air quality impact due to the gaseous emissions from vessels and plant would be minimal and would be no greater than those considered to be acceptable within the approved EIA Report. As such, no additional, nor different, mitigation measures would be considered necessary than those presented within the approved EM&A Manual.

3.2.3 Recommendations of Additional Mitigation Measures and Environmental Monitoring

No additional mitigation measure and EM&A for air quality would be required.

3.3 NOISE

3.3.1 Review of Approved EIA

Only one noise sensitive receiver (NSR) at Northern Lantau is identified for construction phase of the TM-CLKL. The NSR is a village house at Pak Mong near Tai Ho Wan (NSR1 of the approved EIA Report) (see *Figure 3.1*). The maximum predicted construction noise levels at NSR1 for the whole construction sequence is predicted to be 74dB(A), which complies with the Daytime Construction Noise Criteria of 75dB(A). The maximum construction noise level is predicted during the construction of bridge piles on land around the landing point of the Southern Connection viaducts at NLH. No mitigation measure is recommended for the construction of the TM-CLKL. Nevertheless, EM&A for noise is recommended at NSR1 to ensure that there would not be any unacceptable noise impact.

3.3.2 Identification and Evaluation of Potential Impacts

The installation, operation and removal of the temporary staging platforms would generate noise. *Table 3.2* provides the plant inventory of the associated works which has been confirmed to be practicable. The closest NSR is NSR1 Pak Mong Village House which is located more than 450m away from the temporary staging works. Based on the plant inventory shown in *Table 3.2*, the predicted cumulative noise level due to the temporary staging works at NSR1 is 62.6 dB(A) (see *Table 3.3*).

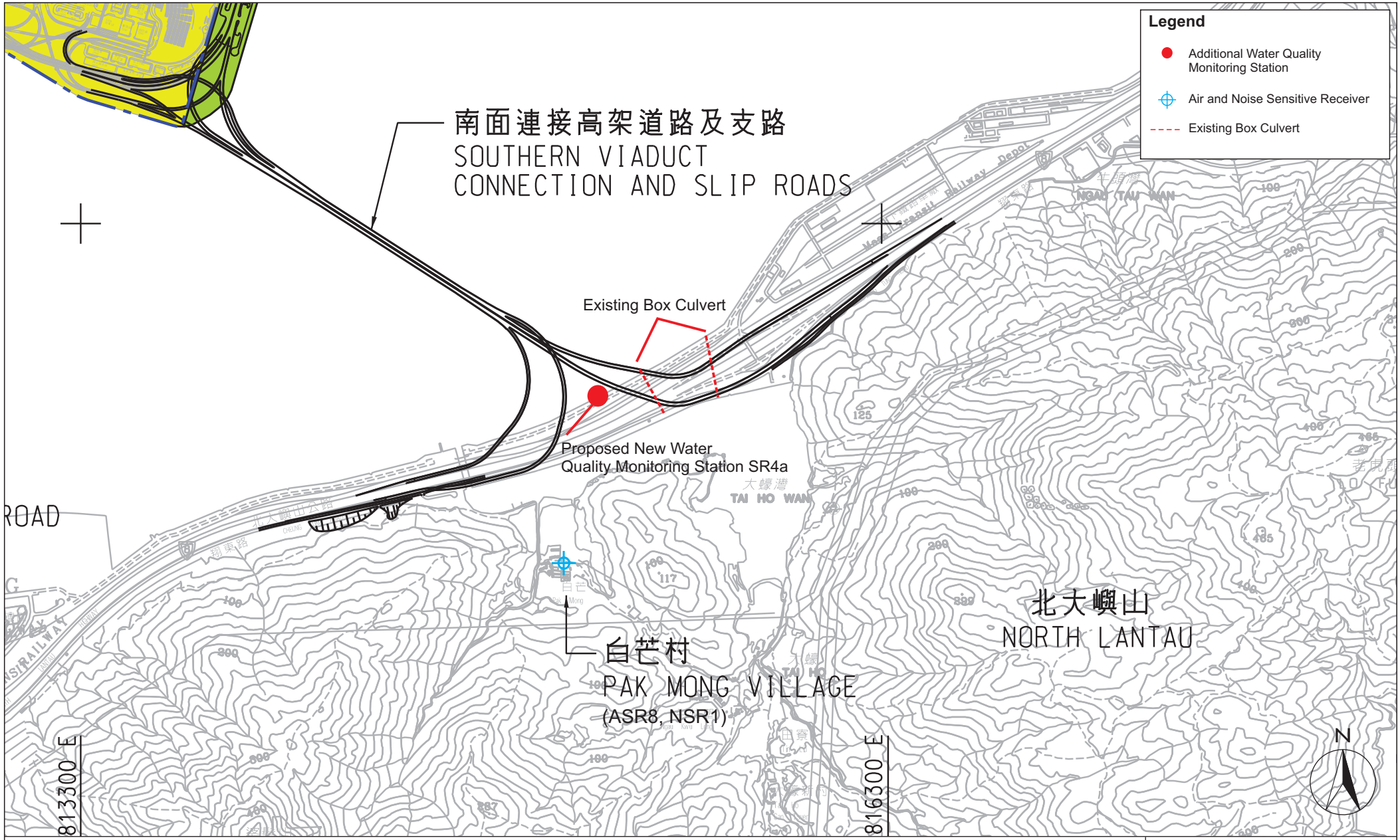


Figure 3.1

Location of Air & Noise Sensitive Receiver and Additional Water Quality Monitoring Station

FILE: 0215660f2
DATE: 21/10/2013

Environmental Resources Management

ERM

Table 3.2 ***Tentative Construction Plant Inventory for the Temporary Staging and Corresponding Sound Power Level***

Power Mechanical Equipment (PME)	No. of items	TM Ref/ Other Ref	Unit Sound Power Level (SWL), dB(A)	On-time %	Total SWL
Plant work for Isolated Platform construction along viaducts A, B, C, D and E1 to E2					
Derrick Lighter	2	CNP 061	104	100%	107
Tugboat	1	CNP 221	110	10%	100
Flat-top Mounted with Crane	1	CNP 048	112	100%	112
Vibratory Hammer	1	EPD/PME/ 18	115	100%	115
Generator	1	CNP 102	100	100%	100
Welding Machine	2	(a)	100	100%	103
Flat-top barge	1	CNP 061	104	100%	104
				Total SWL	**118**
Plant work from the Navigation Channel along Bridge Section E3 to E13					
Derrick Lighter	2	CNP 061	104	100%	107
Tugboat	1	CNP 221	110	10%	100
Flat-top mounted with crane	2	CNP 048	112	100%	115
Vibratory Hammer	2	EPD/PME/ 18	115	100%	118
Generator	3	CNP 102	100	100%	105
Welding Machine	6	(a)	100	100%	108
				Total SWL	**120**
Plant work for landing platforms along the NLH					
Derrick Lighter	3	CNP 061	104	100%	109
Tugboat	1	CNP 221	110	10%	100
Vibratory Hammer	1	EPD/PME/ 18	115	50%	112
Generator	1	CNP 102	100	100%	100
Air Compressor	1	CNP 003	104	50%	101
Flat-top barge	1	CNP 061	104	50%	101
				Total SWL	**114**

Note:
(a) Reference from East Rail Extension - Sheung Shui to Lok Ma Chau Spur Line EIA (Application No. EIA-044/2000) which was approved for public inspection but later rejected upon consideration of public comments. The same SWL reference was also quoted in the Harbour Area Treatment Scheme (HATS) Stage 2A Environmental Impact Assessment Study – Investigation (AEIAR-121/2008).

Table 3.3 ***Prediction of Noise Level at NSR1***

Activities	SWL, dB(A)	Distance, m	Noise Level at NSR1, dB(A) (a)
Plant work for Isolated Platform construction along viaducts A, B, C, D and E1 to E2	118	450	60
Plant work from the Navigation Channel along Bridge Section E3 to E13	120	800	57
Plant work for landing platforms along the NLH	114	450	56
		Total	**62.6**

Note:
(a) Including +3 dB(A) façade correction

The EIA predicted that the construction noise level will reach 74 dB(A) at NSR1 during the peak construction period of the Southern Connection. Adding the predicted noise contributed by the temporary staging works, the overall predicted noise level at NSR1 will still comply with the criterion of 75 dB(A). It is worth to note that the above calculation has assumed that the construction of the temporary staging would be carried out concurrently with the land-based piling work closest to the NSR, which is considered very conservative and would unlikely happen. The installation of the temporary staging is expected to proceed far beyond the shore, probably over 500m from the NSR when the based piling work closest to the NSR begins. Hence, it is expected that the noise contribution from the temporary staging works is negligible and the cumulative impact would be no greater than those considered to be acceptable within the approved EIA Report.

During operation of the temporary staging, construction activities of the permanent structures of the Southern Connection would be the only source of noise from the works which has been assessed by the construction noise assessment in the approved EIA Report. As discussed above, the construction noise level will reach 74 dB(A) at NSR1 during the peak construction period of the Southern Connection and will not exceed the criterion of 75 dB(A).

Given the above, no additional nor different mitigation measures would be considered necessary than those presented within the approved EM&A Manual.

3.3.3 Recommendations of Additional Mitigation Measures and EM&A

No additional mitigation measures and EM&A for noise are required.

3.4 WATER QUALITY

3.4.1 Review of Approved EIA

According to the approved EIA, the construction of the TM-CLKL as well as the HKBCF and HKLR would involve extensive marine works, including various marine piling, foundation works, dredging as well as reclamation filling. The worst-case scenarios for each of the three consecutive years of construction of the three projects have been assessed, based on the more conservative assumption of the construction sequence (sequence A, with higher total sediment loss). Mitigated scenario for a less conservative (and more realistic) construction sequence (sequence B, with lower total sediment loss and the use of leading seawall to confined sediment), has also been assessed. Based on the water quality modelling results, with the application of the integrated protection measures (as given in *Sections 6.7.4.17* and *6.7.4.18* of the approved EIA Report) and also the (1+1) silt curtain system, the major zone of influence is mainly limited to areas within 500m from the reclamation sites, where there is limited specific sensitive use of the waters within this radius. Yet, marginal suspended solids (SS) exceedances of WQO at the airport water intake (WSR 25), artificial reef site at the north-east of the airport

(WSR 41) as well as coral site near the River Trade Terminal (WSR 47b) are still predicted. The use of silt curtain at cooling water intake at WSR 25, the reprovision of artificial reef at WSR 41 as well as the translocation of coral at WSR 47b would be implemented and no significant water quality impact is expected.

The water quality impact due to the operation of the three projects has been assessed in the approved EIA based on the model prediction. It is predicted that the water quality conditions in North-western waters would not be affected by the projects in an unacceptable manner and the predicted changes, especially for physicochemical parameters like DO, salinity and temperature, are small and within the ranges of natural variations experienced in the study area. Residual impacts during the operational phase would be low and considered acceptable.

EM&A for water quality for both construction and operation phase of the project has been recommended.

3.4.2 Identification and Evaluation of Potential Impacts

Sediment Plume Impact from the Installation of the Temporary Staging Platforms

The installation of temporary staging platforms will involve marine piling, which may result in localized elevation in SS. The marine piles would be installed in stages as shown in *Figures 2.2-2.6*, thus the SS elevation during the piling works would be highly localized and minimal. Since the construction of permanent marine bridge piles for the Southern Connection would be commenced when the installation of temporary staging is still in progress, cumulative water quality impact, particularly for suspended solids, from the construction of permanent piles would be expected. As given in *Figure 1b* of *Appendix 0*5 of the approved EIA, the contribution of suspended solid from the construction of permanent pile (1017) has been taken into account in the construction phase sediment plume modelling exercise (2012 scenario). The water quality modelling results of the 2012 construction phase scenario indicated that, the construction of permanent piles of Southern Connection as well as other marine works under TM-CLKL, HKBCF and HKLR would not result in significant elevation in SS level near the Southern Connection. The predicted SS elevation at the nearest WSR (WSR22c Tai Ho Wan Outlet (outside) (Near coral site) is minimal (maximum 0.2 mg/L) and complies well with the relevant assessment criteria (ie 3.6, 5.1, 8.1 and 5.5 mg/L for surface, mid-depth, bottom and depth-averaged level, respectively, for the dry season period; 2.3, 3.3, 6.0 and 2.7 mg/L for surface, mid-depth, bottom and depth-averaged level, respectively, for the wet season period). The predicted SS elevation at other receiver points in Tai Ho Wan (WSR22a and WSR22b) is even lower. No other WSR was identified within 1 km of the Southern Connection (and the temporary staging platforms). It is anticipated that the elevation in SS level contributed from the installation of temporary staging platforms would be even less significant than the level resulted from the construction works for the permanent piles of the Southern Connection. In addition, coral translocation was undertaken in October 2013 before

commencement of the Southern Connection construction which would help to reduce the indirect water quality impacts to corals at Tai Ho Wan. Given the above, it is expected that there would not be significant cumulative impact from the installation of the temporary staging platforms at the nearby receivers at Tai Ho Wan. Unacceptable cumulative water quality impacts at other WSRs further away are also not anticipated in view of the localized nature of the impact from the installation of the temporary staging platforms.

