土木工程拓展署
Civil Engineering and Development Department

Web site 網址 : http://www.cedd.gov.hk
E-mail 電子郵件 : rickycpwong@cedd.gov.hk
Telephone 電話 : (852) 2762 5630
Facsimile 傳真 : (852) 2714 2054
Our reference 本署檔號 : ( ) in PW-15-3005-CE66(14)-GA-11 P001
Your reference 來函檔號 :

土木工程處
Civil Engineering Office
海港工程部 Port Works Division

香港九龍公主道 101 號
土木工程拓展署大樓
Civil Engineering and Development Building,
101 Princess Margaret Road,
Kowloon, Hong Kong.

電郵
(電郵: dwylo@legco.gov.hk)

香港
中區立法會道一號
立法會綜合大樓
立法會秘書處議會事務部
(經辦人: 盧慧欣女士)
(傳真: 2978 7569)

盧女士：

關於: 基本工程儲備基金 2018/19 整體撥款
(馬料水具潛力填海地點的技術議題研究)

多謝你轉介立法會議員張超雄於 2018 年 1 月 25 日致土木工程拓展署署長的來信，要求提交上述研究的完整報告。繼本署於 2018 年 1 月 29 日的回覆，現按議員要求附上該報告的最後文本給立法會秘書處轉交有關議員參閱。

土木工程拓展署
海港工程部／總工程師（署理）
(羅寶儀 羅寶儀)

2018 年 4 月 26 日

附件

副本抄送：（不連附件）
財經事務及庫務局 〔經辦人：何鎧均 女士〕 傳真：2147 5240
發展局 工務科 〔經辦人：鄭毓文 先生〕 傳真：2810 8502

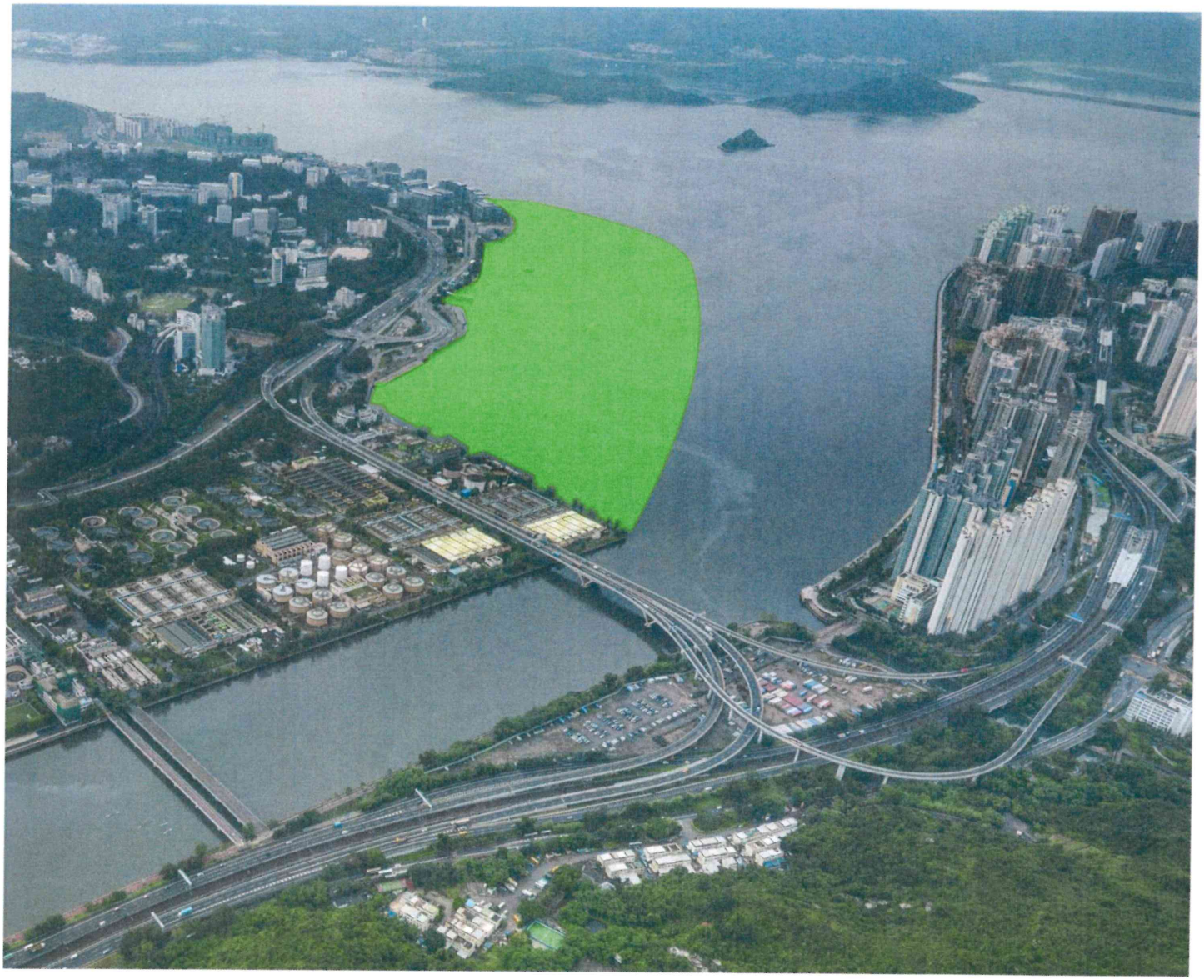
AECOM

Final Report for the Study
(Final)

土木工程拓展署
CEDD Civil Engineering and
Development Department

Agreement No. CE 66/2014 (CE)

Study on Technical Issues Related to Potential Reclamation Site at Ma Liu Shui – Feasibility Study



土木工程拓展署
Civil Engineering Office
Civil Engineering and Development Department

Agreement No. CE 66/2014 (CE)

Study on Technical Issues Related to Potential Reclamation Site at Ma Liu Shui – Feasibility Study

Final Report for the Study (Final)

AECOM ASIA COMPANY LIMITED

TABLE OF CONTENT

FIGURE

APPENDIX

ABBREVIATION

Abbreviation	Full meaning
ADWF	Average Dry Weather Flow
AFCD	Agriculture, Fisheries and Conservation Department
AOI	Area of Influence
APCO	Air Pollution Control Ordinance
ANL	Acceptable Nosie Level
ASRs	Air Sensitive Receivers
AQOs	Air Quality Objectives
B.C.	Box Culvert
BNLs	Basic Noise Levels
CEDD	Civil Engineering and Development Department
CNP	Construction Noise Permit
CPA	Coastal Protection Areas
CUHK	The Chinese University of Hong Kong
dB	Decibel
DIA	Drainage Impact Assessment
DO	Dissolved Oxygen
DP	Designated Project
DSD	Drainage Services Department
EIA	Environmental Impact Assessment
EIAO	Environmental Impact Assessment Ordinance
EM&A	Environmental Monitoring & Auditing
ETWB	Environment, Transport and Works Bureau
EPD	Environmental Protection Department
ERL	East Rail Line
FCZs	Fish Culture Zones
FSP	Fine Suspended Particulates
GESF	EPD's Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning
GFS	Government Flying Services
G/IC	Government, Institution or Community
GMB	Green Minibus
HAT	Highest Astronomical Tide
HKO	Hong Kong Observatory
HKPF	Hong Kong Police Force
HKPSG	Hong Kong Planning Standards and Guidelines
HKSP	Hong Kong Science Park

IOFC	Institute of Future Cities
LCAs	Landscape Character Areas
LCEL	Lower Chemical Exceedance Level
LIA	Landscape Impact Assessment
LRs	Landscape Resources
LVIA	Landscape and Visual Impact Assessment
MLS	Ma Liu Shui
MOWDIST MNDIV, HKPF	Marine Police Outer Waters District Headquarters and Marine North Division
MP	Marine Park
NCO	Noise Control Ordinance
NSRs	Noise Sensitive Receivers
PCW	Prescribed Construction Work
PE	Public Engagement
PME	Powered Mechanical Equipment
PNs	Practice Notes
ProPECC	Professional Persons Environmental Consultative Committee
PRS	Potential Reclamation Site in Ma Liu Shui
PTI	Public Transport Interchange
R&D	Research and Development
REA	Rapid Ecological Assessment
RSP	Respirable Suspended Particulates
SDM	Stormwater Drainage Manual
SIA	Sewerage Impact Assessment
STCSTW	Sha Tin Cavern Sewage Treatment Works
STSTW	Sha Tin Sewerage Treatment Works
SWL	Sound Power Levels
SPS	Sewage Pumping Station
SPME	Specified Powered Mechanical Equipment
SS	Suspended Solids
SSSI	Site of Special Scientific Interest
TC	Technical Circular
THEES	Tolo Harbour Effluent Export Scheme
TM	Technical Memoranda
TSP	Total Suspended Particulates
TTIA	Traffic and Transport Impact Assessment
TPDM	Transport Planning & Design Manual
TPEPS	Tai Po Effluent Pumping Station

UCEL	Upper Chemical Exceedance Level
USEPA	US Environmental Protection Agency
VSRs	Visually Sensitive Receivers
WP	Working Paper
WPCO	Water Pollution Control Ordinance
WCZ	Water Control Zone
WQO	Water Quality Objective
WSRs	Water Sensitive Receivers
WSD	Water Services Department

1 INTRODUCTION

1.1 Project Background

1.1.1 On 13 February 2015, CEDD of the Government of the Hong Kong Special Administrative Region commissioned AECOM Asia Company Limited to provide consultancy services for Agreement No. CE 66/2014 (CE) 'Study on Technical Issues Related to Potential Reclamation Site at Ma Liu Shui – Feasibility Study' (the Study).

1.2 Study Background

1.2.1 In 2011, CEDD had commissioned Ove Arup & Partners Hong Kong Limited under Agreement No. CE9/2011(CE) – Increasing Land Supply Study by Reclamation and Rock Cavern Development cum Public Engagement – Feasibility Study (the Land Supply Study) to identify suitable locations for reclamation outside Victoria Harbour and rock cavern development. Ma Liu Shui (MLS), was identified as one of the potential near-shore reclamation sites for further consideration.

1.2.2 The Stage 1 Public Engagement (PE1) of the Land Supply Study, to solicit views on the feasible ways of increasing land supply, the guiding principles and the site selection criteria, was formally launched in November 2011 and completed in March 2012. The results of PE1 revealed that there was a broad consensus that more land should be required to meet housing and economic development as well as to improve the living environment. There was also a broad support for a "six-pronged approach" to enhance land supply which included reclamation outside Victoria Harbour. The PE1 results also indicated a broad consensus on the proposed site selection criteria with importance attached to the impacts on the community and the environment.

1.2.3 On reclamation outside Victoria Harbour, the public opinions were mixed with supporting and objecting views. Most of the objecting views came from signature campaigns organised in the local communities and focused on several illustrative reclamation sites. Separately, members of the public generally agreed on the eight site selection criteria which can be grouped under three guiding principles namely (i) social harmony and benefits; (ii) economic efficiency; and (iii) practicality and enhanced environmental performance. The general public particularly concerned about the site selection criteria relating to the environmental, marine ecological and social impacts.