The construction of temporary rockfill platform from the NLH side would require removal of rock armour along sloping seawall. The removal and reinstatement of rock armours would not create significant SS impact since the fine content in the rock materials would be negligible. Loss of fines during the seawall removal and reinstatement work is therefore not expected.

Change in Flow Regime and the Associated Change in Water Quality due to the Temporary Staging

The marine piles of the temporary staging platforms may also affect the tidal flow across the channel during its operation. The piles will be the only structure submerged in water during most of the time, except during high tide when part of the supporting truss will also submerge in water.

Evaluation Approach and Justifications

Under the approved EIA, the change in flow regime during the construction phase has not been elaborately assessed for the following reasons:

- The change in flow regime during construction phase is considered limited and is less a significant issue when compared with the SS impact resulted from the marine dredging and filling of the nearby concurrent projects; and

- The worst case scenario for the change in flow regime should be the operation phase (where all reclamation and bridge piles are in place), which has been considered in the operation phase modelling scenario.

To assess the potential change in flow regime as well as the associated change in water quality from the temporary staging, reference has been made to the operation phase water quality modelling results under the approved EIA (referred as "operation phase modelling results" hereafter). It is considered appropriate, conservative and acceptable in adopting the operation phase modelling results of the approved EIA for assessing the worst-case potential change in flow regime and water quality from the temporary staging platforms in view of the followings:

- The worst-case scenario for change in flow regime and the associated impact on water quality arise from TM-CLKL is assessed in the operation phase modelling scenario;

- All reclamation and bridge piles (except for the temporary staging platforms) which are expected to be in place during the lifespan of the

temporary staging platforms have been covered in the operation phase modelling scenario;

- The effect on flow regime due to the partially formed reclamation and bridge piles nearby during the lifespan of the temporary staging platforms is expected to be less than that of the completed reclamation and bridge piles considered in the operation phase modelling scenario;

- The reclamation for the Logistic Parks and the Tung Chung Future Development near Tai Ho Wan affect the tidal flow at Tai Ho Wan and the potential contribution on the change in flow regime by the temporary staging platforms is expected to be less than that of the two pieces of reclamation;

- Adopting the operation phase modelling scenario is deem conservative and acceptable for assessing the worst-case potential change in flow regime and water quality from the temporary staging platforms since (1) the intermediate case during the construction of HKBCF and TM-CLKL would exert less significant effect on flow regime, and (2) the obstruction in tidal flow due to the temporary staging platforms is expected to be minimal when compared with the effect of the reclamation for the Logistic Parks and the Tung Chung Future Development.

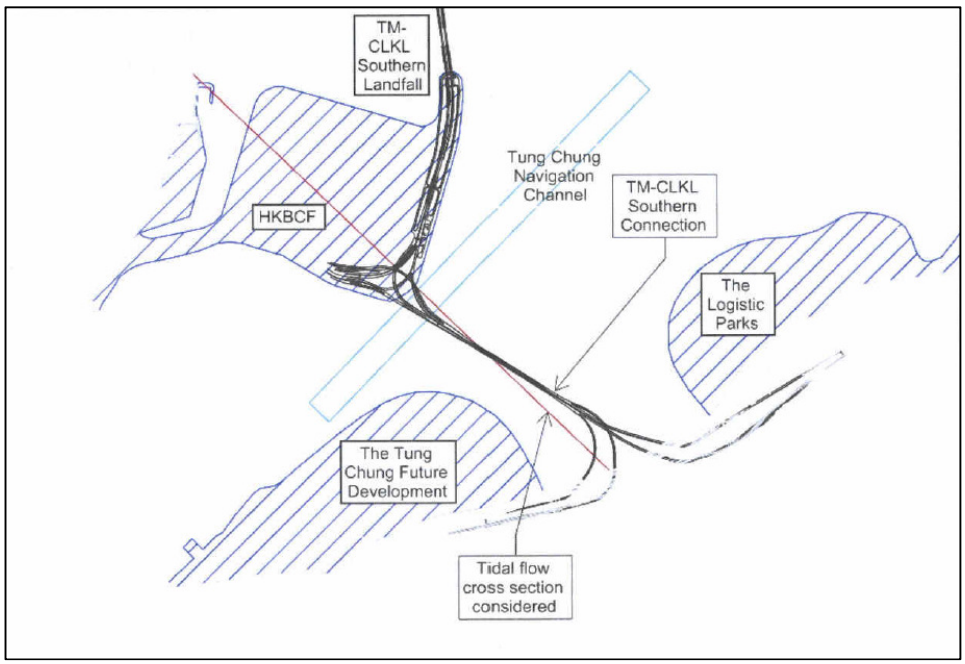
To support the above analysis, *Table 3.4* compare the coastline configuration near the Project Area and *Figure 3.2* shows the coastline configuration assumed in the operation phase modelling scenario.

Table 3.4 Comparison of Coastline Configurations

	Operation Phase Modelling Scenario	**Start of the Construction of the Temporary Staging Platforms**	**Near End of Construction of the Temporary Staging Platforms**
HKBCF Reclamation	Fully formed	Partly formed southern seawall only	Southern seawall formed with some reclamation formed inside
		Less / smaller reclamation than operation phase modelling scenario	Less / smaller reclamation than operation phase modelling scenario
TM-CLKL Southern Connection	Fully formed, with smaller spacing between piles	No marine pile formed yet	Fully formed piles, with larger spacing
		Less obstruction in flow than operation phase modelling scenario	Less obstruction in flow than operation phase modelling scenario
Other Reclamation / Works nearby	Fully formed reclamation of Logistic Parks and Tung Chung Future Development respectively	Some pipe piles installed for temporary staging near the navigation channel and near the coastline of Tai Ho Wan	Fully formed temporary staging
		No reclamation for Logistic Parks and Tung Chung Future Development	No reclamation for Logistic Parks and Tung Chung Future Development

	Operation Phase Modelling Scenario	Start of the Construction of the Temporary Staging Platforms	Near End of Construction of the Temporary Staging Platforms
		No obstruction in flow by reclamation but some minimal obstruction by pipe piles	No obstruction in flow by reclamation but some obstruction by pipe piles (by 242 nos. of pipe piles)

Figure 3.2 ***Coastline Configurations Assumed in the Operation Phase Modelling Scenario***



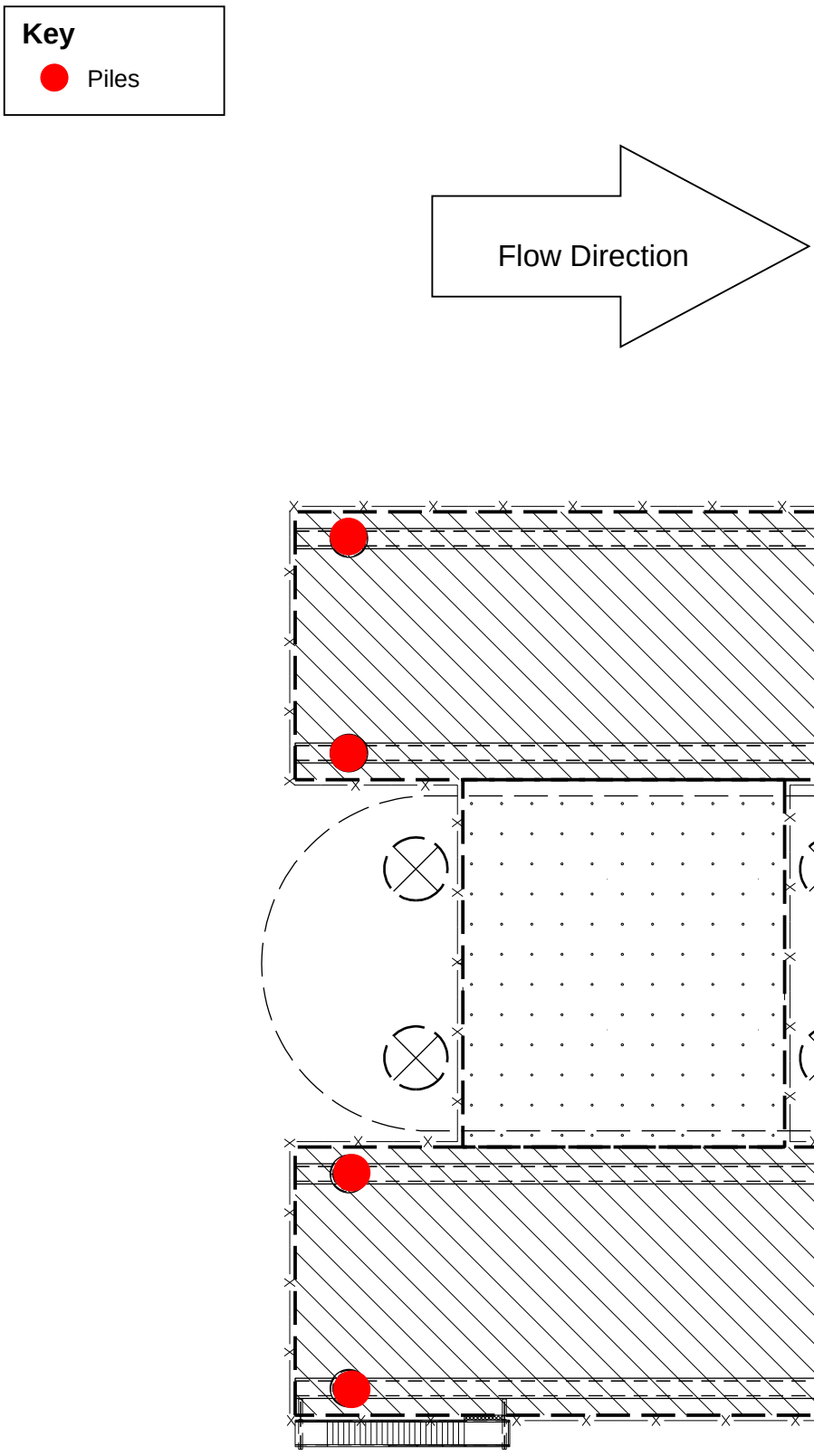
Regional Effect on Tidal Flow

The operation phase hydrodynamic modelling carried out under the approved EIA shows that though the reclamation for the HKBCF and TM-CLKL Southern Connection as well as the permanent piles at the Southern Connection viaducts would result in change in tidal flow at the Western Waters (as indicated in *Table 6.17* of the approved EIA Report), the change in water quality at water sensitive receivers is not significant. As shown in *Appendix D7C* of the approved EIA Report, the water quality parameters are generally in compliance with the WQO (and with sufficient margin of safety), except for the total inorganic nitrogen at WSR 07 (Black Point Cooling Water Intake, over 7km away from the proposed temporary staging platforms) where exceedance is already predicted at the baseline level. While the change in water quality due to the reclamation for the HKBCF, TM- CLKL Southern Connection and the permanent piles for Southern Connection viaducts is not significant, the predicted water quality near the Southern Connection viaducts would also be satisfactory during the operation phase. The three receiver points (WSR22a/b/c) at Tai Ho Wan are only minimally affected.

When compared with the scale of works (and associated change in flow regime) under the TM-CLKL, HKBCF and HKLR, those of the temporary staging platforms are deemed minimal. As calculated in the direction perpendicular to the Tung Chung Navigation Channel, the whole cross section from Tai Ho Wan to the north eastern tip of the Airport Island (indicated by the red line shown in *Figure 3.2*) would be around 3.62km. The projection of the HKBCF Island and the TM-CLKL Southern Landfall would together cover 1,533m of the cross section, which indicated that the HKBCF Island and the TM-CLKL Southern Landfall would contribute to a change of 42.35% of the cross section of the tidal channel. Based on the pile configuration assumed under the *Appendix D3* of the approved EIA Report, the total blockage due to the permanent piles of the Southern Connection viaducts would be 171.6m (based on the assumed pile configurations for TM-CLKL Southern Connection viaducts stated in *Appendix D3* of the approved EIA Report), which contribute to an additional 4.74% reduction of the cross section. As discussed previously, such a significant change (42.35%+4.74% = 47.09%) in the cross section of the tidal channel due to the HKBCF and the TM-CLKL Southern Connection, though may result in some level of change in flow regime, would not contribute to any significant change in water quality at all identified WSRs or any additional exceedance in WQO (TIN exceedance at WSR 07 Black Point Cooling Water Intake is predicted at the base case scenario, thus not considered as "additional exceedance").

It should be highlighted that the reclamation for Logistic Parks and Tung Chung Future Development has not been taken into account in the above calculation since both reclamation areas do not lie exactly on the same cross section considered above (indicated by the red line shown in *Figure 3.2*). Yet it is reasonable to expect the reclamation for Logistic Parks and Tung Chung Future Development would have contributed a notable effect on the flow regime at the tidal flow channel and Tai Ho Wan.

In comparison, the change in cross section of the tidal channel would be minimal by the temporary staging platforms even under the worst case scenario during which 24 platforms will present at the site (please refer to *Figure 2.3*). Based on the current design, the diameter of the pile would be 1.168 to 1.2m. Assuming that parallel arrays of piles of the staging platform would approximately overlap with each other at most of the sections along the current flow direction (see *Figure 3.3*), the additional cross section blocked by the piles would be approximately 93.4m during the critical construction period (see *Table 3.5*). This represents approximately 2.6% of the cross section of the tidal channel between Tai Ho Wan and the north eastern tip of the Airport Island. The same was assumed for the calculation of pile friction in the *Appendix D3* of the approved EIA Report. It should also be noted that the temporary staging platforms would not encroach into the Tung Chung Navigation Channel, where water depth is deep and the major tidal current flow through. The arrays of piles along the extensions at the northern side (where water is deeper) of the temporary staging platforms would generally be quite parallel to the flow direction (as indicated in *Figure 2.1* and *Figure 3.3*).



At Isolated Platforms and Piling Platforms

Figure 3.3

Current Flow Direction and Typical Piles Alignments of Temporary Staging Platforms

FILE: 0215660a
DATE: 12/02/2014

Environmental Resources Management

ERM

Such arrangement would minimize the overall blockage arisen from piles at the extensions.

When compared with the cumulated decrease of cross-section from the TM-CLKL as well as the HKBCF (42.35%), the additional change (2.6%) due to the temporary staging platforms would be minor. Also, as the temporary staging platforms are located at the shallower part of the channel, where current flow is slower, the overall change of current flow due to the temporary staging platforms would be even less significant. Besides, based on the latest update design on the Southern Connection, the spans between permanent piers would be generally greater than those assumed under the computational modelling in the approved EIA, such that the temporary increase in current flow blockage due to the temporary staging platforms would be partly offset and the expected deviation from the result of computational modelling would be less significant. It should also be noted that the cross section covered by the pipe piles of the temporary staging platforms has also been covered by the reclamation for the Logistic Parks and the Tung Chung Future Development assumed in the operation phase modelling scenario. It is therefore expected that the obstruction in tidal flow and the potential change in flow regime by the two reclamation areas would be significantly more than that resulted from the pipes of the temporary staging platforms. The reduction in the obstruction of the tidal flow channel due to the 'absence" of the two reclamation areas during the entire lifespan of the temporary staging platforms would provide some allowance, which could offset part (if not all) of the change in flow regime by the temporary staging platforms. In view of the marginal decrease of cross section area due to the temporary piles (after consideration the offsetting), significant change in the flow regime at the channel over that predicted in the approved EIA is not expected. The associated change in water quality is expected to be minimal as well. In view of the significant separation, aggravation of the predicted WQO exceedance of TIN at WSR 07 (Black Point Cooling Water Intake) is not anticipated. *Table 3.6* shows the change in flow regime and water quality predicted under the operation phase water quality modelling as well as the expected flow and water quality performance of the temporary staging platforms.

Table 3.5 Calculation of Additional Section Blockage

Feature	Arrays of Pile Parallel to flow direction	Total Width (m)	Assumptions
12 nos. of Isolated Platforms E3 to E13	43	50.2	• Piers E4 to E13 each has four rows of piles parallel to the flow direction; • Total number of arrays of pile at E4 to E13 parallel to flow direction = 4 rows of pile/pier x 10 piers = 40 arrays of pile • Pier E3 has three rows of piles parallel to the flow direction • Total number of arrays of pile at E3 parallel to flow direction = 3 arrays of pile • Total arrays of pile = 40 + 3 = 43 • Diameter of pile is 1.168m • Total width = Diameter of pile x Total number of arrays of pile = 43 x 1.168m = 50m.
Other 12 Isolated Platforms at Viaduct A, B, C and D	36	43.2	• Each pier has three rows of piles parallel to the flow direction; • Total number of arrays of pile parallel to flow direction = 3 rows of pile/pier x 12 pier = 36 arrays of pile • Diameter of pile is 1.2m • Total width = Diameter of pile x Total number of arrays of pile = 36 x 1.2 = 43.2m.
Total		93.4	

Table 3.6 Summary of Change in Flow Regime and Associated Change in Water Quality for the Temporary Staging and the Nearby Projects

Development	Reduction in Cross Section in Tidal Channel	Change in Flow Regime	Associated Change in Water Quality
Artificial Island of HKBCF and TM-CLKL Southern Landfall	1,533m (42.35%[(a)])	Change in flow regime considered acceptable.	Change in water quality considered minimal. No additional exceedance predicted.
Permanent Bridge Piles for Southern Connection	171.6m (4.74%[(a)])		
Piles for the Temporary Staging	93.4m (2.6%[(a)])	Additional change in flow regime considered minor and acceptable.	Additional change in water quality considered negligible. Compliance at WSRs is expected.

Note:
(a) Percentage change compared with the base case scenario of the approved EIA, ie without TM-CLKL, HKBCF and HKLR.

The assessment for the regional effect on tidal flow due to the temporary staging platforms is summarized below:

- General compliance of WQO at all WSRs, except for WSR 07, was predicted under the worst-case scenario for change in flow regime and the associated

impact on water quality (which is the operation phase modelling scenario) assessed in the approved EIA;

- The additional blockage of the tidal flow channel by the temporary staging platforms is relatively small when compared with the cumulative impact by the HKBCF and the bridge piles of the TM-CLKL Southern Connection;

- The reclamation for the Logistic Parks and the Tung Chung Future Development which has been considered in the operation phase modelling scenario, would exert some effect on the flow regime nearby, and its absence during the entire lifespan of the temporary staging platforms would provide some allowance for offsetting the reduction in tidal flow channel due to the temporary staging platforms; and

- The additional blockage of the tidal flow channel by the temporary staging platforms would be minimal when compared with the cumulative impact by the HKBCF and the bridge piles of the TM-CLKL Southern Connection. The minimal additional blockage of the tidal flow channel is expected to only result in minor change in flow regime, as compared with the contribution by the HKBCF and the bridge piles of the TM-CLKL Southern Connection. The predicted change in water quality from the operation phase modelling assessment is minimal despite the greater change in flow regime. Similarly, the potential change in water quality is expected to be minimal in view of the minor change in flow regime.

Localised Effect at Tai Ho Wan

It is anticipated that the potential change in flow regime would be highly localized, particularly at the nearshore area of North Lantau where more platforms will be constructed. Stagnation of water at this area may be resulted from the reduced current flow, potentially results in accumulation of floating refuse and depletion of dissolved oxygen. As discuss previously, an embayment area is formed in between the two reclamation areas for Logistic Parks and Tung Chung Future Development at the outer Tai Ho Wan. Similar stagnation of water may be resulted from the formation of embayment. As judged by dimension of the embayment formed, the potentially affected area in outer Tai Ho Wan would be much larger than that of the temporary staging platforms. Also, the level of change in local flow by the temporary staging platforms is expected to be less significant than that caused by the two reclamation areas, since the change is induced by array of separate pipe piles instead of solid reclaimed landmass. As shown in the results of the operation phase modelling scenario, the water quality at the WSRs in Tai Ho Wan (WSR22a/b/c) would full comply with the WQO requirement. In view of the smaller affected area as well as the lower level of change, it is therefore expected that the potential change in flow regime and the associated change in water quality from the use of temporary staging platforms would also be acceptable.

As some small patches of the coral communities are identified at the seawall section along the footprint of the temporary staging [(1)], change in flow regime and water quality may affect these coral communities (*Figure 3.4*). Coral colonies feasible for translocation were translocated to the receptor site at Yam Tsai Wan of North Lantau in October 2013 before commencement of the Southern Connection construction in accordance with the Detailed Coral Translocation Methodology submitted under *Condition 2.6* of the *EP-354/2009A*. As some coral colonies are not feasible for translocation, water quality monitoring is recommended to be carried out at the location of the coral communities (indicated as "SR4a" on *Figure 3.1*, easting and northing: 815247E, 818067N). Baseline monitoring was carried out for 4 weeks before the commencement of all marine works under the Southern Connection on 31 October 2013. The impact monitoring has been undertaking since commencement of the Southern Connection construction and will be undertaken for the entire lifespan of the temporary staging works. Post-construction water quality monitoring will also be carried for at least 4 weeks after the complete removal of temporary staging. The monitoring methodology (including parameters, monitoring equipment, in-situ measurements) follows that of other SR (sensitive receiver) stations. Other water sensitive receivers are much further away and are not expected to be affected by the localized effect in flow regime of the temporary staging platforms. No other additional water quality monitoring is required. In case elevated SS or turbidity is identified during the water quality monitoring, the source of pollution shall be tracked down and be removed as soon as possible. In case depletion of dissolved oxygen is identified, artificial aeration should be arranged at the identified coral community in the vicinity of SR4a (*Figure 3.4*). With the implementation of the proposed monitoring and corresponding measures, the potential change in water quality associated with the change in flow regime due to the temporary staging platform is expected to be acceptable and no unacceptable water quality impact is expected.

The flow regime within the highly landlocked Tai Ho Wan would also be of particular concern. The narrow opening, together with two other small box culverts (the locations of the two small box culverts are shown in *Figure 3.1*) at the Tai Ho Wan Section of the NLH largely separates the Tai Ho Wan water from the external water and any change in flow pattern at the external water would not affect the Tai Ho Wan water directly. Since the opening and the two small box culverts are the only connections with the external water, the flow regime within the Tai Ho Wan is dominated by the flow across the narrow opening (as well as the inflow from nearby watercourse), which itself is driven by the water level inside and outside the opening. While the temporary staging platforms would affect the flow pattern at the outside of the opening, the change of flow pattern could exert only very limited effect on the water level (which is typically dominant by the tidal condition). In addition, the box culvert which is located within the footprint of the

(1) ERM (2013) Detailed Coral Translocation Methodology. Prepared under Contract No. HY/2012/07 for Gammon Construction Limited.

Setting Out Point for Transect					
Point	Easting	Northing	Point	Easting	Northing
C1	814778.2430	818276.7233	C18	815093.1725	818357.7636
C2	814973.2643	818356.5572	C19	815008.3556	818326.5015
C3	814812.6523	818202.1347	C20	815224.7779	818331.0124
C4	814841.6066	818128.1756	C21	815245.1437	818268.1515
C5	815027.7108	818209.2946	C22	815067.1009	818185.9498
C6	814869.0921	818055.5278	C23	815282.6338	818194.9486
C7	815058.8681	818141.3413	C24	815095.6903	818115.2196
C8	814896.1580	817983.1422	C25	815115.5439	818079.1842
C9	815091.2580	818069.7164	C26	815292.1803	818160.4868
C10	815095.2707	818033.9695	C27	815289.4314	818237.4912
C11	814909.7958	817951.4604	C28	815401.0742	818296.0613
C12	814880.4220	817942.9105	C29	815319.0626	818177.7964
C13	814693.1637	817897.9056	C30	815446.1570	818244.8841
C14	814878.4288	817973.3335	C31	815111.5312	818040.1589
C15	814781.0755	817938.8192	C32	815289.9773	818128.9099
C16	814766.0738	817973.3335	C33	815310.5128	818136.9353
C17	814862.4830	818008.5821	C34	815495.5680	818242.7860