1.2.4 Under Stage 2 Public Engagement (PE2) conducted between March and June 2013, the public was consulted on the possible land uses for the potential reclamation sites including MLS, as well as particular aspects which needed attention in further studies. The results for potential reclamation at MLS revealed that land reserve, residential development, GIC and open space such as recreational or leisure facilities, research institute, public park, school, etc. were the major supported land uses. Technical concerns including the potential impact on environment, ecology, landscape and visual, drainage, hydraulic performance of Shing Mun River, traffic and transport infrastructure, etc. were raised. This Study is therefore commissioned in order to examine the technical issues raised by the stakeholders related to the potential reclamation site (PRS) at MLS.

1.2.5 The findings of the Study will be further investigated, elaborated and supplemented in the ensuring planning and engineering study for the Project in the next stage.

1.3 Main Objectives

1.3.1 The overall objective of the Assignment is to establish the preliminary feasibility of the PRS for accommodating a target reclamation area of about 60 ha with due consideration on the critical technical issues in **Section 1.2.4** abovementioned and public views collected during the PE2 exercise.

1.3.2 The main objectives of the Assignment are:-

(a) to carry out preliminary technical assessments for evaluating and establishing the engineering feasibility and environmental acceptability and recommend measures to mitigate any impacts arising from the PRS; and

(b) to formulate possible solutions for the PRS for further detailed study.

1.4 Purpose and Structure of Report

1.4.1 The purpose of the Final Report is to summarise the key findings, recommendations and conclusions of various assessment in this Study.

1.4.2 Apart from this introductory section, the sections of this report are as follows:

- **Section 2** - presents the existing conditions;
- **Section 3** - overviews the planning context, opportunities, constraints and key issues;
- **Section 4** - addresses the major water quality impacts arising from the PRS and proposes recommendation on the predicted impacts;
- **Section 5** - addresses the major air quality impacts arising from the PRS and proposes recommendation on the predicted impacts;
- **Section 6** - addresses the major noise impacts arising from the PRS and proposes recommendation on the predicted impacts;
- **Section 7** - addresses the major ecological quality impacts arising from the PRS and proposes recommendation on the predicted impacts;
- **Section 8** - reviews the landscape and visual impact due to the PRS;
- **Section 9** - highlights the major findings of the preliminary Drainage Impact Assessment (DIA) arising from the PRS;
- **Section 10** - highlights the major findings of the preliminary Sewerage Impact Assessment (SIA) arising from the PRS;
- **Section 11** - identifies impacts on hydraulic performance near Sha Tin Hoi and Shing Mun River and recommends feasible options for the mitigation of the impacts;
- **Section 12** - examines the potential impacts on the existing and planned transport systems arising from the PRS; and
- **Section 13** - examines the development potential of existing and proposed transport infrastructure arising from the PRS.
- **Section 14** - provides conclusions of the Final Report.

2 EXISTING CONDITIONS OF MA LIU SHUI

2.1 Study Area

2.1.1 In general, the Study Area for the Assignment should cover the entire area of MLS, Pak Shek Kok and Sha Tin Districts. The Study Area is shown in **Figure 2.1.1**.

2.1.2 The boundaries for some technical and environmental assessments are not confined to the Study Area in order to take account of the relevant conditions outside the Study Area.

2.2 Land Users and Provisions

2.2.1 The PRS is located in the proximity of the Sha Tin/Ma On Shan New Town and immediately adjacent to the Chinese University of Hong Kong (CUHK), Hong Kong Science Park (HKSP) and Sha Tin Sewage Treatment Works (STSTW).

2.2.2 There are waterfront related facilities established along the existing water edge, namely the Marine Police Outer Water District Headquarters and Marine Police North Division (MOWDIST MNDIV, HKPF) and its Helipad, MLS Ferry Pier, Water Sports Centre of CUHK, Marine Science Laboratory of CUHK, Water Supplies Department (WSD) Salt Water Pumping Station, existing waterfront promenade and the cycling track along the existing water edge. Relocation and reprovisioning of these affected facilities will be required for implementation of the PRS. In particular, the integration and re-arrangement of the MOWDIST MNDIV, HKPF and its Helipad with the future development shall be carefully handled.

2.3 Existing Traffic and Transport Network

Existing Road Network

2.3.1 Based on the existing road network, the main vehicular routes to the PRS is via either:-

(i) Tolo Highway, Chak Cheung Street, Sui Cheung Street and Science Park Road, or

(ii) Tate's Cairn Highway, T6 Tate's Cairn Bridge, Chak Cheung Street, Sui Cheung Street and Science Park Road.

2.3.2 The Tolo Highway is an expressway of dual-4 traffic lanes, which connects to Fanling Highway to the north and Tai Po Road - Sha Tin Section to the south. The Science Park Road is dual-2 traffic lanes which connects to Chak Cheung Street / Sui Cheung Street to the south and Chong San Road to the north. The Chak Cheung Street and Sui Cheung Street are local roads which link up several roundabouts and connect to the MTR East Rail Line University Station.

2.3.3 The Tate's Cairn Highway is an expressway of dual-3 traffic lanes, which connects to Tate's Cairn T6 Bridge to the north and Tate's Cairn Tunnel to the south. The Tate's Cairn T6 Bridge is a rural trunk road of dual-2 traffic lanes, which connects to Tolo Highway to the west and Ma On Shan Road to the east.

Existing Public Transport Facilities

2.3.4 The MTR East Rail Line University Station is located around 700m from the southern half of the PRS. The pedestrian can walk to / from the MTR East Rail Line University Station via Science Park Road, subway across Tolo Highways and Chak Cheung Street.

2.3.5 In addition, there are franchised bus and green minibus (GMB) routes serving along Science Park Road, Chong San Street and Science Park West Avenue and at the public transport interchange (PTI) of the MTR East Rail Line University Station.

Existing Pedestrian and Cycle Network

2.3.6 Footpaths are currently provided along Science Park Road and the other local roads in the vicinity. A footbridge across Tolo Highway is provided adjacent to Chak Cheung Street which links up the pedestrian connection between the MTR East Rail Line University Station and the Science Park Road. There is an existing cycle track along Chak Cheung Street (leading to the MTR East Rail Line University Station), Shui Chong Street, Shui Cheung Road and Science Park Road, which provides linkage to the Sha Tin, Tai Po and Ma On Shan area.

2.4 Existing Environmental and Ecology Issues

Air

2.4.1 There are waterfront related facilities established along the existing water edge, namely the MOWDIST MNDIV, HKPF and its Helipad, Ma Liu Shui Ferry Pier, Water Sports Centre of CUHK, Marine Science Laboratory of CUHK, WSD Salt Water Pumping Station, existing waterfront promenade and the cycling track along the existing water edge.

2.4.2 Representative existing Air Sensitive Receivers (ASRs) includes Harbour View at HKSP, Photonic Centre at HKSP, Hong Kong Institute of Biotechnology, Student Residence of CUHK (Wu Ho Man Yuen Building), Hyatt Regency Hong Kong Sha Tin, etc.

Noise

2.4.3 The existing noise sources in the study area include fixed plant noise from MOWDIST MNDIV, HKPF and Sewage Pumping Stations (SPS), operational noise to and from the MOWDIST MNDIV, HKPF, railway noise from MTR East Rail Line and vehicular traffic noise from the road network within the PRS, the Tolo Highways and Tate's Cairn Highway. There is a helipad at MOWDIST MNDIV, HKPF, however, its operation is infrequent as advised by Government Flying Service (GFS). Representative existing Noise Sensitive Receivers (NSRs) include, Postgraduates Hall of CUHK, Student Residence of CUHK, S.K.H. Ma On Shan Holy Spirit Primary School, etc.

Water Quality

2.4.4 Major Water Sensitive Receivers (WSRs) includes the nearby inland waters including the Shing Mun River system and the marine water of Tolo Harbour. Based on the Environmental Protection Department's (EPD) routine water quality monitoring data, the water quality of Shing Mun River main channel and its tributaries was rated excellent or good. The Water Quality Objective (WQO) compliance rate of Shing Mun River was 91% in 2015. Occasional WQO non-compliances were, however, still recorded in the Shing Mun River system for all WQO parameters (pH, biochemical oxygen demand, chemical oxygen demand, suspended solids (SS) and *E. coli*). On the other hand the overall WQO compliance rate of the marine water in Tolo Harbour in 2015 was 79%, due to the low compliance rate with the Dissolved Oxygen (DO) objective of 57%. Since Tolo Harbour is a shallow semi-enclosed water body with low water exchange rate with Mirs Bay, the harbour's essentially landlocked situation often leads to stratification of the water column and lower bottom DO levels particularly during the hot summer months, hence resulting in non-compliance with the DO objective in the summer months. Full compliance with the WQO for other WQO parameters (including *E. coli* and chlorophyll-*a*) was achieved in the marine water of Tolo Harbour.

Ecology and Fisheries

Marine Ecology

2.4.5 Marine ecological sites of conservation importance occur within the Tolo Harbour and Channel Water Control Zone (WCZ), including Coastal Protection Areas (CPA), Kei Ling Ha Mangal Site of Special Scientific Interest (SSSI), Ting Kok SSSI, Hoi Ha Wan Marine Park (MP) and Yan Chau Tong MP. The CPA on the southern shoreline of Yim Tin Tsai lies approximately 2.5 km north of the PRS, while other sites are more than 4 km away.

Terrestrial Ecology

2.4.6 Plantation and developed area were identified in the vicinity of the PRS. Vegetation was dominated by common flora species in Hong Kong with no species of conservation importance recorded. Fauna species recorded including common avifauna, butterfly and reptile species. Three avifauna species of conservation importance were recorded, including Great Egret, Little Egret and Black Kite. Both egret species were recorded along the shoreline of Inner Tolo Harbour, while Black Kite was recorded flying above the shoreline as well as the plantation habitat. Penfold Park Egretry occurs approximately 1.5 km southwest of the PRS.

Fisheries

2.4.7 Tolo Harbour and Channel supports low fisheries production and low to moderate number of vessels (AFCD, 2006), and is not considered an important fish spawning ground or nursery area of commercial fish species (AFD, 1998). Four Fish Culture Zones (FCZs) exist within the Tolo Harbour and Channel WCZ, but they are more than 4 km away from the PRS.

[BLANK]

3 KEY ASSUMPTIONS

3.1 Introduction

3.1.1 The PRS has been featured in the conceptual spatial framework of Hong Kong 2030+. Given that the PRS located at one of the primary development axes, i.e. the "Eastern Knowledge and Technology Corridor", there are opportunities to develop high technology and knowledge-based industries, housing and other uses at this location. It could create synergy with other developments such as the CUHK and HKSP, which will in turn strengthen the corridor by additional knowledge and technology developments. It could also generate employment opportunities and help to redress the home job imbalance.

3.1.2 In addition to this Study, the CEDD has engaged The Institute of Future Cities (IOFC) of CUHK to conduct a Community Profiling Study separately. As a part of the Community Profiling Study, IOFC conducted questionnaire surveys from December 2016 to January 2017 and design charrette in April 2017. According to its key findings, the public longs for better job opportunities, leisure and cultural activities together with human-water interaction in the area. It is majorly proposed to have ecological mix-land use development which combines business, residential and recreational land uses with consideration to potential environmental, visual and traffic impacts, along with individual members' aspirations on minimal disturbances to the existing water body.

3.1.3 Taking into account the opportunities, the following crude assumptions were made under the Study in order to facilitate the preliminary technical assessments on the PRS. The planning assumptions (e.g. reclamation extent, land uses and scale of development, etc.) made under the Study are merely to ascertain broad technical feasibility of the PRS and that the reclamation extent, detailed land uses and potential infrastructures would be subject to the ensuring planning and engineering study.

(a) Reclamation Extent: About 60ha

(b) Scale and Type of Development (including the potential development at the vacated site of STSTW):

- Population: about 34,100
- Total no. of flats: about 11,000
- Employment opportunities: about 41,500
- Development Type: research and development (R&D), higher education, housing and/ or other uses

(c) Public and Private Housing:

- Ratio of 60:40

(d) Additional Greenery Area:

- Around 30% of the site including about 20% of the site for open space plus roadside amenity

(e) Building Height:

- A stepped height profile increasing from north to south and increasing from seaside to inland

(f) Air Paths:

- Provision of suitable air paths and building separations

3.1.4 The assumed reclamation extent of the PRS for preliminary technical assessment purpose is shown in **Figure 3.1.1**.

3.1.5 In addition to the above key assumptions, some crude assumptions, including the construction program and phasing details, etc., are also adopted in the Technical Study, which are subject to review in the next stage of this Project.

4 PRELIMINARY WATER QUALITY IMPACT ASSESSMENT

4.1 Objectives

4.1.1 The Preliminary Water Quality Impact Assessment mainly covers the concerns of the stakeholders on water quality due to the reclamation works and the change of hydraulic condition.

4.2 Environmental Legislation, Policies, Plans, Standards and Assessment Criteria

4.2.1 The water quality assessment based on the following Environmental Legislation, Policies, Plans, Standards and Assessment Criteria:-

- Water Pollution Control Ordinance (WPCO)
- Environmental Impact Assessment Ordinance (EIAO) - Annex 6 and 14;
- Hong Kong Planning Standards and Guidelines (HKPSG), Chapter 9 (Environment);
- Technical Memorandum on Effluent Discharge Standard;
- The Practice Note (PN) for Professional Persons on Construction Site Drainage (Professional Persons Environmental Consultative Committee (ProPECC) PN 1/94);
- The ProPECC PN 5/93 "Drainage Plans subject to Comments by EPD";
- Technical Circular (ETWB TC) (Works) No. 5/2005;
- Water Supplies Department Water Quality Criteria;
- Cooling Water Intake SS Criterion;
- Fish Culture Zone SS Criterion; and
- Sedimentation Criterion (Applicable to Ecological Subtidal Habitats Only)

4.3 Assessment Methodology

4.3.1 The Study Area for preliminary water quality impact assessment covers the marine waters in Tolo Harbour as well as the inland waters near the PRS including the Shing Mun River designated under the WPCO and other relevant areas in the vicinity being impacted by the Project. The WSRs that may be affected by the Project have been identified. Potential sources of water quality impact that may arise during the construction and operational stages of the Project were described. The existing emergency submarine outfall of STSTW would be reprovisioned to about 1km away from the original discharge location, which may cause impact to the adjacent WSRs during emergency discharge from the existing STSTW / future Sha Tin Cavern Sewage Treatment Works (STCSTW). This assessment also included identifying pollutants from point discharges and non-point sources that could affect the quality of surface water bodies. All the identified sources of potential water quality impact were then evaluated to further determine their impact significance. The need for mitigation measures to reduce any identified adverse impacts on water quality to acceptable levels was determined.

4.4 Description of Environment

Marine Water

4.4.1 The water quality monitoring results at stations in vicinity of the Study Area, namely TM2, TM3 and TM4, are referenced to Appendix B of EPD Marine Water Quality in Hong Kong in

2015. The selected marine water quality monitoring stations are shown in **Figure 4.4.1**. Full compliances with the WQO was recorded at all the three selected stations for DO, chlorophyll-*a* and *E. coli* in 2015.

Marine Sediment

4.4.2 The sediment quality in inner Tolo Harbour are referenced to the sediment quality monitoring data collected by EPD (at Stations TS2 and TS3) in 2011 – 2015, which are issued in Appendix E of EPD Marine Water Quality in Hong Kong in 2015. Locations of the selected monitoring stations are shown in **Figure 4.4.1**. The sediment at inner Tolo Harbour is considered potentially contaminated with lead and zinc. The level of lead in both selected stations exceeded the Lower Chemical Exceedance Level (LCEL) of 75 mg/kg, while the level of zinc in Stations TS2 and TS3 exceeded the LCEL of 200 mg/kg and Upper Chemical Exceedance Level (UCEL) of 270 mg/kg respectively. The level of other metalloid, metal and organic pollutants complied well with the LCEL.

Inland Water

4.4.3 The water quality monitoring results at stations in Shing Mun River, namely TR17, TR17L, TR19I, TR23L, TR23A, KY1, TR20B, TR19A, TR19C and TR19 are referenced to EPD River Water Quality in Hong Kong in 2015. The selected river water quality monitoring stations are shown in **Figure 4.4.2**. Although Shing Mun River in the Tolo Harbour and Channel WCZ has not yet reached 100% WQO compliance in 2015, it showed marked improvement during the last decade. The compliance rate of Shing Mun River rose from 78% in 1997 to 91% in 2015.

Other Inland Water

4.4.4 Apart from the monitoring data extracted from EPD's "*River Water Quality Monitoring in Hong* Kong *2015*", reference was also made to the monitoring data extracted from the approved EIA report of STCSTW (Report No. EIA-240/2016).

4.4.5 In general, the levels of SS and BOD_5 measured at all stations were low. The DO levels measured at all the stations are considered satisfactory except at the lower reach of Miu Tsz Lam Road Stream (Station R2a) where backflow of seawater and poor water circulation is observed, and the DO levels recorded at this station were thus relatively low in the wet season. Relatively high *E.coli* Levels were measured in both Miu Tsz Lam Road Stream and Ma Tai Stream which indicated that these inland waters could be contaminated by sewage discharges.

4.5 Water Sensitive Receiver

Marine Water

4.5.1 Key marine WSRs in Tolo Harbour were identified with reference to Annex 14 of the EIAO-TM and their indicative locations as well as the assumed extent reclamation and extension of emergency outfall for technical assessment purpose are shown in **Figure 4.4.1**. **Table 4.5.1** tabulates the identified marine WSRs in Tolo Harbour within the PRS.

Table 4.5.1 Marine WSRs in Tolo Harbour

ID	Name	Approximate Distance to Site Boundary (km)
Cooling Water Intake		
C1	CUHK Marine Biolaboratory	Immediate vicinity
Flushing Water Intake		
W1	Sha Tin	within the PRS

ID	Name	Approximate Distance to Site Boundary (km)
W1 (reprovisioned)	Sha Tin (reprovisioned)	within the PRS
Corals		
CR16	Sha Tin Hoi North	within the PRS
CR17	Sha Tin Hoi South	within the PRS

Inland Water

4.5.2 Major inland water bodies that may be affected by the Project were identified and their indicative locations are shown in **Figure 4.4.2**. **Table 4.5.2** presents the identified inland water bodies in the vicinity of the PRS.

Table 4.5.2 Major Inland Waters in the vicinity of the PRS

ID	Description	Approximate Distance to Site Boundary (km)
R1	Shing Mun River System (including the Main Channel and its tributaries namely Fo Tan Nullah, Siu Lek Yuen Nullah, Tai Wai Nullah, Kwun Yam Shan Stream and Tin Sum Nullah)	Immediate vicinity
R2a, R2b and R2c	Stream along Mui Tse Lam Road	0.3
R3	Ma Tai Stream	0.7

Water Recreational Uses

4.5.3 The inland water (i.e. Shing Mun River) and the marine water in Tolo Harbour and Channel WCZ are designated under the WPCO as secondary contact recreation subzone, which can be used for water sports and water recreational activities (e.g. dragon boating, sailing, rowing etc.). The *E. coli* bacteria would be the principle parameter for assessing the acceptability of using the inland and marine water for water sports or secondary contact recreation activities with a WQO of not exceeding 610 no./100mL (calculated as the geometric mean of all samples collected in one calendar year).

Sites of Fisheries Importance

4.5.4 There are four mariculture areas identified in the Study Area, Yim Tin Tsai FCZ (F1), Yim Tin Tsai (East) FCZ (F2), Yung Shue Au FCZ (F3) and Lo Fu Wat FCZ (F4). The locations of the key fisheries resources within the assessment area are shown in **Figure 4.4.1**. Based on the findings of the literature review, no important nursery or spawning area was identified in immediate vicinity of the PRS in Tolo Harbour (ERM, 1998 [1]).

4.6 Identification and Evaluation of Potential Impacts

Construction Phase

4.6.1 The major sources of the potential water quality impacts during construction phase of the PRS include the following:

- Loss of fines and contaminants into the receiving waters associated with the marine construction works;
- Wastewater discharges from general construction activities;

1 Environmental Resources Management (1998). Fisheries Resources and Fishing Operation in Hong Kong Waters. Prepared by ERM for Agriculture and Fisheries Department, HK SAR Government.

- Drainage and construction site runoff from land-based construction;
- Sewage effluent produced by construction workforce;
- Accidental spillage; and
- Construction works in close proximity of inland water

4.6.2 It should be noted that the construction methodologies of the PRS have not been finalized which would be subject to change in the future detailed design stage. Different methods of reclamation including non-dredging approach will be explored and detailed reclamation construction design will be carried out under the future planning and engineering study to determine the final reclamation or construction schemes for the Project.

Potential Sediment Loss

4.6.3 Existing submarine outfall from STSTW would need to be re-provisioned before reclamation can be carried out. Re-provision of the submarine outfall will require dredging work and the associated water quality impact has been considered in this water quality modelling exercise.

4.6.4 Non-dredged approach for the reclamation in MLS will be recommended for construction of the PRS to minimize environmental impacts to the adjacent WSRs inside Tolo Harbour. As non-dredged method would be adopted, potential water quality impact would only arise due to loss of filling material into the water column, causing elevation in SS concentrations in the water column. The quantities of fine sediment lost to suspension during reclamation will primarily depend on production rate. Impact from SS may be caused by sediment plumes being transported by currents to form sediment plumes along the tidal flows to sensitive areas. In addition, it is also noted that non-dredged method could be considered for the diversion of the Tolo Harbour Effluent Export Scheme (THEES) Submarine Pipe such that the potential water quality impact from marine dredging of submarine pipe alignment can be avoided. The diversion of the THEES submarine rising main will be assessed and with necessary mitigation measures proposed in the future EIA study if diversion is preferred after the review.