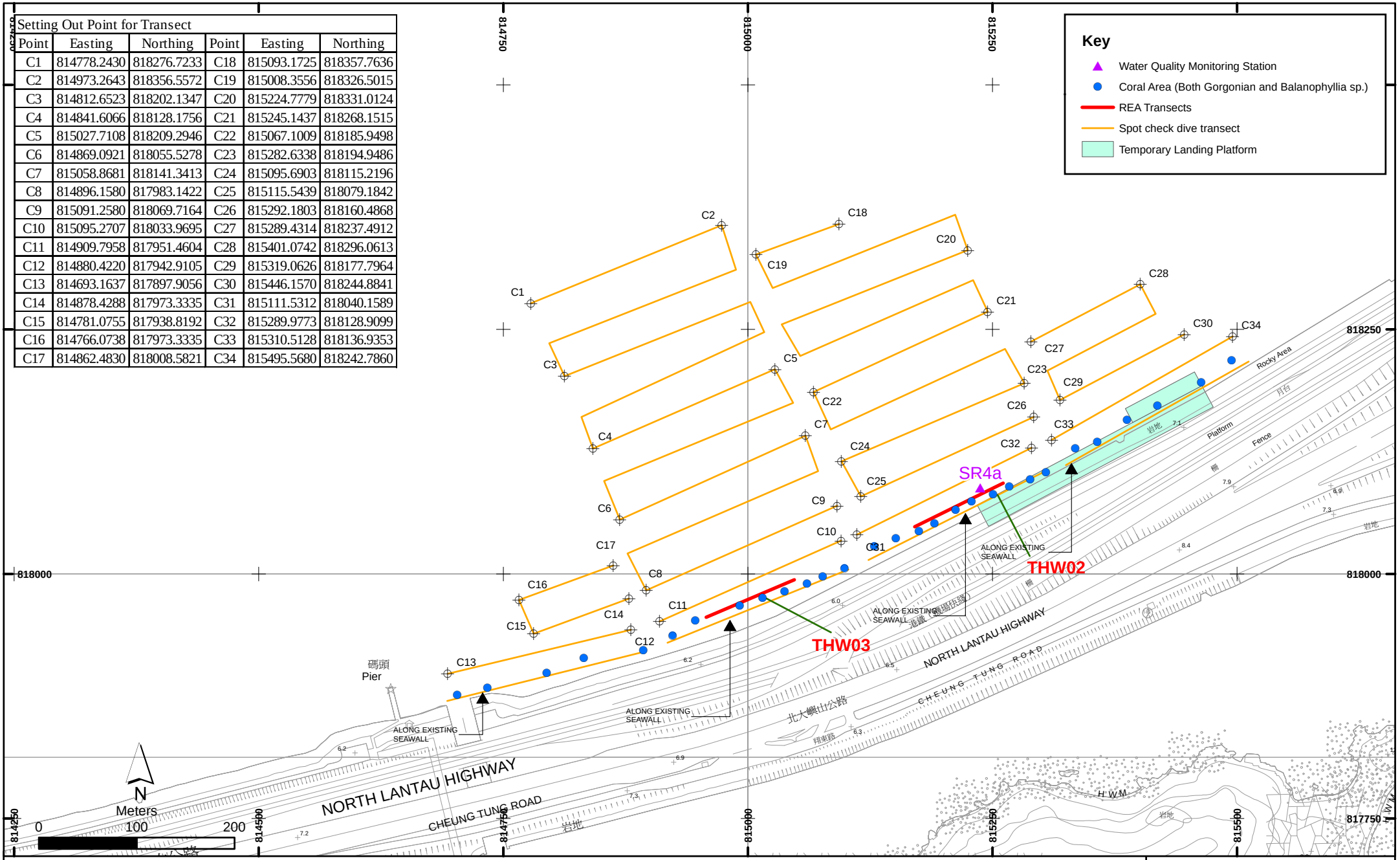


Figure 3.4

Indicative Locations of Coral Area and REA Transect at Tai Ho Wan

File: T:\GIS\CONTRACT\0212330\Mxd\0212330_Indicative_locations_of_coral_REA_at_Tai_Ho_Wan.mxd
Date: 21/3/2014

Environmental Resources Management

ERM

temporary landing platform will be extended in order to maintain the existing function of the culvert to allow water flow between Tai Ho Wan and the external waters (please refer to *Figure 2.9* for the location of the box culvert and its extension). It is therefore expected that the temporary staging platforms would not result in significant change in flow regime in the Tai Ho Wan water.

Besides, the pipe piles of the temporary staging platforms may allow the accumulation of floating refuse at the nearby water, resulting in deterioration of water quality. Inspection for the accumulation of floating refuse will form part of the regular site inspection and collection of floating refuse will be carried out on a need basis to remove any trapped floating refuse as soon as possible. The collection of floating refuse will be carried out from the shore, from the temporary staging platforms or from low draft vessels. In view of the low water depth near the works area, the use of vessels for collection of floating refuse will be carried out at high tide, to ensure sufficient clearance from the seabed to the vessels and avoid any excessive disturbance of seabed from the movement of the vessels.

Brief Summary

In conclusion, it is expected that during the construction and operation of the temporary staging platforms, the additional marine piles would only result in minimal change in flow regime and water quality additional to the level predicted under the operation phase of the approved EIA. Additional exceedance in WQO due to the temporary staging platforms is not expected and no unacceptable water quality impact is expected. In view of the significant distance between the temporary staging platform and WSR07 as well as the small scale of the temporary staging works (when compared with other nearby works), significant deterioration of water quality at WSR07 due to the proposed temporary staging works is not anticipated. The flow pattern and water quality at Tai Ho Wan are not expected to be significantly affected by the temporary staging platforms in view of its land-locked geographic settings. The potential of accumulation of floating refuse identified and regular site inspection as well as collection of floating refuse would be provided to ensure the avoidance of the potential water quality impact.

3.4.3 Potential Water Quality Impacts from Other Construction Activities Associated with the Temporary Staging

The temporary staging would be the platform for all the required construction works to be carried out for the construction of the Southern Connection, including but not limited to:

- Transportation of workers, machineries and construction materials;
- Loading and unloading of vehicles and barges;
- Positioning of cranes and other machineries for the construction of the Southern Connection;

- Transportation and lifting of parts of the viaducts and main crossing; and

- Bored piling for the construction of the permanent piles.

Construction site runoff would be generated from various construction activities as well as during rainstorm which may contain high level of suspended solid from the temporary staging platforms. If uncontrolled, the construction site runoff may enter the marine environment and result in adverse water quality impact. Standard measures and good site practices stipulated in *ProPECC PN 1/94 "Construction Site Drainage"* should be followed as far as practicable. In particular, temporary drainage system such as surface channel will be provided on the temporary staging platforms to divert and collect the surface runoff from daily operation and the first flush during a rainstorm. The runoff will be properly treated prior to discharge into the sea. Wastewater generated from construction works such as bored / drilling water will be collected, treated, neutralized and de-silted through silt trap or sedimentation tank prior to discharge into sea. As such, unacceptable water quality impact from runoff containing high level of suspended solid is not anticipated to occur.

The following types of chemical wastes may be generated during the construction activities on the temporary staging platforms:

- Used paints, engine oils, hydraulic fluids and waste fuel; and

- Spent cleansing fluids / mineral oils from machineries.

Chemical wastes will be disposed of via a licensed waste collector to a facility licensed to receive chemical waste in accordance with the Waste Disposal (Chemical Waste) (General) Regulation. As such, there will not be any planned discharge of chemical wastes to the surrounding waters. To reduce the possibility of chemicals entering surrounding waters, chemical waste will be handled with care in accordance with the Code of Practice on the Packaging, Handling and Storage of Chemical Wastes. For example, chemical wastes will be stored by containers which are suitable for the substance they are holding, resistant to corrosion, maintained in a good condition, and securely closed. The storage area will also be covered to prevent rainfall entering (water collected within the bund must be tested and disposed of as chemical waste, if necessary). In addition, precautionary measures to prevent spillage of oil and chemicals as well as response actions to be taken in the event of accidental spillage are presented in the Spill Response Plan (SRP) which has been developed in accordance with Clause 2.7 of the Environmental Permit (EP-354/2009/B). The Contractor will strictly follow mitigation measures stipulated in the SPR in order to reduce the possibility of spillage as well as the potential water quality impacts. Given the above, it is expected that no unacceptable water quality impacts will be caused by the use of chemicals during the construction of the temporary staging platforms.

Concrete batching would be carried out offsite and be transported onsite via concrete lorry mixers. Concrete dump truck will be loaded onto the barge. The barge will then move to the construction location and the concrete inside would be pumped directly from the concrete pump truck to the location where marine piers are being constructed. The Contractor will ensure all equipment used are well-maintained and would not result in accidental leak of concrete to the marine environment. In addition, concrete lorry mixers and concrete dump trucks would be washed at a designated bunded area where the washout will be pumped out to a proprietary wastewater treatment unit with pH adjustment provided on the temporary landing platform and concrete delivery barges. The effluent quality of treated water will also be monitored to confirm compliance with discharge limits as per the respective Water Pollution Control Ordinance (WPCO) discharge license before discharged. Unacceptable water quality impact associated with concrete batching, transportation and storage onsite is thus not anticipated. With the implementation of the appropriate mitigation measures, adverse water quality impact arise from the construction site runoff from the temporary staging is not anticipated.

The construction materials as well as machineries would be delivered by sea to the temporary staging platforms. At the platforms, goods will be loaded /unloaded from barges by cranes lifting. Goods to be loaded to / unloaded from barges include construction machineries, tools, plant, construction material and construction waste. Following industrial standards required for crane lifting in Hong Kong will minimize the risk of accidental dropping of goods during lifting. Since the amount of goods to be loaded / unloaded by cranes lifting is small and relatively intact, significant water quality impact due to any accidental dropping of these goods into the sea would be unlikely. The barging location at the staging platforms will allow sufficient clearance for the barges from the seabed and disturbance of the seabed due to the movement of the barges is therefore not expected. During construction of the temporary staging platforms, there will be 38 numbers of isolated platforms to be constructed in stages with three individual work fronts at any one time. It is anticipated that the installation works will involve four flat-top barges, four derrick barges and two tug boats. It should also be noted that the construction of the landing platforms, which involve the use of one flat-top barge, three derrick barges and one tug boat, will also be undertaken concurrently with the staging platform construction. During operation of the temporary staging (ie during construction of the permanent structures), the number of barges present within the working area at any one time will be below 18. Since the number of works vessel present within the working area at any one time is low, significant blockage of current flow by the draft of the works vessel is not expected during both the construction and operation of the temporary staging. In addition, potential water quality impacts due to disturbance of the seabed sediment by propeller wash is not expected to be unacceptable given the low number of vessels involved as presented above and the localised nature of the sediment disturbance. Also, coral translocation was undertaken in October 2013 before commencement of the Southern Connection construction which would help to reduce the indirect

water quality impacts to corals at Tai Ho Wan, which is the nearest WSR to the works area.

With the implementation of standard good site practice and the provision of temporary drainage system on the temporary staging platforms, unacceptable water quality impact is not anticipated to arise from the construction and operation of the proposed temporary staging platforms.

3.4.4 Potential Water Quality Impacts from the Removal of the Temporary Staging Platforms

The removal of the temporary staging platforms will involve cutting of the pipe pile 1m below the existing seabed level. The cutting of the metallic pipe pile will be carried out by industrial divers using underwater flame cutter. To allow cutting of the pipe pile 1m below the existing seabed level, a small area of sediment will be displaced around the pipe pile manually by the divers. It is anticipated that small and localized elevation of suspended solid may arise from the displacement of the marine sediment by the divers. Yet such elevation in suspended solid will be transient and the disturbed sediment will be settled within a relatively short period of time. No unacceptable water quality impact from this operation is expected. Since the marine construction required for the permanent piles will be completed during the removal of the temporary staging platforms, cumulative water quality impact from the nearby marine construction is not anticipated. The minor depression of seabed would be left and allow the seabed to reinstate naturally.

Additional water quality impact from the installation, operation and removal of the temporary staging has been assessed and predicted to be minimal. Cumulative impact from the temporary staging platforms and the nearby works is expected to be acceptable.

3.4.5 Recommendations of Additional Mitigation Measures and EM&A

Additional mitigation measures for water quality proposed include:

- Regular inspection for the accumulation of floating refuse and collection of floating refuse if required;
- Provision of temporary drainage system for collection of construction site runoff to allow appropriate treatment before discharge into the sea; and
- Wastewater generated from construction works such as bored / drilling water will be collected, treated, neutralized and de-silted through silt trap or sedimentation tank before disposal.

Minimization of the flow blockage due to piles of the temporary staging platforms and minimization of propeller wash in shallow water have been taken into account during the detailed design of the temporary staging platforms. The following factors have been considered:

- Maximizing span between piers;
- Minimising number of piles; and
- Locate temporary piles behind each other along the current flow direction.

One additional water quality monitoring station for EM&A is proposed at the coral communities in the proximity of the temporary staging (station SR4a as shown in *Figure 3.1*), as some coral colonies are not feasible to be translocated. The monitoring had covered the 4 weeks period before the commencement of all marine works under the Southern Connection, and will cover the whole period when the temporary staging is in its lifespan as well as 4 weeks after the complete removal of the temporary staging platforms. In case elevated SS or turbidity is identified during the water quality monitoring, the source of pollution will be tracked down and be removed as soon as possible. In case depletion of dissolved oxygen is identified, artificial aeration will be arranged at the identified coral community in the vicinity of SR4a (*Figure 3.4*). Inspection for accumulation of floating refuse will be carried out during the regular site inspection. Collection of floating refuse will be arranged on a need basis. Other details of the water quality monitoring should be in line with the requirements for monitoring at SR (sensitive receiver) stations stated in the EM&A manual.

In order to further reduce the potential impacts from propeller wash, the possibility of reducing the volume of vessel traffic within the works area will be explored. For example, the works vessel stationed at Viaducts A, B, C and D could potentially be re-positioned without the use of tug boat by adjustment of the anchor position.

3.5 MARINE ECOLOGY

3.5.1 Review of Approved EIA

The findings of the ecological survey conducted under the approved EIA indicated that the benthic species present at the area along the proposed alignment are generally similar throughout the North-western Waters. In addition, infauna diversities at the area along the proposed alignment are similar to other areas in the North-western Waters and are relatively low compared to other regions in Hong Kong (*Section 8.9.2.17* of the approved EIA Report). According to the coral survey (spot check dive and rapid ecological assessment) carried out for the approved EIA, the coral coverage along the alignment of the Southern Connection viaducts was found to be low and the diversity of the coral was found to be low as well *(Sections 8.9.4.7- 8.9.4.10* of the approved EIA Report). The cetacean line-transect survey also indicated that with the exception of a rare sighting in which two Chinese White Dolphins (CWD) was made near Tung Chung, CWD were largely absent to the east of airport platform and near Tai Ho Wan, as indicated in *Appendix F1* of the approved EIA Report (*Section 8.9.1.6*).