4.6.5 To assess the potential water quality impacts due to the marine-based construction activities, the sources and natures of water pollution to be generated have been identified and their impacts have been quantified where practicable. Sediment plume modelling was carried out for 4 construction phase scenarios as follows:

- Construction Scenario for Re-provision of the STSTW submarine outfall
- Construction Scenario for the PRS Phase 1a filling behind a 200m leading seawall
- Construction Scenario for the PRS Phase 1b filling behind a 200m leading seawall
- Construction Scenario for the PRS Phase 2 filling behind a 200m leading seawall

4.6.6 The reclamation works is assumed to be implemented under 3 phases (Phase 1a, 1b and 2) tentatively. The purpose of carrying out Phase 1a first is to keep a clearance with THEES submarine pipe and provide land for potential relocation of the MOWDIST MNDIV, HKPF and the Salt Water Pumping Station. While Phase 1b aims to re-provide the MLS public piers and land facilities at Phase 1a reclaimed land to maintain the marine access point for CUHK's water sports as well as keeping the clearance with THEES submarine pipe. The dredging works for the STSTW submarine outfall construction is scheduled to be carried out before filling works for Phase 1a, no dredging works will be overlapped with the entire filling works of PRS. For more details of the assumptions, please refer to **Appendix 4.6.1**. The assumptions are merely for Preliminary Water Quality Impact Assessment subject to the ensuring studies.

General Construction Activities

4.6.7 Various types of construction activities may generate wastewater. These include general cleaning and polishing, wheel washing, dust suppression and utility installation. These types of wastewater would contain high concentrations of SS. Various construction works may also generate debris and rubbish such as packaging, construction materials and refuse. Uncontrolled discharge of site effluents, rubbish and refuse generated from the construction works could lead to deterioration in water quality.

4.6.8 Effluent discharged from temporary site facilities should be controlled to prevent direct discharge to the neighboring inland waters and storm drains. Such effluent may include wastewater resulting from wheel washing of site vehicles at site entrances. Debris and rubbish such as packaging, construction materials and refuse generated from the construction activities should also be properly managed and controlled to avoid accidental release to the local storm system and inland waters. Adoption of the guidelines and good site practices for handling and disposal of construction discharges, for example, provision of sand/silt removal facilities, would minimize the potential impacts.

Drainage and Construction Site Run-off

4.6.9 Potential pollution sources of site run-off may include:

- Run-off and erosion of exposed bare soil and earth, drainage channel, earth working area and stockpiles;
- Release of any bentonite slurries, concrete washings and other grouting materials with construction run-off or storm water;
- Wash water from dust suppression sprays and wheel washing facilities; and
- Fuel, oil and lubricants from maintenance of construction vehicles and equipment.

Sewage Effluent from Construction Workforce

4.6.10 During the construction of the PRS, the workforce on site will generate sewage effluents, which are characterized by high levels of BOD, ammonia and *E. coli* counts. Potential water quality impacts upon the local drainage and fresh water system may arise from these sewage effluents, if uncontrolled.

4.6.11 The construction sewage need to be handled by portable chemical toilets prior to the commission of the on-site sewer system. Appropriate numbers of portable toilets should be provided by a licensed contractor to serve the large number of construction workers over the construction site. Provided that sewage is not discharged directly into the storm drains / marine waters / inland waters adjacent to the construction site, and temporary sanitary facilities are used and properly maintained, it is unlikely that sewage generated from the site would have a significant water quality impact.

Accidental Spillage of Chemical

4.6.12 A large variety of chemicals may be used during construction activities. These chemicals may include petroleum products, surplus adhesives, spent lubrication oil, grease and mineral oil, spent acid and alkaline solutions/solvent and other chemicals. The use of these chemicals and their storage as waste materials has the potential to create impacts on the water quality of adjacent marine waters / inland waters / storm drains if spillage occurs. Waste oil may infiltrate into the surface soil layer, or run-off into local water courses, increasing hydrocarbon levels. The potential impacts could however be mitigated by practical mitigation measures and good site practices, for example, provision of sump and oil interceptors.

Construction Works in Close Proximity of Inland Water

4.6.13 Construction activities in close vicinity to the inland water courses may pollute the inland water bodies due to the potential release of construction wastes. Construction wastes are generally characterized by high concentration of SS and elevated pH. The implementation of measures to control runoff and drainage will be important for the construction works adjacent to the inland water in order to prevent runoff and drainage water with high levels of SS from entering the water environment. With the implementation of adequate construction site drainage as specified in the ProPECC PN 1/94 "*Construction Site Drainage*" and the provision of mitigation measures as described in the ETWB TC (Works) No. 5/2005 "*Protection of natural streams/rivers from adverse impacts arising from construction works*", it is anticipated that unacceptable water quality impacts would not arise.

Operation Phase

4.6.14 The key sources of water quality impacts during operation phase of the PRS would potentially include the following:

- Change in Hydrodynamic Regime due to the PRS;
- Change in Water Quality due to presence of the PRS and re-provision of the emergency submarine outfall of STSTW;
- Sewerage / Sewage Discharge from the future development of PRS;
- Surface Run-off and Drainage Discharge from the PRS.

4.6.15 Change in the coastline configuration due to the presence of the PRS could have impact on the flow regime and associated water circulation in the Tolo Harbour and Shing Mun River, and therefore potentially cause a change in the sedimentation and water quality pattern.

4.6.16 According to the assumed extent reclamation of the PRS as shown in **Figure 4.4.1**, the formation of the PRS will eliminate the existing semi-embayed area (waters adjacent to the existing STSTW and Pak Shek Kok). The reclamation configuration of the PRS would not form any contraction / blockage / embayment area to the Shing Mun Main Channel, accumulation of pollutants within the waters adjacent to the PRS is not anticipated. The current speed of waters adjacent to the PRS would be increased due to contraction of Sha Tin Hoi but the effect would be localized which have only minor change in current speed of waters in Shing Mun Main Channel and Tolo Harbour. There may be change in flushing of the water body but the water quality result does not show significant change in this area (**Section 4.6.31**). No significant change in flow discharge in absolute terms is anticipated and no adverse hydrodynamic impact would therefore be expected.

Change in Water Quality

4.6.17 Due to the presence of the PRS, the existing emergency submarine outfall of STSTW would be re-provisioned to about 1km away from the original discharge location. Extension of the STSTW outfall will cause different water quality impact from that assessed in the EIA study for STCSTW. To address the potential water quality changes due to extension of the STSTW outfall, three water quality assessment scenarios as simulated under the EIA study for STCSTW, namely Scenario 5 (normal operation of STCSTW), 6b (4-week THEES Maintenance Discharge from Tai Po STW and STCSTW) and 7 (Emergency Bypass from STCSTW) have been re-assessed under this Study to address the potential water quality impacts due to presence of the PRS during the operation phase.

4.6.18 The assessment indicates that there is no other significant deviations of water quality modelling results predicted between this Study and that in the EIA study for STCSTW, no change / update in the findings of the EIA study of STCSTW is needed. No adverse water quality impact would therefore be expected from the Project.

Sewerage / Sewage Discharge

4.6.19 Sewage will be generated from the new development of the PRS. A public sewerage system will be built to collect and convey all the sewage effluents generated from the PRS to the existing STSTW for proper treatment and export to Victoria Harbour via Kai Tak River. No direct discharge of sewage effluent into the marine environment would be allowed and hence no adverse water quality impact would be anticipated from sewage generated from new development of the PRS. The existing emergency bypass outfall of STSTW in Tolo Harbour will be reprovisioned to farther as the existing outfall location is located within the PRS.

4.6.20 The existing design capacity of STSTW of 340,000 m^3 per day has been reviewed to be sufficient to cater for the sewage flow generated from the future developments within the catchment of STSTW including the future developments of the PRS. No upgrading of STSTW or new sewage treatment works are required for handling the sewage generated from the future development of PRS. No sewage effluent would be discharge to the Tolo Harbour and hence no adverse water quality impact in Tolo Harbour would be anticipated.

Surface Run-off and Drainage Discharge

4.6.21 Other potential source of impact on water quality during the operational phase would be non-point source surface runoff from the open paved areas of the PRS. The surface runoff may contain small amount of oil and grit that may cause water quality impacts to the nearby receiving marine and inland waters. However, impacts upon water quality will be minimal provided that a proper drainage system will be provided to receive surface run-off at the planning and design stages. With proper implementation of recommended mitigation measures and best management, for example, provision of catchpits and perimeter channels, adverse impact associated with the discharge of runoff is not anticipated.

4.7 Conclusion

Construction Phase

Marine-based Construction

4.7.1 The marine-based works including proposed dredging works for reprovision of the STSTW submarine outfall and filling works for the reclamation of the PRS has been assessed using the Delft3D Model. The result indicates that with implementation of proposed mitigation measures, no exceedance of assessment criteria at the identified WSRs such as flushing water intakes, FCZs and coral sites after commencement of construction works for the PRS. No adverse water quality impacts due to marine-based construction of the Project would therefore be expected.

Land-based Construction

4.7.2 For land-based works, water quality monitoring and regular site inspection will be implemented for the construction works to ensure that the recommended mitigation measures are properly implemented, and hence the Project would not result in adverse water quality impacts.

Operation Phase

4.7.3 During the operation of the PRS, the preliminary assessment indicates that

a) no significant change in current velocities at Tolo Harbour and Shing Mun River were predicted with presence of the PRS, and hence no significant change in flow discharge in absolute terms is anticipated;

b) slight SS and *E-coli* impact to WSD flushing water intakes were predicted but no significant effect on the health and environment is anticipated as WSD's practice is to treat flushing water to reduce the SS and *E-coli* to safe levels before supplying to the end-users;

c) no other significant deviations of water quality modelling results predicted between this Study and that in the EIA study brief no. ESB-273/2014 for STCSTW. Hence no change/ update in the findings of the EIA study of STCSTW; and

d) no direct discharge of sewage effluent to marine environment and hence no adverse water quality impact is anticipated from sewage generated from the developments of the PRS. Hence, no adverse water quality impact in Tolo Harbour is anticipated. With proper implementation of the recommended mitigation measures, it is anticipated that the water quality impacts associated with the non-point source discharge from road surfaces and developed areas of the PRS would be minimized. Moreover, the water quality impacts of the diversion of the submarine rising main of THEES and twin 2,500mm dia. submarine outfall pipes will be assessed in the future EIA study if diversion is preferred after the review.

5 PRELIMINARY AIR QUALITY IMPACT ASSESSMENT

5.1 Objectives

5.1.1 The Preliminary Air Quality Impact Assessment mainly covers the concerns of the stakeholders on air quality due to the reclamation works and the potential odour issue.

5.2 Environmental Legislations, Standards and Guidelines

5.2.1 The criteria for evaluating air quality impacts and the guidelines for air quality assessment include the following:-

- Annex 4 and Annex 12 of the EIAO-TM;
- Air Pollution Control (Construction Dust) Regulation; and
- Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation.

5.2.2 The Air Pollution Control Ordinance (APCO) provides the statutory authority for controlling air pollutants from a variety of sources. The Hong Kong Air Quality Objectives (AQOs), which stipulate the maximum allowable concentrations over specific periods for typical pollutants, should be met. The relevant AQOs are listed in **Table 5.2.1**.

Table 5.2.1 Hong Kong AQOs

Pollutants	Averaging Time	Concentration Limit ($\mu g/m^3$)(1)	Number of Exceedance Allowed per Calendar Year
Respirable Suspended Particulates (RSP) (PM_{10})(2)	24-hour	100	9
	Annual	50	N/A
Fine Suspended Particulates (FSP) ($PM_{2.5}$)(3)	24-hour	75	9
	Annual	35	N/A
Nitrogen Dioxide (NO_2)	1-hour	200	18
	Annual	40	N/A
Sulphur Dioxide (SO_2)	10-min	500	3
	24-hour	125	3

Remarks:
(1) Measured at 293K and 101.325kPa
(2) Suspended particulates in air with a nominal aerodynamic diameter of 10μm or smaller.
(3) Suspended particulates in air with a nominal aerodynamic diameter of 2.5μm or smaller.

5.2.3 Apart from AQOs, the limit of hourly Total Suspended Particulates (TSP) concentration should not exceed 500 $\mu g/m^3$ (measured at 25°C and one atmosphere) for construction dust impact assessment according to Annex 4 of EIAO-TM.

5.2.4 In accordance with Annex 4 of EIAO-TM, the limit of 5 odour units based on an averaging time of 5 seconds for odour prediction assessment should not be exceeded at any ASRs.

5.3 Description of Environment

5.3.1 The Study Area is located at the mouth of Shing Mun River and covers entire area of MLS, Pak Shek Kok and Sha Tin Districts which is a new town area with mainly residential buildings and educational institutes. Existing air quality in the Study Area is affected by emissions from the existing traffic from Tolo Highway and Tate's Cain Highway.

5.3.2 The nearest EPD fixed air quality monitoring station is located at Sha Tin Government Secondary School. The annual average monitoring data recorded at EPD's Sha Tin air quality monitoring station has shown steady trend of pollutants' concentration in the past five

years. The recent five years (2012 - 2016) different time average concentrations are summarized in **Table 5.3.1.**

Table 5.3.1 Average Concentrations of Pollutant in the Recent Five Years (Year 2012 – 2016) at Sha Tin EPD Air Quality Monitoring Station

Pollutant	2016	2015	2014	2013	2012	Mean
Maximum Hourly TSP Concentration (μg/m³) [1]	N/A	N/A	N/A	136	110	123
Annual Average TSP Concentration (μg/m³) [1]	N/A	N/A	N/A	57	54	56
10th Highest Daily Average PM_{10} Concentration (μg/m³)	66	79	93	107	85	86
Annual Average PM_{10} Concentration (μg/m³)	29	34	39	42	39	37
10th Highest Daily Average $PM_{2.5}$ Concentration (μg/m³)	44	60	67	85	62	64
Annual Average $PM_{2.5}$ Concentration (μg/m³)	20	24	25	29	26	25
19th Highest Hourly Average NO_2 Concentration (μg/m³)	137	175	171	180	177	168
Annual Average NO_2 Concentration (μg/m³)	38	41	44	47	43	43

Remarks:
[1] Monitoring data of TSP after 2013 are not available

5.4 Identification of ASRs

5.4.1 In accordance with Annex 12 of the EIAO-TM, domestic premises, hotel, hostel, hospital, clinic, nursery, temporary housing accommodation, school, educational institution, office, factory, shop, shopping centre, place of public worship, library, court of law, sports stadium or performing arts centre are considered as ASRs.

5.4.2 Potentially affected ASRs by the Project are generally identified within 500m study boundary from the Project boundary. Details of representative ASRs are summarized in **Table 5.4.1**. The locations of ASRs are illustrated in **Figure 5.4.1** and **Figure 5.4.2** during construction phase and operation phase respectively.

Table 5.4.1 Representative ASRs

ID	Description	Land Use	Shortest Distance to Project Boundary (m)	Construction Phase	Operation Phase
A01	SAE Technology Centre at HKSP	Commercial	54	✓	✓
A02	Photonic Centre at HKSP	Commercial	65	✓	✓
A03	Hong Kong Institute of Biotechnology	Education Institute	123	✓	✓
A04	Postgraduates Hall of CUHK	Residential	230	✓	✓
A05	The Sir Philip Hadden-Cave Sports Field	Recreational	241	✓	✓
A06	Student Residence of CUHK (Wu Ho Man Yuen Building)	Residential	223	✓	✓
A07	Shanghai Fraternity Association Research Services	Education Institute	200	✓	✓
A08	Hyatt Regency Hong Kong Sha Tin	Hotel	232	✓	✓

ID	Description	Land Use	Shortest Distance to Project Boundary (m)	Construction Phase	Operation Phase
A09	MOWDIST MNDIV HKPF (1)	G/IC	13	✓ (before Phase 1a is completed)	x
A10	Planned comprehensive development at existing STSTW site	Residential/ Commercial	257	x	✓
A11	S.K.H. Ma On Shan Holy Spirit Primary School	Education Institute	295	✓	✓
A12	Kam Tai Court	Residential	336	✓	✓
A13	Tak Sun Secondary School	Education Institute	388	✓	✓
A14	Mountain Shore	Residential	393	✓	✓
A15	Sausalito	Residential	395	✓	✓
A16	La Coasta	Residential	410	✓	✓
A17	Ocean View	Residential	417	✓	✓
A18	Baycrest	Residential	470	✓	✓
A19	Vista Paradiso	Residential	500	✓	✓
A20	Relocated MOWDIST MNDIV HKPF	G/IC	Within the PRS	✓ (after Phase 1a is completed)	✓

Remarks:
(1) Marine Outer Waters District Headquarters and Marine North Division (A09) will be closed and relocated. It is regarded as air sensitive receiver until its closure.

5.5 Identification of Potential Impacts during Construction Phase

Identification of Key Air Pollution Sources

5.5.1 The identified potential air quality impacts during construction phase of the Project from fugitive dust emissions are generated by construction activities such as sand filling above water, placement and removal of surcharge and site formation works during reclamation at potential works areas within the Project boundary. The tentative working hours would be 07:00 to 19:00 for all works sites. Potential fugitive dust impacts (TSP, RSP and FSP emissions) on adjacent ASRs would be expected from these activities.

5.5.2 Vehicular emission from the existing open road traffic is also the contributor to the cumulative construction dust impact.

Identification of Key Air Pollutants of Emission from Construction Activities

5.5.3 Major construction activities with significant particulate emission include loading/ unloading of spoils, material handling and wind erosion of exposed site area. Particulates from these construction activities would be the major air pollutant during construction phase. According to Annex 4 of the EIAO-TM, TSP is the criteria pollutant for construction dust impact assessment. Quantitative assessment of TSP emission impact as well as other particulates PM_{10} and $PM_{2.5}$ stipulated in AQOs is conducted for assessing construction dust impact due to the Project.

5.6 Assessment Methodology for Construction Stage

Construction Dust Emission from Project Site

5.6.1 Construction activities with significant particulate emission are identified from the construction method suggested by engineering design. Construction dust impact is predicted based on emission factors from US Environmental Protection Agency (USEPA) Compilation of Air Pollution Emission Factors (AP-42), 5th edition and activity information from the engineer design. The major dusty construction activities for the Project to be concerned and considered in the modelling assessment include:

- Site Formation Works for the reclamation sites, drainage works and road works within the Project area;
- Sand filling, material handlings, surcharging, loading and unloading of sand fill materials within the construction site modelled as heavy construction activities; and
- Wind erosion of open active work site during non-working hours.

5.6.2 Works activities and plants would not be concentrated in certain areas of the site close to ASRs for an extended period of time during the construction period. However, notwithstanding that such a scenario would not be expected to occur, a hypothetical Tier 1 screening test assuming 100% active area of construction site of the Project with mitigation measures in place has been undertaken for predicting hourly average TSP, daily average RSP and FSP levels. It aims to highlight the hot spot locations where construction dust may potentially become an issue. However, it should be emphasised that Tier 1 screening test is a hypothetical one which is very conservative and does not occurred in reality.

5.6.3 The tier results have allowed a more focused next tier assessment to be undertaken at the specific hot spot locations where TSP/RSP/FSP non-compliance is predicted under the Tier 1 screening test. A focused Tier 2 assessment is undertaken whereby the percentage of maximum active works areas, which is calculated based on total number of operating plant for dusty construction activities, for each stage of the Project are positioned closest to the potentially worst affected ASRs. A more conservative percentage of active works area of 10% is assumed for the Tier 2 assessment, which is a practicable assumption.

5.6.4 For the ASRs which would still be adversely affected by the construction works under Tier 2 assessment, a Tier 3 assessment would be conducted with further limitation of size of the active work area of the Phase nearest to the affected ASR to 5% of monthly average work area of the work contract. The limitation of the active work area in Tier 2 and Tier 3 assessment is workable.

5.6.5 In terms of the annual average prediction, the highest percentage active work area is less than 10% during any short period of time based on the engineers' estimation. It is assumed that 10% of hourly/daily assessment emission rates are adopted for the long-term annual predictions for RSP/FSP. The emission factors for identified dust sources are summarized in **Table 5.6.1**.

Table 5.6.1 Emission Factor for Dusty Construction Activities

Emission Source	Activity	Emission Factor	Remarks
Site Formation Works, Drainage Works and Road Works at Reclamation Sites	Heavy Construction Activities	E(TSP) = 2.69 Mg/hectare/month of activity E(RSP) = 2.69 x 47.3% Mg/hectare/month[1] E(FSP) = 2.69 x 7.2% Mg/hectare/month[1]	100% area actively operating (for hourly and daily concentration prediction) 10% area actively operating (for annual concentration prediction) AP-42, Section 13.2.3, 1/95 ed.

Emission Source	Activity	Emission Factor	Remarks
	Wind Erosion	E(TSP)=0.85 Mg/hectare /year E(RSP) = 0.85 x 47.3% Mg/hectare/month[1] E(FSP) = 0.85 x 7.2% Mg/hectare/month[1]	100% area actively operating (for hourly and daily concentration prediction) 10% area actively operating (for annual concentration prediction) AP-42, 5th ed., Table 11.9-4

Remarks:
[1] Reference from USEPA AP-42, 5th ed. 11/06 ed. Section 13.2.3

5.6.6 Construction dust emission factors in AP-42 would be in terms of TSP. Fractions of finer particulates are to be estimated from the TSP emission which requires the size distribution information of the concerned process, in order to compare against the AQOs. The particle size distributions of general construction processes are available in AP-42 by USEPA. Particle size distributions of general construction processes are listed in **Table 5.6.2.** Construction dust emission inventory in RSP (PM_{10}) and FSP ($PM_{2.5}$) are estimated by applying the factors of associated process to TSP emission.