During the construction of the TM-CLKL, the major ecological impacts to marine ecological resources include:

- Permanent loss of approximately 47ha of seabed for northern and southern reclamation and pier construction as well as 390m of sloping seawall and 210m of vertical seawall at Tuen Mun.

- Indirect impacts due to the change in water quality, namely SS elevation, oxygen depletion and release of contaminants, due to marine dredging, filling and viaduct pier works.

- Increased acoustic disturbance to marine life due to piling works for the viaduct piers, dredging and reclamation works.

- Injury/mortality or disturbance from construction phase vessel traffic to marine life, specifically the CWD.

With the implementation of mitigation measures proposed for the marine works, the potential water quality impact as well as the associated impact to the marine ecology would not be significant. The implementation of other mitigation measures, including acoustic decoupling, dolphin exclusion zone, vessel speed limit and restrictions, etc. would also help to reduce the potential acoustic disturbance to marine life due to piling works for the viaduct piers, dredging and reclamation works, as well as injury/mortality or disturbance from vessel traffic. EM&A for marine ecology has been recommended.

3.5.2 Identification and Evaluation of Potential Impacts

As discussed in the earlier *Section 3.4*, the potential change in water quality due to the installation, operation and removal of the temporary staging platforms would be minimal. It is expected that the potential indirect impact to marine ecology due to the change in water quality would be minimal as well.

Soft Substrate Benthic Communities and Corals

The installation of temporary staging would result in direct disturbance to the bottom sediment and the associated marine life at the Southern Connection viaducts. Yet in view of the coverage by the temporary piles (each pile would only cover 1.07 m^2 (1) or 1.13 m^2 (2) of seabed and the total covered area would be about 269 m^2 or 0.03ha (3)), as well as the low diversity and common species at the affected area, ecological impact due to the direct disturbance from the temporary staging would be minimal. The direct loss of subtidal marine habitat due to the temporary staging platforms is relatively negligible when compared with the impact resulted from the rest of the TM-CLKL (loss

(1) Pile diameter is 1.168m for temporary platforms of Pier E3 to E13; area covered by each pile = $(1.168/2)^2 \times 3.1416 = 1.07\ m^2$.

(2) Pile diameter is 1.2m for other temporary platforms; area covered by each pile = $(1.2/2)^2 \times 3.1416 = 1.13\ m^2$.

(3) Total number of piles of 1.168m in diameter is 86 while total number of piles of 1.2m in diameter is 156; total area covered by the piles = $(86 \times 1.07) + (156 \times 1.2) = 269\ m^2$

of approximately 47ha of seabed). No significant increase in cumulative impact on subtidal marine habitat is expected from the construction and operation of the temporary staging.

The disturbance of rock armour at the landing platform may potentially affect the attached coral communities on the rock armour. According to the results of coral survey conducted under the approved EIA, no coral community was found along the alignment of the four landing positions of the viaducts of the Southern Connection (survey stations E1-E10). The coral survey results at the survey station C6 and C7 near the landing position in the east indicated that there is only limited level of coral communities (gorgonian [1 colonies per 2 m^2] and ahermatypic coral [1 colonies per $1m^2$] for C6; gorgonian [1 colonies per m^2] and ahermatypic coral [1 colonies per $2m^2$] for C7). Findings from further dive surveys undertaken at Tai Ho Wan in December 2012, January and October 2013 (1) confirmed the existence of coral communities with low coverage and low diversity on the rock armour (*Figure 3.4*). Based on the engineering design, disturbance to approximately 260m long of rock armour seawall is required for the construction of the landing platforms. Potential direct impact to the coral communities attached to the affected rock armour would be expected. In view of the extent of potential direct impact, limited level of coral communities expected to be affected by the removal of rock armour as well as the completion of coral translocation, it is expected that direct impact to coral communities would be limited as well. The temporary loss of intertidal marine habitat due to the landing platforms is relatively negligible when compared with the impact arises from the rest of the TM-CLKL. No significant increase in cumulative impact on intertidal marine habitat is expected from the construction and operation of the temporary staging platforms.

Chinese White Dolphin

The piling works required for the installation of the temporary staging platforms would not involve the use of bored and percussive piling as well as any rock socket formation, which may produce significant level of underwater noise that may affect marine life, especially CWD. As indicated by the findings of the cetacean line-transect survey conducted under the approved EIA (refer to *Appendix F1* of the approved EIA Report), the water around the Southern Connection viaducts is of little usage by CWD. Based on the latest Final Report of Monitoring of Marine Mammals in Hong Kong Waters (2012-13), the distribution pattern of CWD at water near the Southern Connection remains similar to that of *Appendix F1* of the approved EIA Report. The CWD usage near Tai Ho Wan remains low as shown in *Figures 3.5 and 3.6*. In addition, recent land-based theodolite tracking of CWD undertaken as part of the baseline marine bored piling monitoring of the EM&A programme confirmed the low usage of CWD with no sightings recorded along the alignment of the Southern Connection Viaduct Section during 30 survey days from early September to mid-October. As required under the approved EIA,

(1) ERM (2013) *Op. cit.*

acoustic decoupling should be carried out for all noisy equipment, such as compressors and generators on barge to minimize the transmission of vibration from the barge to the marine environment. Based on the same logic, the transmission of vibration from the temporary staging platforms to the marine environment should be reduced by the application of the similar acoustic decoupling measures at the noisy equipment during the entire lifespan of the temporary staging. A 250m dolphin exclusion zone will also be implemented during the construction and decommissioning of the temporary staging platforms and the temporary landing platform. With the implementation of the precautionary and mitigation measures, it is expected that the potential acoustic disturbance to CWD due to the whole lifespan of the temporary staging would be minimal.

Figure 3.5 ***Distribution of CWD Sightings in Central North Lantau from 2005-2009 (Source: Appendix F1, Approved EIA of TM-CLKL)***

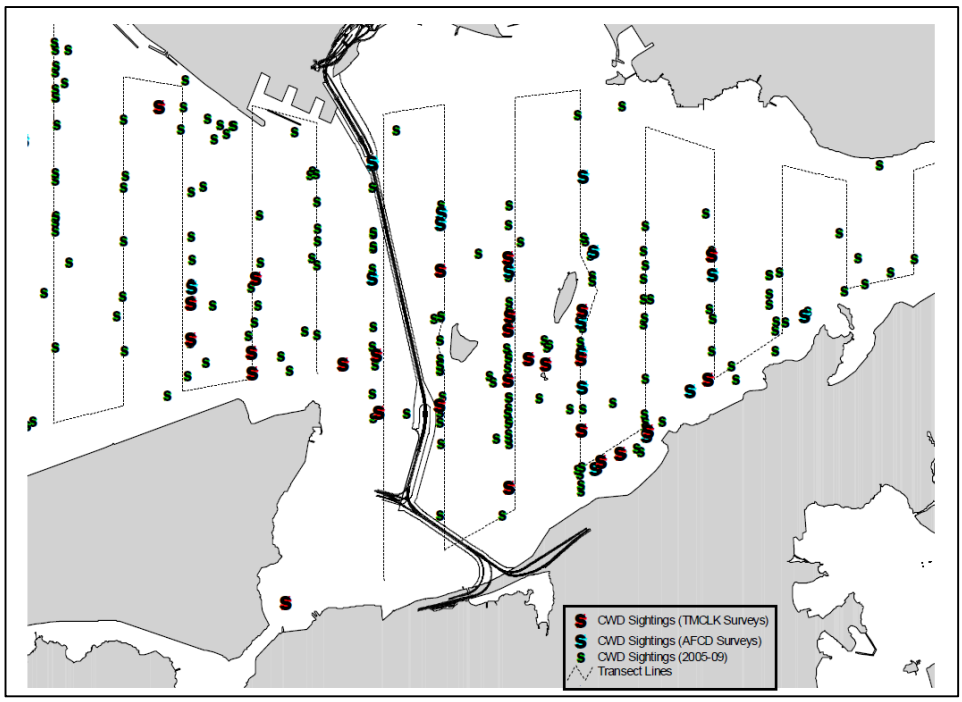
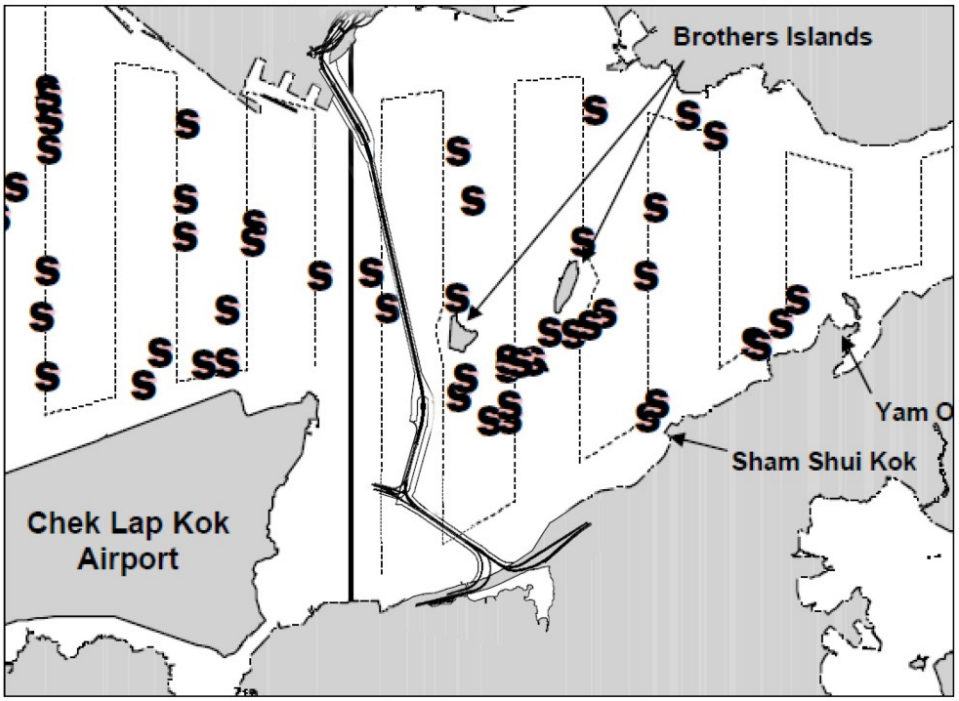


Figure 3.6 *Distribution of CWD Sightings in North Lantau from April 2012 –Mar 2013 (Source: Monitoring of Marine Mammals in Hong Kong Waters (2012-2013))*



The presence of piles of the temporary staging platforms may affect the movement of CWD within the area. Considering the low usage of CWD within the works area, temporary nature of the piles and a maximum of 242 piles that occupy 2.6% of the whole cross section of the tidal channel (indicated by the red line shown in *Figure 3.2*) will present at the site at any one time, it is not expected that the presence of the piles will lead to any unacceptable impact to the movement of CWD. It should also be noted that ~1,100 piles will be installed under the reference staging scheme which will occupy 3.79% of the concerned tidal channel. As such, potential impact to CWD movement is considered greater under the reference than the current schemes.

Regarding the potential disturbance to CWD as a result of marine traffic caused by the temporary staging, a comparison of the estimated volume of marine traffic that will be caused by the current temporary staging scheme and the reference scheme is presented in *Tables 3.7a-b.* It is expected that the volume of marine traffic, in terms of total estimated distance travelled by the vessels during the construction, operation and decommissioning stages of the temporary staging, would be lower for the current scheme than the reference schemes. Summary of key findings regarding the estimated total marine traffic volume is listed below:

During construction and decommissioning of the temporary staging:

- The estimated volume of marine traffic is higher for the reference scheme due to its continuous nature as more steel structures would be required to

be transported and removed from the site during the construction and decommissioning stages, respectively.

During operation of the temporary staging:

- The estimated volume of marine traffic required for the delivery of bored pile casings and disposal of sediments and spoils is the same between the reference and current schemes.

- The estimated volume of marine traffic required for delivery of concrete and passengers, which are mainly within the works area, is expected to be lower for the reference scheme which could rely on the continuous staging for such land delivery. However, it should be noted that the reference scheme would still require to delivery 50% of the concrete through off-site marine route due to constraint on land traffic capacity at the temporary vehicular bridge. Overall, the estimated volume of marine traffic within the works area is expected to be lower for the reference scheme than the current scheme.

- The estimated volume of marine traffic required for delivery of reinforcement cages is expected to be lower for the current scheme as it only involves short distance of marine traffic within the works area between the isolated platforms and the temporary landing platform where the fabrication of reinforcement cages will be undertaken. For the reference scheme under which there is no landing platform for fabrication on site, the reinforcement cages are required to be fabricated offsite and transported to the works area. As such, the estimated volume of marine traffic off the works area is higher for the reference scheme than the current scheme.