Table 5.6.2 Particle Size Distribution

Process	Cumulative % of TSP		
	RSP	FSP	Reference
Aggregate Handling (equivalent to Heavy Construction Activities)	47.3%	7.2%	Page 13.2.4-4, Section 13.2.4, AP-42, USEPA (Version 11/06)

5.6.7 For the prediction of the highest hourly average TSP, the 10th highest daily average and annual average RSP and FSP concentrations, 12-hour (07:00-19:00) per day, 7 days a week is assumed for the construction period in the assessment. Only wind erosion is assumed for other non-working hours (19:00 to 07:00 of the following day).

Vehicular Emission from Existing Open Roads

5.6.8 Particulates come from the vehicular emission in the vicinity of the Project, in particular Tolo Highway, Tate's Cairn Highway, Science Park Road and Ning Tai Road, are considered in the cumulative construction phase impact assessment.

5.6.9 The projected 24-hour traffic flows and vehicle compositions are adopted in this air quality assessment.

5.6.10 EMFAC-HK v3.3 model is adopted to estimate the vehicle emission rates of particulate matters, both RSP and FSP. The "vehicle fleet" refers to all motor vehicles operating on roads within this assessment area. The modelled fleet is broken down into 16 vehicle classes based on the information in the Transport Monthly Digest and vehicle population provided by EPD.

Background Contribution

5.6.11 An integrated modelling system, Pollutants in the Atmosphere and their Transport over Hong Kong model (PATH-2016) which is developed and maintained by EPD is applied to estimate the background pollutant concentrations.

5.6.12 The Study Area covers 5 grid cells of PATH-2016, namely grid (44,43), (44,44), (44,45), (45,43) and (45,44). PATH-2016 data for Year 2020 of these 5 grid cells are adopted as the background concentration for the assessment.

Determination of the Assessment Scenarios

5.6.13 The construction phase (2022 – 2029) is divided into 3 phases, which are Phase 1a (2022 – 2025), Phase 1b (2023 – 2027) and Phase 2 (2025 – 2029).

5.6.14 Both assessment scenarios 1 and 2 are based on the conservative assumptions as mentioned in **Table 5.6.3** to determine the worst construction dust impact on the representative ASRs over the whole construction period.

Table 5.6.3 Assumption for Two Construction Dust Assessment Scenarios

Scenarios	Work Site Area & ASRs Considered in the Assessment	Justification
Scenario 1: Year 2022 – Year 2026 (Phase 1a + Phase 1b)	All work sites in Phase 1a and Phase 1b All representative existing ASRs except the relocated MOWDIST MNDIV HKPF (A20)	As a conservative approach, assume all work sites under Phase 1a and Phase 1b undertaking the dusty construction activities concurrently in the assessment.
Scenario 2: Year 2026 – Year 2029 (Activity 11 of Phase 1b + Phase 2)	Work sites for Activity 11 – Roadworks, Drainage, Utilities under Phase 1b and all work sites in Phase 2 All representative existing ASRs except the existing MOWDIST MNDIV HKPF (A9)	As a conservative approach, assume all work sites under Activity 11 of Phase 1b and Phase 2 undertaking the dusty construction activities concurrently in the assessment.

5.6.15 The cumulative emission sources considered in both scenarios are listed in **Table 5.6.4**.

Table 5.6.4 Cumulative Dust Emission Sources

Emission	Cumulative Dust Sources
Construction Dust	As described in **Table 5.6.3**
Open Road Traffic	All existing roads within 500 m assessment area. As a conservative approach, the open road traffic emission will be assessed based on the highest traffic flow within the construction years i.e. Year 2029. The traffic data of Year 2029 will be adapted to the EMFAC-HK model set as the construction commencement year, i.e. Year 2022, to estimate the hourly emission factors of each vehicles classes.
Background Contributions	PATH-2016 Data for Year 2020

Dispersion Modelling & Concentration Calculation

5.6.16 AERMOD, Gaussian dispersion model recommended by EPD, is adopted to assess the potential dust impact from the construction works. Assessment heights up to the roof level of the respective ASRs are adopted for the construction dust impact assessment.CALINE4, the EPD approved line source air dispersion model developed by the California Department of Transport, is used to assess the contribution due to vehicular emissions from the roads within 500 m assessment area. The surface roughness coefficient of each grid in each assessment scenario is 100cm, which is the typical value for new development areas advised in "Guidelines on Choice of Models and Model Parameters" by EPD. The grid-specific WRF meteorological data have also been adopted to calculate the hourly impact. PCRAMMET has been applied to generate Pasquill-Gifford stability class for the meteorological input to CALINE4 model based on the WRF meteorological data.

5.6.17 The future prevailing RSP background concentrations for both assessment scenarios are extracted from the PATH-2016 model run for Year 2020 for the corresponding grids. The FSP concentration is calculated in accordance with the EPD's "Guidelines on the Estimation of $PM_{2.5}$ for Air Quality Assessment in Hong Kong". (That is Annual FSP background = 0.71 * Annual RSP from PATH model and Daily FSP background = 0.75 * Daily RSP from PATH-2016 model.). The hourly TSP concentration are assumed to be the same as that for RSP, as the best estimation.

5.6.18 Cumulative dust impacts upon ASRs are derived from the sum of predictions by local air quality models and background concentration from PATH-2016 system on hour-by-hour basis. Averaging results, namely hourly, daily and annual, are derived from the cumulative hour-by-hour results in accordance with Title 40, Code of Federal Regulations, USEPA 40 CFR Part 51 "Revision to the Guideline on Air Quality Models, Version 2005". Cumulative

average predictions at each ASR amongst 365 days are ranked by highest concentration and compared with the maximum allowable concentration to determine the number of exceedance throughout a year. The dust impact upon ASRs is evaluated by number of exceedance per annum against the AQO criteria.

5.7 Prediction and Evaluation of Environmental Impact during Construction

5.7.1 The cumulative air quality impact due to emissions from construction activities and vehicular traffic at representative existing ASRs in Year 2022 – Year 2026 (Scenario 1) and Year 2026 – Year 2029 (Scenario 2) has been evaluated. The predicted cumulative results are summarized in **Table 5.7.1**.

Table 5.7.1 Predicted Cumulative Construction Dust Impact at Representative ASRs (Unmitigated)

Scenario	Maximum Hourly TSP Conc. (μg/m³)	10th Highest Daily RSP Conc. (μg/m³)	Annual RSP Conc. (μg/m³)	10th Highest Daily FSP Conc. (μg/m³)	Annual FSP Conc. (μg/m³)
Year 2022 – Year 2026	352 - **24253**	68 - **768**	30 - **52**	51 - **186**	21 - 25
Year 2026 – Year 2029	363 - **14311**	68 - **707**	30 - 45	51 - **171**	21 - 25

5.8 Mitigation of Adverse Environmental Impacts during Construction Phase

5.8.1 In order to minimise the construction dust impact, the following dust mitigation measures shall be implemented:

1) Watering once every 2 hours on active works areas, exposed areas and unpaved haul roads during working hours to reduce dust emission by 91.7%. In fact, watering frequency would be subject to the actual site condition. For example, a construction activity that produces inherently wet conditions or in cases under rainy weather, the above water application intensity may not be unreservedly applied. While the above watering frequency is to be followed, the extent of watering may vary depending on actual site conditions but should be sufficient to achieve the removal efficiency.

Year 2022 – 2026 (Scenario 1)

5.8.2 With the implementation of the mitigation measures described in the above section, the predicted cumulative maximum hourly average TSP, 10th highest daily and annual average RSP and FSP concentrations at the representative ASRs are summarised in **Table 5.8.1**.

Table 5.8.1 Predicted Cumulative Construction Dust Impact at Representative ASRs in Year 2022 – Year 2026 (Mitigated, Tier 1)

ASR ID	Maximum Hourly TSP Conc. (μg/m³)	10th Highest Daily RSP Conc. (μg/m³)	Annual RSP Conc. (μg/m³)	10th Highest Daily FSP Conc. (μg/m³)	Annual FSP Conc. (μg/m³)
A01	234 - **3620**	70 - 87	31 - 32	53 - 54	22 - 22
A02	243 - **3310**	73 - **114**	31 - 33	53 - 59	22 - 22
A03	211 - **1445**	71 - **141**	30 - 34	52 - 62	21 - 22
A04	211 - 212	70 - 71	30 - 30	52 - 52	21 - 21
A05	212 - 215	72 - 73	30 - 31	53 - 53	22 - 22
A06	211 - 217	71 - 73	30 - 30	52 - 53	21 - 22
A07	212 - **1121**	73 - **131**	30 - 33	53 - 62	22 - 22
A08	206 - **745**	71 - **103**	31 - 32	52 - 60	22 - 22
A09	349 - **2064**	72 - **127**	31 - 32	53 - 59	22 - 22
A11	209 - 380	70 - 71	31 - 31	53 - 53	22 - 22
A12	209 - 425	70 - 71	31 - 31	53 - 53	22 - 22
A13	209 - 452	70 - 71	31 - 31	53 - 53	22 - 22
A14	209 - 440	70 - 71	31 - 31	53 - 53	22 - 22
A15	209 - 418	70 - 72	31 - 31	53 - 53	22 - 22
A16	209 - 394	70 - 71	31 - 31	53 - 53	22 - 22
A17	211 - 489	68 - 73	30 - 30	51 - 52	21 - 21
A18	211 - 442	68 - 72	30 - 30	51 - 52	21 - 21
A19	211 - 420	68 - 70	30 - 30	51 - 52	21 - 21

Remarks: Bolded and underlined figure represents exceedance of relevant limits stipulated in EIAO-TM and AQOs. The range of the results means the predicted concentrations at the ASRs within the site at all assessment heights.

5.8.3 Those ASRs with non-compliance in particulates levels under Tier 1 screening during the construction of the Project are selected to undergo Tier 2 assessment accordingly. In Year 2022 – Year 2026 scenario, there are 9 and 5 nos. of non-compliance ASRs required for TSP (hourly average) and RSP (daily average) Tier 2 assessment respectively. The active work areas of concurrent construction phases are positioned closest to the potentially worst affected ASRs. The predicted cumulative maximum hourly average TSP and 10th highest daily average RSP concentrations at the ASRs of Tier 2 scenarios are presented in **Table 5.8.2.**

Table 5.8.2 Predicted Cumulative Construction Dust Impact at Representative ASRs in Year 2022 – Year 2026 (Mitigated, Tier 2)

ASR ID	Assessment Height (mAG)	Maximum Hourly TSP Conc. (μg/m³)	
A01	1.5	234	
	5	216	
A02	5	216	
A09	5	215	
ASR ID	**Assessment Height (mAG)**	**Maximum Hourly TSP Conc. (μg/m³)**	**10th Highest Daily RSP Conc. (μg/m³)**
A02	1.5	334	77
A03	1.5	355	79
A07	1.5	377	75
A08	1.5	428	77
A09	1.5	**724**	80

Remarks:
Bolded and underlined figure represents exceedance of relevant limits stipulated in EIAO-TM and AQOs. The range of the results means the predicted concentrations at the ASRs within the site at all assessment heights.