Overall, the volume of marine traffic within the works area, where the usage by CWD is noted to be low, is expected to be higher for the current scheme. However, the volume of marine traffic outside the works area, which involves the larger North Lantau area more frequently used by the CWD, is expected to be higher for the reference scheme. Given the above and the higher estimated total volume of marine traffic of the reference scheme (ie considering both marine traffic within and outside the works area), it is expected that the disturbance to CWD as a result of marine traffic caused by the current scheme would be no worse than that of the reference scheme.

Table 3.7a Estimated Volume of Marine Traffic for the Reference Scheme

Item	Major Marine Traffic	Routing	Vessels involved	Total no. of round trips	Distance per trip (km)	Travel distance within the Works Area (km) [(a)]	Travel distance off the Works Area (km) [(b)]
Construction and Decommissioning of Temporary Staging							
1	Loading of steel structures during construction	WA23 ↔ Pier workfront	Tug boat, working barges (e.g. derrick lighter, flat-top barge, etc.)	96	13	-	1,248
2	Removal of steel structures during decommissioning	Pier workfront ↔ WA23	Tug boat, working barges (e.g. derrick lighter, flat-top barge, etc.)	96	13	-	1,248
Bored Piling Works							
3	Delivery of bored pile casings	WA23 ↔ Pier workfront	Tug boat, working barges (e.g. derrick lighter, flat-top barge, ro-ro barge, etc.)	68	13	-	884
4	Disposal of Cat. L sediments	Pier workfront ↔ E. Sha Chau	Tug boat, working barges (e.g. derrick lighter, flat-top barge, hopper barge, ro-ro barge, etc.)	48	15	-	720
5	Disposal of Cat. Mp & Mf sediments	Pier workfront ↔ E. Sha Chau	Tug boat, working barges (e.g. derrick lighter, flat-top barge, hopper barge, ro-ro barge, etc.)	38	15	-	570
6	Disposal of spoils other than sediments	Pier workfront ↔ TM38	Tug boat, working barges (e.g. derrick lighter)	48	16	-	768
7	Delivery of reinforcement cages	WA23 ↔ Pier workfront	Tug boat, working barges (e.g. derrick lighter, flat-top barge, ro-ro barge, etc.)	58	13	-	754
8	Delivery of concrete (50% of total volume) [(1)]	Marine container terminal ↔ Pier workfront	Tug boat, working barges (e.g. derrick lighter, flat-top barge, ro-ro barge, etc.)	1,212	5	-	6,060
Passengers Transportation							
9	Day-to-day workers/ project staff transportation	Pak Mong jetty ↔ Pier workfront	Passenger ferry/ sampan	4,400	1	4,400	-
					Subtotal	**4,400**	**12,252**
					Estimated Total Volume of Marine Traffic (km) [(a) + (b)]	**16,652**	

(1) Truck delivery of concrete is constrained by the traffic capacity of temporary vehicular bridge. As such, 50% of the concrete delivery will still be accomplished by marine transport.

Table 3.7b Estimated Volume of Marine Traffic for the Current Scheme

Item	Major Marine Traffic	Routing	Vessels involved	Total no. of round trips	Average distance per trip (km)	Travel distance within the Works Area (km) [a]	Travel distance off the Works Area (km) [b]
Construction and Decommission of Temporary Staging							
1	Loading of steel structures during construction	WA23 ↔ Pier workfront	Tug boat, working barges (e.g. derrick lighter, flat-top barge, etc.)	73	13	-	949
2	Removal of steel structures during decommissioning	Pier workfront ↔ WA23	Tug boat, working barges (e.g. derrick lighter, flat-top barge, etc.)	73	13	-	949
Bored Piling Works							
3	Delivery of bored pile casings	WA23 ↔ Pier workfront	Tug boat, working barges (e.g. derrick lighter, flat-top barge, ro-ro barge, etc.)	68	13	-	884
4	Disposal of Cat. L sediments	Pier workfront ↔ E. Sha Chau	Tug boat, working barges (e.g. derrick lighter, flat-top barge, hopper barge, ro-ro barge, etc.)	48	15	-	720
5	Disposal of Cat. Mp & Mf sediments	Pier workfront ↔ E. Sha Chau	Tug boat, working barges (e.g. derrick lighter, flat-top barge, hopper barge, ro-ro barge, etc.)	38	15	-	570
6	Disposal of spoils other than sediments	Pier workfront ↔ TM38	Tug boat, working barges (e.g. derrick lighter)	48	16	-	768
7	** Delivery of reinforcement cages [1]	Extended rockfill platform ↔ Pier workfront	Tug boat, working barges (e.g. derrick lighter, flat-top barge, ro-ro barge, etc.)	58	1	58	-
8	Delivery of concrete	Extended rockfill platform ↔ Pier workfront	Tug boat, working barges (e.g. derrick lighter, flat-top barge, ro-ro barge, etc.)	2,424	1	2,424	-
Passengers Transportation							
9	Day-to-day workers/ project staff transportation	Pak Mong jetty ↔ Pier workfront	Passenger ferry/ sampan	8,800	1	8,800	-
					Subtotal	**11,282**	**4,840**
					Estimated Total Volume of Marine Traffic (km) [a] + [b]	**16,122**	

(1) The proposed temporary landing platform would serve as the reinforcement fabrication yard. As such, delivery of reinforcement cages will only involve marine traffic within the works area.

Impact Evaluation

The potential ecological impacts to marine habitats and key sensitive receivers in the proximity resulting from the temporary staging platforms have been evaluated according to *Table 1* of *Annex 8* of the *TM-EIAO* and are presented in *Table 3.8 to Table 3.11*. It should be noted that the following tables evaluate only the impacts resulted from the installation, operation and removal of the temporary staging platforms, but not the operation of the TM-CLKL Project.

Table 3.8 Impact Evaluation of Marine Waters

Evaluation Criteria	Marine Wasters (Within Site Boundary of the Southern Connection)	Marine Waters (Outside Site Boundary of the Southern Connection)
Predicted Impact	Installation / removal impact: Acoustic disturbance from construction/removal work, Injury/mortality or disturbance from vessel traffic Operation Impact: Habitat loss; Change of hydrodynamics and water quality; Marine fragmentation; Accidental chemical spillage	Installation / removal impact: Alternation of hydrodynamics and water quality; Blocking of dolphin travel corridors; Acoustic disturbance from construction / removal work; Injury/mortality or disturbance from vessel traffic; Disturbance to CWD from suspended solid and bio-accumulation Operation impact: Change of hydrodynamics and water quality
Habitat quality	The ecological value of this habitat is low as reflected by the low sighting density around the Site Boundary.	The ecological value of this habitat is moderate as reflected by the moderate sighting density around the Brothers Islands.
Species	The CWD is only sighted within the site boundary of the Southern Connection at very low frequency.	The CWD is regularly sighted in North Lantau waters year round.
Size/Abundance	The project site of the Southern Connection locates at the south western corner of the Northeast Lantau areas. The encounter rate was 2.2 sightings per 100 km in Northeast Lantau. Low abundance.	The encounter rates were 7.2 sightings per 100 km in Northwest Lantau and 2.2 sightings per 100 km in Northeast Lantau, respectively.
Duration	The habitat will only be lost temporarily (0.03 ha due to the piles of the temporary staging platforms). Operation impact of marine fragmentation and change of hydrodynamics and water quality will be last for around 33 months.	Operation impact of marine fragmentation and change of hydrodynamics and water quality will be last for around 33 months.
Reversibility	Temporary disturbance to CWD during installation and removal is reversible. Operation impact of marine fragmentation and change of water quality is reversible. There would be no permanent habitat loss.	Temporary disturbance to CWD during installation and removal is reversible. Operation impact of marine fragmentation and change of hydrodynamics and water quality is reversible.

Evaluation Criteria	Marine Wasters (Within Site Boundary of the Southern Connection)	Marine Waters (Outside Site Boundary of the Southern Connection)
Magnitude	Small	Small
Overall impact conclusion	**Installation / removal impact: Negligible to Minor**	**Installation / removal impact: Negligible**
	Operation impact: Negligible to Minor	**Operation impact: Negligible**

Table 3.9 *Impact Evaluation of Soft Substrate Benthic Habitat*

Evaluation Criteria	Soft Substrate Benthic Habitat
Predicted Impact	Installation / removal impact: Disturbance associated with suspended solid. Operation impact: Habitat loss.
Habitat quality	The ecological value of benthic habitats is low.
Species	No direct impact to species of conservation interest.
Size/Abundance	Additional temporary loss: approximately 0.03ha for piling for the installation of the temporary staging platforms
Duration	There would be no permanent loss. The exact duration of temporary disturbance and temporary loss of habitat is estimated to be 33 months.
Reversibility	There would be no permanent loss. All habitat loss is reversible.
Magnitude	Small
Overall impact conclusion	**Installation / removal impact: Minor** **Operation impact: Minor**

Table 3.10 *Impact Evaluation of Hard Substrate Habitat*

Evaluation Criteria	Hard Substrate Habitat
Predicted Impact	Installation / removal impact: Disturbance associated with suspended solid. Operation impact: Habitat loss due to removal of rock armour.
Habitat quality	The scattered coral colonies associated with the hard substratum is considered to be of low-moderate ecological value. Coral colonies potentially be lost are located at the seawall of the Tai Ho Wan section of the NLH.
Species	Coral species *Guaiagorgia* sp. and *Balanophyllia sp.* were recorded at the seawall of the Tai Ho Wan section of the NLH. These coral species are of no special conservation status.
Size/Abundance	Approximately 260m of sloping seawall at NLH Tai Ho Wan section would be affected from the construction of the landing platform. All affected seawall would be reinstated after the removal of the landing platform. There would be no permanent loss of subtidal habitat. The coral communities affected are common species. Coverage at affected site is expected to be very low or none.

Evaluation Criteria	Hard Substrate Habitat
Duration	There would be no permanent loss of habitat. The exact duration of temporary disturbance and temporary loss of habitat is estimated to be 33 months.
Reversibility	All affected seawall would be reinstated after the removal of the landing platform. There would be no permanent loss of habitat.
Magnitude	Small
Overall impact conclusion	**Installation / removal impact: Negligible** **Operation impact: Negligible**

Table 3.11 ***Impact Evaluation of Coastal Intertidal Habitats***

Evaluation Criteria	Artificial Hard Shore
Predicted Impact	Installation/ removal impact: Disturbance associated with suspended solid. Operation impact: Habitat loss due to removal of rock armour.
Habitat quality	The habitat quality is low
Species	Coral species *Guaiagorgia* sp. and *Balanophyllia* sp. were recorded in two survey stations at the seawall of the Tai Ho Wan section of the NLH. These coral species are of no special conservation status.
Size/Abundance	Approximately 260m of sloping seawall will be directly lost as a result of installation of the landing platform.
Duration	Approximately 260m of sloping seawall at NLH Tai Ho Wan section would be affected from the construction of the landing platform. All affected seawall would be reinstated after the removal of the landing platform. There would be no permanent loss of habitat. The exact duration of temporary disturbance and temporary loss of habitat is estimated to be 33 months.
Reversibility	All affected seawall would be reinstated after the removal of the landing platform. There would be no permanent loss of habitat.
Magnitude	Small
Overall Impact Conclusion	**Installation/removal impact: Negligible** **Operation impact: Negligible**

The temporary staging would not result in significant additional impact to marine ecology. Cumulative impact to marine ecology would be acceptable.

3.5.3 Recommendations of Additional Mitigation Measures and EM&A

As part of the construction works under the TM-CLKL, the implementation of dolphin exclusion zone will be applied for protection of CWD during the construction and decommissioning of the temporary staging platforms and the temporary landing platform, similar to the requirements of other piling

process of the TM- CLKL project. The same would be applied to the vessel speed limit and restrictions required for other part of the works under the TM-CLKL. Acoustic decoupling all noisy equipment, such as compressors and generators, should be carried out as much as appropriate during the whole lifespan of the temporary staging. In addition, coral translocation was undertaken in October 2013 before commencement of the Southern Connection construction which would help to reduce the potential impacts to corals at Tai Ho Wan.

Although the estimated marine traffic volume is expected to be lower for the current scheme, further potential mitigation measure to reduce the marine traffic volume within the works area will be explored. This may involve the use of concrete pump and floating hose to reduce the need of on-site delivery of concrete for the current temporary staging scheme. In addition, the potential of further reducing the marine traffic volume for transportation of staff/site personnel will also be explored which may include fully loaded a passenger ferry/sampan, as far as practicable, before sailing and implementation of fix schedule for staff/site personnel transportation using passenger ferry/sampan.

3.6 FISHERIES

3.6.1 Review of Approved EIA

Areas of fishing importance in the vicinity of the three projects include:

- Fishing grounds covering much of the open waters of the North-western waters;
- Spawning and nursery grounds for fish and shrimp;
- Ma Wan Fish Culture Zone (FCZ); and
- Artificial Reefs at Sha Chau and Lung Kwu Chau Marine Park and Chek Lap Kok Marine Exclusion Zone 3, at the north-east corner of the airport island.