5.8.4 According to the above Tier 2 assessments, ASR A09 would still exceed the criterion of hourly average TSP levels stipulated in EIAO-TM. Tier 3 assessments for this ASR are then conducted with reduction in active works area of the nearest Phase (i.e. Phase 1b for A09 case) to 5% of monthly average work. 5% of monthly average work area during any short period of time is considered practical applying for this ASR. The predicted cumulative maximum hourly average TSP at A09 of Tier 3 scenario is 436 μg/m³. The results show that construction dust impact on this ASR would comply with the criteria with implementation of reduced active works area nearby. However, no existing or planned ASR is identified within these predicted exceedance areas during the construction phase of the Project. The results show that construction dust impact in Year 2022 – Year 2026 would comply with the criteria with implementation of reduced active works area nearby.

Year 2026 – 2029 (Scenario 2)

5.8.5 With the implementation of the mitigation measures, the predicted cumulative maximum hourly average TSP, 10th highest daily and annual average RSP and FSP concentrations at the representative ASRs are summarised in **Table 5.8.3.** It is noted that the 10th highest daily average FSP and annual average RSP and FSP concentrations at the representative ASRs would comply with the AQOs. However, exceedance of hourly average TSP and 10th highest daily average RSP would still be predicted at some ASRs which are located in proximity to the work sites. Tier 2 assessment is required for these affected ASRs.

Table 5.8.3 Predicted Cumulative Construction Dust Impact at Representative ASRs in Year 2026 – Year 2029 (Mitigated, Tier 1)

ASR ID	Maximum Hourly TSP Conc. (μg/m³)	10th Highest Daily RSP Conc. (μg/m³)	Annual RSP Conc. (μg/m³)	10th Highest Daily FSP Conc. (μg/m³)	Annual FSP Conc. (μg/m³)
A01	216 - 398	70 - 72	31 - 31	53 - 53	22 - 22
A02	216 - **575**	71 - 75	31 - 31	53 - 53	22 - 22
A03	211 - **864**	69 - 85	30 - 31	52 - 55	21 - 22
A04	211 - 212	69 - 69	30 - 30	52 - 52	21 - 21
A05	212 - 212	70 - 70	30 - 30	52 - 53	21 - 22
A06	211 - 212	69 - 70	30 - 30	52 - 53	21 - 22
A07	212 - **1010**	70 - **126**	30 - 33	53 - 63	21 - 22
A08	206 - **1245**	70 - **136**	31 - 33	52 - 63	22 - 22
A11	209 - **932**	70 - 80	31 - 31	53 - 53	22 - 22

ASR ID	Maximum Hourly TSP Conc. (μg/m³)	10th Highest Daily RSP Conc. (μg/m³)	Annual RSP Conc. (μg/m³)	10th Highest Daily FSP Conc. (μg/m³)	Annual FSP Conc. (μg/m³)
A12	209 - **970**	70 - 77	31 - 31	53 - 53	22 - 22
A13	209 - **792**	70 - 75	31 - 31	53 - 53	22 - 22
A14	209 - **812**	70 - 74	31 - 31	53 - 53	22 - 22
A15	209 - **773**	70 - 73	31 - 31	53 - 53	22 - 22
A16	209 - **731**	70 - 73	31 - 31	53 - 53	22 - 22
A17	211 - **934**	68 - 82	30 - 30	51 - 52	21 - 21
A18	211 - **822**	68 - 76	30 - 30	51 - 52	21 - 21
A19	211 - **784**	68 - 75	30 - 30	51 - 52	21 - 21
A20	268 - **692**	71 - 72	31 - 31	53 - 53	22 - 22

Remarks:
Bolded and underlined figure represents exceedance of relevant limits stipulated in EIAO-TM and AQOs. The range of the results means the predicted concentrations at the ASRs within the site at all assessment heights.

5.8.6 Those ASRs with non-compliance in particulates levels under Tier 1 screening during the construction of the Project are selected to undergo Tier 2 assessment. In Year 2026 – Year 2029 scenario, there are 16 and 2 nos. of non-compliance ASRs required for TSP (hourly average) and RSP (daily average) Tier 2 assessment respectively. The active work areas of concurrent construction phases are positioned closest to the potentially worst affected ASRs. The predicted cumulative maximum hourly average TSP and 10th highest daily average RSP concentrations at the ASRs of Tier 2 scenarios are presented in **Table 5.8.4**.

Table 5.8.4 Predicted Cumulative Construction Dust Impact at Representative ASRs in Year 2026 – Year 2029 (Mitigated, Tier 2)

ASR ID	Assessment Height (mAG)	Maximum Hourly TSP Conc. (μg/m³)	
A02	1.5	404	
	5	223	
A03	1.5	**504**	
A11	1.5	361	
A12	1.5	331	
A13	1.5	263	
A14	1.5	334	
A15	1.5	277	
A16	1.5	280	
A17	1.5	307	
A18	1.5	314	
A19	1.5	286	
A20	1.5	310	
	5	262	
ASR ID	**Assessment Height (mAG)**	**Maximum Hourly TSP Conc. (μg/m³)**	**10th Highest Daily RSP Conc. (μg/m³)**
A07	1.5	290	77
A08	1.5	473	79

Remarks:
Bolded and underlined figure represents exceedance of relevant limits stipulated in EIAO-TM and AQOs. The range of the results means the predicted concentrations at the ASRs within the site at all assessment heights.

5.8.7 According to the above Tier 2 assessments, ASR A03 would still exceed the criterion of hourly average TSP levels stipulated in EIAO-TM. Tier 3 assessments for this ASR are then conducted with reduction in active works area of the nearest Phase (i.e. Roadworks, Drainage, Utilities of Phase 1b for A03 case) to 5% of monthly average work. 5% of monthly average work area during any short period of time is considered practical applying for this ASR. The predicted cumulative maximum hourly average TSP at A03 of Tier 3 scenario is 470 μg/m³. The results show that construction dust impact on this ASR would comply with the criteria with implementation of reduced active works area nearby. However, no fresh air intake is identified within the predicted exceedance areas during the construction phase of the Project, i.e. no air sensitive areas within the exceedance areas. The modeling results indicate that the predicted cumulative particulate concentrations in Year 2026 – Year 2029 at all representative ASRs would comply with the respective AQOs and criteria stipulated in EIAO-TM.

5.9 Identification and Evaluation of Potential Impacts during Operational Phase

Identification of Potential Emissions during Operation Phase

5.9.1 Potential air pollution sources affecting the Project during operational phase would include vehicular traffic emission (NO_2, RSP and FSP) from the existing (mainly from Tolo Highways and Tate's Cairn Highway) and proposed open roads, odour emission from relocated STSTW and SPSs, as well as the emission (NO_2, SO_2, RSP and FSP) from marine vessels to and from the relocated MOWDIST MNDIV, HKPF.

Vehicular Emission

5.9.2 Adequate buffer distances between the air sensitive uses at the PRS and vehicular traffic emission sources based on the requirements of the HKPSG will be considered in the formation of development layout. In order to provide an initial evaluation of the potential air quality impact arising from the existing vehicular emission in the vicinity of the PRS. A preliminary air quality assessment has been conducted.

5.9.3 The predicted cumulative air quality impact due to vehicular emission at assessment points in Year 2029 is tabulated in **Table 5.9.1**. It shows that the NO_2 concentrations at the assessment points along the Project boundary would be well below the respective AQO criteria. It is considered that the PRS should have adequate buffer distance from the vehicular emission sources and no adverse vehicular emission impact from Tolo Highway to the PRS.

Table 5.9.1 Predicted Cumulative Air Quality Impact Due to Vehicular Emission at Assessment Points in Year 2029

Assessment Point	Assessment Height (mAG)	19th Highest Hourly NO_2 Conc. ($\mu g/m^3$)	Annual NO_2 Conc. ($\mu g/m^3$)
O1	1.5	110	19
	5	110	19
	10	108	18
	15	105	17
	20	102	17
O2	1.5	121	22
	5	119	21
	10	115	20
	15	110	18
	20	105	17
O3	1.5	123	23
	5	122	22
	10	116	21
	15	111	19
	20	105	18
O4	1.5	116	23
	5	115	22
	10	112	21
	15	108	19
	20	102	18
O5	1.5	133	27
	5	129	26
	10	119	22
	15	112	20
	20	105	18
O6	1.5	105	20
	5	105	20
	10	103	19
	15	99	18
	20	96	18

Remarks:
Bolded and underlined figure represents exceedance of relevant limits stipulated in AQOs.

Emissions from Marine Traffic and Helicopter

5.9.4 The marine traffic from the relocated MOWDIST MNDIV, HKPF will be similar to the present condition. It is considered the impact from the vessel emissions is similar. [redacted] the helipad located at the relocated MOWDIST MNDIV, HKPF would be used as emergency use during 0700-1900 hours. In addition, the flight path and the helipad would be located at least 151m and 360m from the ASRs. Therefore, adverse impact from helicopter emission would not be anticipated.

Evaluation of Cumulative Impacts

5.9.5 The proposed land uses of the reclamation site would be used for GIC, residential, commercial and educational developments, there is no pollution industry to be recommended in the reclamation site. The traffic in the surrounding road network may be increased due to the operation of the Project, however, the separation distances between the existing ASRs and the trunk roads/primary distributor/district distributor would still fulfil the requirements of HKPSG, and no adverse traffic emission impact induced from the Project is anticipated.

Odour Emission

5.9.6 Odour emission from the relocated STSTW and the proposed SPSs under this Project may pose potential odour impact to the ASRs in the vicinity. However, according to the approved EIA Report of STCSTW (EIA-240/2016), the odour concentration at all representative ASRs in the vicinity of relocated STSTW would be well below the criterion of 5 OU/m^3 with the installation of deodorizing units. Further, deodorizers would also be provided for the proposed SPSs which are practical odour mitigation measures to a number of SPSs in Hong Kong. No adverse odour impact would be expected at the planned ASRs on the Project site.

5.9.7 Odour patrol was conducted under this Study to provide information on the existing condition around the Project Site and Shing Mun River. The odour patrol results show that there is no noticeable odour source along the odour patrol route, apart from the existing Sha Tin Sewage Treatment Works, the Stables of the Sha Tin Race Course and the air relief valves chamber of Shatin Main Pumping Station. Therefore, no odour impact is expected from the existing Shing Mun River.