The value of fisheries production within the Study area was in the range of HK$1,000-5,000/ha, overall, which is of moderate value in comparison to other areas in Hong Kong waters. There is a small area within the Sha Chau and Lung Kwu Chau Marine Park that has a value of HK$5,000-10,000/ha, although fishing in marine parks are generally restricted and only fishermen and villagers with a valid permit are allowed to fish in this area. This marine park, however, will not be affected by the TM-CLKL project. The Northern Lantau waters are not identified as a primary nursery ground. However, they were previously identified in 1998 as important fisheries spawning grounds for high value commercial species.

The key potential issues associated with the project alignment with respect to fisheries are related to the permanent loss of fishing grounds due to

reclamation and piers of the marine viaduct foundations during the construction and operational phases, the temporary loss of seabed habitat due to any other marine works and also seabed disturbance and release of suspended solids into the water as a result of dredging and filling activities during the construction phase. The permanent and temporary loss of fishing ground due to the construction of the Southern Connection is predicted to be 1.2 and 29.8 ha, respectively.

The implementation of mitigation and enhancement measures, including the minimization of reclamation extent, the reprovision of artificial reef and water quality mitigation measures, is considered sufficient to mitigate the predicted impacts from the TM-CLKL and, therefore, no significant adverse residual impacts are predicted for either the construction or operational phases of the project.

3.6.2 Identification and Evaluation of Potential Impacts

The major impact on fisheries from the temporary staging platform includes:

- The temporary loss of seabed habitat;
- The temporary loss of fishing ground; and
- Indirect impacts due to the change in water quality, namely SS elevation, oxygen depletion and release of contaminants, due to marine staging pile installation works.

As stated previously in *Section 3.5.2*, the piles for the temporary staging platforms would cover around 269m^2 or 0.03ha of seabed temporarily. Besides, as shown in *Figures 9.2* and *9.3* of the approved EIA Report, the fisheries production near the Southern Connection viaducts is low when compared with nearby waters and the fishing operation at the areas is also limited. It is anticipated that the potential loss of seabed habitat due to the temporary staging platforms would be minimal. The additional temporary loss of fishing ground habitat from the temporary staging platforms is expected to be limited as well given that the temporary staging follows the alignment of the bridge and viaducts. Most of the marine construction works involved in the installation and removal of the temporary staging platforms as well as construction of the permanent piles from the temporary staging would be kept within the limit of work area shown in *Figure 2.1*. The direct loss of fishing ground to the temporary staging platforms is relatively negligible when compared with the impact arise from the rest of the TM-CLKL (loss of approximately 47ha of fishing ground). No significant increase in cumulative impact on fishing ground is expected from the construction and operation of the temporary staging.

As discussed in the earlier *Section 3.4*, the potential change in water quality due to the installation, operation and removal of the temporary staging platforms would be minimal. It is expected that the potential indirect impact

to fisheries resources due to the change in water quality would be minimal as well.

Additional direct and indirect impact to fisheries resources have been assessed and is expected to be minimal. Cumulative impact on fisheries resources from the temporary staging and the nearby works would be acceptable.

3.6.3 Recommendations of Additional Mitigation Measures and EM&A

No additional mitigation measure and EM&A for fisheries would be required.

3.7 LANDSCAPE AND VISUAL

3.7.1 Review of Approved EIA

The proposed development and associated works follow in principle the planning intentions from the Revised Concept Plan for Lantau and the Outline Zoning Plans. Permanent loss of seawater body under this project includes 16.5ha near Pillar Point for the northern landfall reclamation, 19.1ha east of the HKBCF for the southern landfall reclamation and a further 0.2ha for the southern marine viaducts due to TM-CLKL. Further loss from nearby concurrent projects, including 138ha for the HKBCF, 27ha for the HKLR, 72 ha for the Planned Lantau Logistic Park, 40 ha for the Planned Lantau Logistics Park Extension and approximately 160 ha for the Future Tung Chung East & West Developments is expected as well. The landscape impact can only be slightly mitigated by minimizing area and construction period. Therefore, the overall residual impact on seawater body and shoreline near Pillar Point (LR01) and Seawater body and shoreline north of Tai Ho Wan (LR08) are considered as moderate.

Landscape impacts are also expected at the following landscape resources:

- Current Temporary River Trade Golf (LR03), due to the temporary encroachment of TM-CLKL works area;
- Tall shrubland and disturbed hillside plantation area at Pillar Point (LR04), due to the loss of trees for the toll plaza, associated slope works and retaining walls of TM-CLKL; and
- Vegetation at Tai Ho and Pak Mong (LR11), due to the natural terrain hazard mitigation works of TM-CLKL;

With the proposed mitigation measures including the aesthetic design of the built structures, minimizing construction area, the Inshore Water Landscape near Pillar Point (LCA04) and the Inshore Water Landscape near Tai Ho (LCA09) will still suffer moderate landscape impact due to the proposed reclamation for northern landfall, and southern landfall of TM-CLKL and HKBCF respectively.

Kap Shui Mun and Ma Wan Channel to Urmston Road is a unique public asset and natural visual resources as viewed from Lantau, providing an open

seascape along the northern coast of Lantau Island and the south coast of Tuen Mun. The proposed TM-CLKL, particularly the marine viaducts from the southern landfall reclamation at HKBCF to North Lantau Highway at Tai Ho, together with HKLR and HKBCF, will induce partial blockage of views and permanent loss of open seascape view. The cumulative visual impacts can only be slightly mitigated by minimizing area, avoidance of excessive height and bulk of buildings and structures and construction period.

Unavoidably moderate residual impacts at the receivers on the Lantau side, including residents of Seaview Crescent, Coastal Skyline, Caribbean Coast, residential development in CDA zone (R4), Planned theme park/major recreational uses (OU10), Planned Lantau Logistics Park (OU11), Possible planned Lantau Logistics Park Extension or other compatible uses (including recreation uses) (OU12) and Planned residential area of Tung Chung users (R8), would be expected. For the Planned residential uses at the future Tung Chung East Development (R6), the residual impacts are still considered to be moderate given their high sensitivity and close proximity to the source of impacts.

With mitigation measures during construction and operation phases, notably to produce an attractive and more pleasing overall form and appearance of the viaducts by aesthetic design, overall, it is considered that the residual landscape and visual impacts of the proposed TM-CLKL are acceptable.

3.7.2 Identification and Evaluation of Potential Impacts

The construction of the temporary staging platforms commenced in November 2013 in phases and the staging would be maintained till completion of the bridge construction in mid-2016 (total about 33 months, including 2 months of decommissioning at months 32 and 33) [(1)] . Additional landscape and visual impact would arise from the temporary staging platforms due to the additional blockage of view in this period.

Photomontage of the temporary staging platforms is shown in *Figure 3.7* which is based on Stage 2 of the temporary staging when the largest number of isolated platforms will be present at the site. When compared with the Southern Connection viaducts, the temporary staging platforms would be much lower in height at about 5.4mPD (3.25m above high water mark) and would be of smaller size. The temporary staging platforms will generally follow the alignment of the permanent Southern Connection viaducts. The temporary staging would be less visually prominent and less visually obstructive when compared with the Southern Connection viaducts. In view of the temporary nature as well as the smaller size of the temporary staging platforms when compared with the Southern Connection viaducts, the visual impact arising from the temporary staging platforms is expected to be less significant than that of the Southern Connection viaducts. Additional visual impact arising from the temporary staging platforms is expected to be limited,

(1) It should be noted that the construction of temporary staging is currently being undertaken according to the revised 2013 design for which EPD has confirmed no comment on.

Figure 3.7

Photomontage of Temporary Staging Platforms

FILE: 0215660n
DATE: 04/11/2013

Environmental
Resources
Management

ERM

while the cumulative visual impact would be acceptable. The nature of the temporary staging platforms limits the use of some mitigation measures such as the use of hoarding for screening as well as aesthetic pleasing design. Other mitigation measures proposed under the approved EIA, including the control night-time lighting and glare by hooding all lights, ensuring no direct run-off into water body adjacent to the Project area, as well as avoiding excessive height and bulk of buildings and structures, will be implemented as far as practicable. With the implementation of the proposed mitigation measures, it is considered that the residual landscape and visual impacts of the proposed temporary staging platforms at Southern Connection are acceptable. Cumulative impacts of the temporary staging and the nearby works of TM-CLKL and HKBCF are expected to be acceptable as well.

4 SUMMYAR OF ENVIRONMENTAL ASSESSMENT OF CURRENT TEMPORARY STAGING SCHEME

The installation of temporary staging platforms is the recommended method for the construction of the Southern Connection viaducts for the TM-CLKL project considering the time/programme constraint. Similar method has been used for the construction of Shenzhen Western Corridor and was found to be environmentally acceptable.

Relevant environmental aspects covered under the approved EIA have been reviewed and assessment for the potential environmental impacts due to the installation, operation and removal of the temporary staging platforms has been carried out. Cumulative environmental impact with the nearby concurrent works of TM- CLKL, HKLR and HKBCF has been assessed as well. Amongst all, the potential water quality impact during the operation of the temporary staging, the potential underwater noise impact to CWD due to piling works, the potential marine traffic disturbance to CWD and impact on coral community at the temporary staging footprint would be the major issues.

The potential water quality impacts from the temporary staging platforms, including its installation, operation and removal, have been identified and evaluated. The major water quality issue would be the change in flow regime due to the temporary staging platforms. The potential change in flow regime and water quality due to the temporary staging platforms is considered marginal and negligible when compared with that due to the reclamation for HKBCF and TM-CLKL Southern Landfall. No unacceptable water quality impact is expected from the temporary staging platforms in view of the minimal change in water quality predicted for the operation phase of the TM-CLKL, the HKBCF and the HKLR (the operation phase water quality modelling results is deemed appropriate for using in this assessment, as discussed in *Section 3.4*). The potential of accumulation of floating refuse near the temporary staging platforms is identified and collection of floating refuse has been proposed. The potential water quality impact from construction site runoff, wastewater from construction activities carried out on the temporary staging platform and propeller wash of vessel in the shallow water area has been identified. Appropriate mitigation measures have been proposed to alleviate the potential water quality impacts. Water quality monitoring at one additional station for a coral community close to the temporary staging platform is proposed as some coral communities are not feasible and thus have not been translocated.

Dolphin exclusion zone would be implemented during the construction and decommissioning of the temporary staging platforms and the temporary landing platform to minimize impact to the nearby CWD. Vessel speed limit and restriction would also be implemented for the construction of the temporary staging platforms. With the implementation of mitigation measures as well as the low usage of nearby area by CWD, the potential

acoustic disturbance to CWD due to the piling works required for the installation of the temporary staging platforms would be minimal.

Regarding the potential disturbance to CWD as a result of marine traffic caused by the temporary staging, it is estimated that the volume of marine traffic, in terms of total estimated distance travelled by the vessels during the construction, operation and decommissioning stages of the temporary staging, would be lower for the current staging scheme than the reference scheme. As such, it is expected that the disturbance to CWD as a result of marine traffic caused by the current scheme would be no worse than that of the reference scheme which has been considered as acceptable.

Coral translocation was undertaken before commencement of temporary staging platforms installation in order to reduce the marine ecological impacts to the potentially affected coral communities.

The noise level generated from the piling works for the temporary staging platforms is similar to other piling methods which have been considered in the approved EIA, which are found to be acceptable. Potential fugitive dust impact and landscape and visual impact arising from the temporary staging platforms have been assessed and impact is expected to be acceptable. Temporary loss of fishing ground and seabed of 0.03ha is expected and no significant fisheries impact is envisaged.

Table 4.1 Summary of Environmental Outcomes

Environmental aspects	Predicted impacts	Additional Mitigation Measures / EM&A Required
Air Quality	Minimal additional fugitive dust impact from the temporary staging Minimal additional gaseous emissions from additional plant	No additional mitigation measures and EM&A required
Noise	No significant additional noise impact predicted	No additional mitigation measures and EM&A required
Water Quality	Significant elevation in suspended solid is not expected from the installation and removal of the temporary staging	Regular inspection for the accumulation of floating refuse and collection of floating refuse if required.
	Minimal change in overall flow regime and water quality in view of the small scale of the project as well as the geographic settings	Provision of temporary drainage system for collection of construction site runoff to allow appropriate treatment before discharge into the sea.
	Accumulation of floating refuse could be prevented with the implementation of appropriate mitigation measures.	Wastewater generated from construction works such as bored / drilling water shall be collected, treated, neutralized and de-silted through silt trap or sedimentation tank before disposal. Additional monitoring of water quality at coral communities at station SR4a. In case elevated SS or turbidity is identified during the water quality monitoring, the source of pollution shall be tracked down and be removed as soon as possible. In case depletion of dissolved oxygen is identified, artificial aeration shall be arranged at the identified coral community in the vicinity of SR4a (*Figure 3.4*). Concrete lorry mixers and concrete dump trucks will be washed at a designated bunded area where the washout will be pumped out to a proprietary wastewater treatment unit with pH adjustment provided on the temporary landing platform and concrete delivery barges. The effluent quality of treated water will also be monitored to confirm compliance with discharge limits as per the respective Water Pollution Control Ordinance (WPCO) discharge license before discharged.

Environmental aspects	Predicted impacts	Additional Mitigation Measures / EM&A Required
		Chemical waste will be handled with care in accordance with the Code of Practice on the Packaging, Handling and Storage of Chemical Wastes. The Contractor will strictly follow mitigation measures stipulated in the Spill Response Plan (SRP) which has been developed in accordance with Clause 2.7 of the Environmental Permit (EP-354/2009/B) in order to reduce the possibility of spillage as well as the potential water quality impacts. In order to further reduce the potential impacts from propeller wash, the possibility of reducing the volume of vessel traffic within the works area will be explored. For example, the works vessel stationed at Viaducts A, B, C and D could potentially be re-positioned without the use of tug boat by adjustment of the anchor position.
Marine Ecology	Indirect impact due to change in water quality would be minimal Underwater noise impact, blockage of movement due to presence of piles and marine traffic impact to CWD would be minimal Small area of direct disturbance to bottom sediment and the associated marine lives expected Temporary loss of subtidal, intertidal as well as marine habitat is expected, yet the loss is reversible and the ecological value of the impacted habitats is limited	Implementation of dolphin exclusion zone as well as the vessel speed limit and restrictions for the construction of the temporary staging Acoustic decoupling for noisy equipment shall be carried out during the whole lifespan of the temporary staging Coral translocation completed for the identified coral communities. Further potential mitigation measure to reduce the marine traffic volume within the works area will be explored. This may involve the use of concrete pump and floating hose to reduce the need of on-site delivery of concrete. In addition, the potential of further reducing the marine traffic volume for transportation of staff/site personnel will also be explored which may include fully loaded a passenger ferry/sampan, as far as practicable, before sailing and implementation of fix schedule for staff/site personnel transportation using passenger ferry/sampan.

Environmental aspects	Predicted impacts	Additional Mitigation Measures / EM&A Required
		No additional EM&A required
Fisheries	Indirect impact due to change in water quality would be minimal Small area of direct disturbance to bottom sediment and the associated marine lives expected Temporary loss of fishing ground and seabed is expected, yet the loss is reversible and the area affected is small	No additional mitigation measures and EM&A required
Landscape and Visual	Visual impact from the temporary staging is expected to be acceptable	No additional mitigation measures and EM&A required

The potential impacts from the temporary staging platforms are expected to be minimal and its cumulative impacts on various environmental aspects are expected to be acceptable. In view of the temporary and reversible nature of the temporary staging platforms, it is considered the environmental impacts of the temporary staging platforms would be transient and acceptable.

Table 5.1 provides a summary of environmental impacts and mitigation measures associated with the reference scheme which has been assessed in 2012 (1) and the currently proposed scheme of temporary staging platforms.

In general, the environmental impacts associated with the two schemes are similar. Hence, both schemes are considered acceptable in terms of environmental impact with the implementation of mitigation measures.

(1) AECOM (October 2012) Environmental Assessment for the Temporary Staging for Construction of the Southern Connection. Prepared under Agreement No. CE 7/2011 (HY) – TM-CLKL Design and Construction

Table 5.1 Comparison of Environmental Impacts Associated with the Temporary Staging Schemes

Environmental Aspects	Reference Scheme [(a)]	Current Scheme	Comment
Air Quality	Predicted impacts: • Minimal additional fugitive dust impact from the temporary staging. • Minimal additional gaseous emissions from additional plant. Additional mitigation measures/EM&A requirements: • No additional mitigation measures and EM&A required	Predicted impacts: • Minimal additional fugitive dust impact from the temporary staging platforms. • Minimal additional gaseous emissions from additional plant. Additional mitigation measures/EM&A requirements: • No additional mitigation measures and EM&A required	• Minimal impact under both schemes. • The quantity of construction plant to be used by the current scheme are of similar order with the reference scheme. Hence, the gaseous emission impacts of both schemes are expected to be similar. • No additional mitigation measures and EM&A required under both schemes.
Noise	Predicted impacts: • Predicted noise level from temporary staging works was 66 dB(A) • During operation of the temporary staging, construction activities of the permanent structures of the Southern Connection would be the only source of noise from the works. The associated noise level of 74 dB(A) has been assessed to be lower than the noise criterion of 75 dB(A) at NSR1 during the peak construction period of the Southern Connection. • No significant additional noise impact predicted Additional mitigation measures/EM&A requirements: • No additional mitigation measures and EM&A required	Predicted impacts: • Predicted noise level from temporary staging works was 62.6 dB(A) • During operation of the temporary staging, construction activities of the permanent structures of the Southern Connection would be the only source of noise from the works. The associated noise level of 74 dB(A) has been assessed to be lower than the noise criterion of 75 dB(A) at NSR1 during the peak construction period of the Southern Connection. • No significant additional noise impact predicted Additional mitigation measures/EM&A requirements: • No additional mitigation measures and EM&A required	• Predicted noise level from the construction of the current scheme is lower than that of the reference scheme. • Noise levels during operation of the temporary staging under both schemes are expected to be the same. • No significant additional noise impact predicted under both schemes • No additional mitigation measures and EM&A required.
Water Quality	Predicted impacts: • Significant elevation in suspended solid is not expected from the installation and removal of the temporary staging. • Minimal change in overall flow regime (reduction in cross section in tidal channel is 3.79%) and water quality in view of the small scale of the project as well as the geographic settings. • Accumulation of floating refuse could be prevented with the implementation of appropriate mitigation measures.	Predicted impacts: • Significant elevation in suspended solid is not expected from the installation and removal of the temporary staging platforms. • Minimal change in overall flow regime (reduction in cross section in tidal channel is 2.6%) and water quality in view of the small scale of the project as well as the geographic settings. • Accumulation of floating refuse could be prevented with the implementation of appropriate mitigation measures.	• The overall impact on flow regime is smaller under the current scheme and the change is still regarded as minimal and transient when comparing with that during the operation stage of the TM-CLKL project with the permanent bridge piles of the Southern Connection and the HKBCF island. • Same mitigation measures and EM&A requirements

Environmental Aspects	Reference Scheme [a]	Current Scheme	Comment
	Additional mitigation measures/EM&A requirements: • Regular inspection for the accumulation of floating refuse and collection of floating refuse if required. • Provision of temporary drainage system for collection of construction site runoff to allow appropriate treatment before discharge into the sea. • Wastewater generated from construction works such as bored / drilling water shall be collected, treated, neutralized and de-silted through silt trap or sedimentation tank before disposal. • Additional monitoring of water quality at coral communities at station SR4a.	Additional mitigation measures/EM&A requirements: • Regular inspection for the accumulation of floating refuse and collection of floating refuse if required. • Provision of temporary drainage system for collection of construction site runoff with high suspended solid content to allow appropriate treatment before discharge into the sea. • Wastewater generated from construction works such as bored / drilling water shall be collected, treated, neutralized and de-silted through silt trap or sedimentation tank before disposal. • Concrete lorry mixers and concrete dump trucks will be washed at a designated bunded area where the washout will be pumped out to a proprietary wastewater treatment unit with pH adjustment provided on the temporary landing platform and concrete delivery barges. The effluent quality of treated water will also be monitored to confirm compliance with discharge limits as per the respective Water Pollution Control Ordinance (WPCO) discharge license before discharged. • Chemical waste will be handled with care in accordance with the Code of Practice on the Packaging, Handling and Storage of Chemical Wastes. • The Contractor will strictly follow mitigation measures stipulated in the Spill Response Plan (SRP) which has been developed in accordance with Clause 2.7 of the Environmental Permit (EP-354/2009/B) in order to reduce the possibility of spillage as well as the potential water quality impacts. • Additional monitoring of water quality at coral communities at station SR4a. • In order to further reduce the potential impacts from propeller wash, the possibility of reducing the volume of vessel traffic within the works area will be explored. For example, the works vessel stationed at Viaducts A, B, C and D could potentially be re-positioned without the use of tug boat by adjustment of the anchor position.	under both schemes, except that mitigation measure to further reduce the potential water quality impact from propeller wash will be explored for the current scheme.
Marine Ecology	Predicted impacts: • Indirect impact due to change in water quality would be minimal. • Underwater noise impact and disturbance caused by marine traffic to CWD would be minimal during the 8 month construction period of the temporary staging. • Involve rock socket formation for pipe piling as a source of disturbance to CWD which should not be undertaken during the peak calving season in May and June. • Small area of direct disturbance to bottom sediment and the associated marine lives expected. • Temporary loss of subtidal and intertidal marine habitat is expected (0.03ha of seabed and 75m of sea wall), yet the loss is reversible and the ecological value of the impacted habitats is limited.	Predicted impacts: • Indirect impact due to change in water quality would be minimal. • Underwater noise impact and disturbance caused by marine traffic to CWD would be minimal during the 4 month construction period of the temporary staging platforms. • Does not involve any rock socket formation • Small area of direct disturbance to bottom sediment and the associated marine lives expected. • Temporary loss of subtidal and intertidal is expected (0.03ha of seabed and 260m of sea wall), yet the loss is reversible and the ecological value of the impacted habitats is limited.	• The volume of marine traffic within the works area, where the usage by CWD is noted to be low, is expected to be higher for the current scheme. However, the volume of marine traffic outside the works area, which involves the larger North Lantau area more frequently used by the CWD, is expected to be higher for the reference scheme. Given the above and the higher estimated total volume of marine traffic of the reference scheme (ie considering both marine traffic within and outside the works area), it is expected that the

Environmental Aspects	Reference Scheme [a]	Current Scheme	Comment
	Additional mitigation measures/EM&A requirements: • Implementation of dolphin exclusion zone as well as the vessel speed limit and restrictions for the construction of the temporary staging. • Acoustic decoupling for noisy equipment will be carried out during the whole lifespan of the temporary staging. • Avoidance of formation of rock socket for the pipe piling works for the construction of the temporary staging during the peak CWD calving season in May and June. • Coral translocation will be carried out for the identified coral communities.	Additional mitigation measures/EM&A requirements: • Implementation of dolphin exclusion zone as well as the vessel speed limit and restrictions for the construction of the temporary staging. • Acoustic decoupling for noisy equipment will be carried out during the whole lifespan of the temporary staging. • Coral translocation will be carried out for the identified coral communities. • Further potential mitigation measure to reduce the marine traffic volume within the works area will be explored for the current scheme. This may involve the use of concrete pump and floating hose to reduce the need of on-site delivery of concrete. In addition, the potential of further reducing the marine traffic volume for transportation of staff/site personnel will also be explored which may include fully loaded a passenger ferry/sampan, as far as practicable, before sailing and implementation of fix schedule for staff/site personnel transportation using passenger ferry/sampan.	disturbance to CWD as a result of marine traffic caused by the current scheme would be no worse than that of the reference scheme. • Under the current scheme, the number of piles present at the site at any one time (242 piles) will be less than that for the reference scheme (1,100 piles). In addition, the piles under the current scheme will only occupy 2.6% of the cross section area of the tidal channel when compared to 3.79% of the reference scheme. As such, potential impact to CWD movement due to presence of piles is considered greater under the reference than the current schemes. • The current scheme does not involve any rock socket formation as a source of disturbance to CWD which would need to avoid the peak calving season of CWD in May and June. • The extent of seabed and seawall disturbance is larger in the current scheme, yet the impact is still regarded as minor given that the scale of the work is still small and temporary in nature and the limited value of the affected communities. Potentially affected coral colonies have been translocated as far as practicable to reduce the potential impacts.
Fisheries	Predicted impacts: • Indirect impact due to change in water quality would be minimal. • Small area of direct disturbance to bottom sediment (0.03 ha) and the associated marine lives expected. • Additional temporary loss of fishing ground is limited. • Loss of fishing ground and disturbance to seabed habitat are reversible. Additional mitigation measures/EM&A requirements: • No additional mitigation measures and EM&A required.	Predicted impacts: • Indirect impact due to change in water quality would be minimal. • Small area of direct disturbance to bottom sediment (0.03 ha) and the associated marine lives expected. • Additional temporary loss of fishing ground is limited. • Loss of fishing ground and disturbance to seabed habitat are reversible. Additional mitigation measures/EM&A requirements: • No additional mitigation measures and EM&A required.	• The area of direct disturbance to seabed habitat is the same as the reference scheme. The seabed habitat is considered as of low ecological value. • The area of loss of fishing ground is similar under both schemes given that the works generally follow the bridge and viaduct alignment. In fact, the extent of works area, within which fishing operations will not be allowed, would be the same under both schemes. • No additional mitigation measures and EM&A required under both schemes.
Landscape and Visual	Predicted impacts • Visual impact from the temporary staging is expected to be acceptable Additional mitigation measures and EM&A required • No additional mitigation measures and EM&A required.	Predicted impacts • Visual impact from the temporary staging platforms is expected to be acceptable Additional mitigation measures and EM&A required • No additional mitigation measures and EM&A required.	• Visual impacts from both schemes are expected to be acceptable. • The above water structures of the current scheme, which included isolated platforms only, are less extensive than the continuous staging of the reference schemes. • No additional mitigation measures and EM&A required under both schemes.