5.10 Other Recommended Mitigation Measures

Construction Phase

5.10.1 In addition to the dust control measures described in above section, dust suppression measures stipulated in the Air Pollution Control (Construction Dust) Regulation and good site practices listed below should be considered to minimize dust emission from the work site:

- For large area formation and excavation, where feasible, should take the excavation by phases in order to avoid exposure of large area of bare ground.
- Soil compacting, grass spraying and use of water sprinklers, etc. can be adopted to excavated area and bare ground in order to prevent dust generation.
- Scattered dust and materials within the construction site should be cleaned regularly.
- Use of regular watering with complete coverage, to reduce dust emissions from exposed site surfaces and unpaved roads, particularly during dry weather.
- Every vehicle should be washed to remove any dusty materials from its body and wheels before leaving the construction sites.
- Dump trucks for material transport should be totally enclosed by impervious sheeting;

- The area where vehicle washing takes place and the section of the road between the washing facilities and the exit point should be paved with concrete, bituminous materials or hardcore.
- Every main haul road should be kept clear of dusty materials or sprayed with water in order to maintain the entire road surface wet.
- The load of dusty materials carried by vehicles leaving a construction site should be covered entirely by clean impervious sheeting to ensure dusty materials do not leak from the vehicle.

Operational Phase

5.10.2 Buffer distance suggested by HKPSG should be followed in order to minimize the impact of the traffic emission from the open roads.

5.10.3 In order to minimize the potential odour emissions, the following mitigation measures in reference to Environmental Guideline Note for Sewage Pumping Station which is not a Designated Project (DP) are recommended for the proposed SPSs under this Project:

- All the major odour sources should be enclosed.
- Odorous gas should be treated in the deodorizing units before discharging into the atmosphere.

5.11 Conclusion

Construction Phase

5.11.1 Air quality impacts from the construction works of the Project would mainly be related to fugitive dust emissions generated by various construction activities, including sand filling above water, placement and removal of surcharge, site formation works and wind erosion etc., at all potential works areas. With the implementation of mitigation measures specified in the Air Pollution Control (Construction Dust) Regulation, proposed dust suppression measures and good site practices checked by regular site environmental audits, no adverse dust impact on the ASRs in the vicinity of the construction site would be anticipated.

Operation Phase

5.11.2 No adverse air quality impact would be expected during the operational phase of the Project.

5.11.3 Apart from the above preliminary assessment, CEDD had engaged IOFC to conduct an expert evaluation for site wind availability study and air ventilation as well as urban climatic map separately. According to IOFC's expert evaluation, the annual prevailing wind of the site is mainly from the northeast while the summer prevailing wind is mainly from the southwest. The site is relatively narrow. Assuming a stepped height profile, provision of appropriate breezeway, vegetated airpaths and greenery area, no adverse air ventilation issue is anticipated. Based on the urban climatic map prepared by IOFC, no adverse urban climatic issue is expected.

6 PRELIMINARY NOISE IMPACT ASSESSMENT

6.1 Objectives

6.1.1 The Preliminary Noise Impact Assessment mainly covers the concerns of the stakeholders on noise pollution due to the reclamation works.

6.2 Environmental Legislations, Standards and Guidance

6.2.1 Noise impacts are assessed in accordance with the criteria and methodology given in the Technical Memoranda (TMs) under the Noise Control Ordinance (NCO) and the EIAO and the Project Brief. Besides, EPD's ProPECC PN 2/93 sets out assessment criteria and requirements relating to construction noise not currently controlled under the NCO.

6.2.2 The NCO provides a statutory framework for noise control. Assessment procedures and standards are set out in the following TMs:

- TM on Noise from Construction Work other than Percussive Piling (GW-TM);
- TM on Noise from Percussive Piling (PP-TM);
- TM on Noise from Construction Work in Designated Areas (DA-TM); and
- TM on Noise from Places other than Domestic Premises, Public Places or Construction Sites (IND-TM).

6.2.3 With regard to the assessments of the construction noise impact during restricted hours and operational fixed plant noise impact, the NCO designates acceptable noise levels for NSRs on the basis of an Area Sensitivity Rating, based on the characteristics of the area within which they are located such as rural, village, low-density residential, or urban (see **Table 6.2.1**). Within these areas, the presence of "influencing factors" (IFs) (such as the presence of industrial activities or major roads) can further affect the Area Sensitivity Rating and hence the acceptable noise levels.

Table 6.2.1 Area Sensitivity Ratings

Type of Area Containing NSR	Degree to which NSR is Affected by Influencing Factor		
	Not Affected	Indirectly Affected	Directly Affected
Rural area	A	B	B
Urban area	B	C	C
Low density residential area consisting of low-rise or isolated high-rise developments	A	B	C
Area other than those above	B	B	C

Construction Noise

6.2.4 The NCO provides the statutory framework for noise control of construction works, other than percussive piling, using PME between 1900 and 0700 hours or at any time on Sundays and general holiday (i.e. restricted hours). Noise control on construction activities taking place at other times is subject to the Criteria for Evaluating Noise Impact stated in Table 1B of Annex 5 in the EIAO-TM. The noise limit is L_{eq}(30 minutes) 75 dB(A) at the façades of dwellings and L_{eq}(30 minutes) 70 dB(A) at the façade of schools (L_{eq}(30 minutes) 65 dB(A) during examinations).

6.2.5 For construction noise that are not controlled under NCO, ProPECC PN 2/93 stated that construction noise at the residential dwellings should not exceed L_{eq}(30-minute) 75dB(A), and construction noise at the schools should not exceed L_{eq}(30-minute) 70 dB(A) (65 dB(A) during examinations) between 0700 and 1900 hours on any day not being a general holiday.

6.2.6 Between 1900 and 0700 hours and all day on Sundays and public holidays, activities involving the use of PME for the purpose of carrying out construction works is prohibited unless a Construction Noise Permit (CNP) has been obtained. A CNP may be granted provided that the Acceptable Noise Level (ANL) for the NSRs can be complied with. ANLs are assigned depending upon the Area Sensitive Rating. The corresponding basic noise levels (BNLs) for evening and night time periods are given in **Table 6.2.2**.

Table 6.2.2 BNLs

Time Period	BNLs, dB(A)		
	Area Sensitive Rating A	Area Sensitive Rating B	Area Sensitive Rating C
Evening (1900 to 2300 hours) (1)	60	65	70
Night (2300 to 0700 hours)	45	50	55

Note:
(1) Includes Sundays and Public Holidays during daytime and evening.

6.2.7 The Noise Control Authority will consider a well-justified CNP application, for construction works within restricted hours as guided by the relevant TM issued under the NCO. The Noise Control Authority will take into account of contemporary conditions / situations of adjoining land uses and any previous complaints against construction activities at the site before making his decision in granting a CNP. Nothing in this Study shall bind the Noise Control Authority in making his decision. If a CNP is to be issued, the Noise Control Authority shall include in it any condition he thinks fit. Failure to comply with any such conditions will lead to cancellation of the CNP and prosecution action under the NCO.

6.2.8 Under the DA-TM, the use of five types of Specified Powered Mechanical Equipment (SPME) and three types of Prescribed Construction Work (PCW) within a designated area during restricted hours would require a valid CNP. The SPME includes hand-held breaker, bulldozer, concrete lorry mixer, dump truck and hand-held vibratory poker. The PCW are:

- Erecting or dismantling of formwork or scaffolding;
- Loading, unloading or handling of rubble, wooden boards, steel bars, wood or scaffolding material; and
- Hammering.

6.2.9 In general, it should not be presumed that a CNP would be granted for carrying out PCW within a designated area during restricted hours. The CNP may be granted for the execution of construction works during restricted hours involving the use of PME and/ or SPME if the relevant ANLs and criteria stipulated in the GW-TM and DA-TM can be met.

6.2.10 Percussive piling is prohibited between 1900 and 0700 hours on any weekday not being a general holiday and at any time on Sunday or general holiday. A CNP is required for the carrying out of percussive piling between 0700 and 1900 hours on any day not being a general holiday. PP-TM sets out the requirements for working and determination of the permitted hours of operations. Referring to the construction method for the Project, percussive piling is not usually required.

6.3 Description of Environment

6.3.1 The Study Area is located at the mouth of Shing Mun River. South of the Study Area is the existing STSTW and Hong Kong Police Force Marine North Divisional Station. North of the

Study Area is HKSP. Located west of the Study Area is CUHK and MTR East Rail Line University Station. East of the Study Area is Sha Tin Hoi and existing residential area of Ma On Shan area is located farther east.

6.3.2 Existing noise environment in the Study Area is dominated by road traffic noise from Tolo Highway and Tate's Cain Highway, railway noise from East Rail Line, and marine traffic noise and helicopter noise from emergency use of the helipad at MOWDIST MNDIV, HKPF.

6.4 Noise Sensitive Receivers

6.4.1 In accordance with Annex 13 of the EIAO-TM, any domestic premises including temporary housing, school, educational institution, hospitals, medical clinics, homes for the aged, convalescent homes, places of worship, libraries, courts of law, performing arts centres, auditoria, and amphitheaters are identified as NSRs. The Study Area is the areas within 300 m from the Project area.

Existing NSRs

6.4.2 In order to evaluate the noise impacts from the Project, existing representative NSRs within the Study Area are identified for assessment. Only the first layer of NSRs has been identified as representative for assessment because it would provide acoustic shielding to those receivers at further distance behind. **Figure 6.4.1** shows the locations of the identified existing representative NSRs and the details of the NSRs are summarized in **Table 6.4.1**.

Table 6.4.1 Existing Representative NSRs

ID	Description	Land Use [1]	Distance from Project Boundary, m	Rely on Opened Windows for Ventilation	Noise Impact Affecting the NSR induced from the Project [2]
N1	Hong Kong Institute of Biotechnology	E	120	No	-
N2	Postgraduates Hall of HKCU	R	210	Yes	C, T, F, H
N3	Student Residence of HKCU (Wu Ho Man Yuen Building)	R	240	Yes	C, T, F, H
N4	Shanghai Fraternity Association Research Services	E	260	No	-
N5	S.K.H. Ma On Shan Holy Spirit Primary School	E	230	Yes	C, T, F, H
N6	Tak Sun Secondary School	E	320	Yes	C, H
N7	Ocean View	R	320	Yes	C, H
N8	Vista Paradiso	R	320	Yes	C, H
N9	Kam Fung Court	R	330	Yes	C, H

Note:
[1] E = Educational; R = Residential.
[2] C = Construction Noise; T = Road Traffic Noise; F = Fixed Plant Noise; H = Helicopter Noise.

6.4.3 NSRs N1 and N4 are provided with central air conditioning and do not rely opened windows for ventilation. Therefore, they are not considered as representative NSRs in the assessment.

6.4.4 NSRs N6, N7, N8 and N9 are located outside 300m assessment boundary from the Project. However, as they are the first layer NSRs to the east, they are selected to demonstrate construction noise compliance at these NSRs.

6.5 Evaluation of Construction Noise

Identification of Potential Impacts

6.5.1 Marine-based construction works, including seawall construction works and filling works, and land-based construction works such as site formation works and road construction would be undertaken during construction phase of the Project. Construction activities will involve the use of PME. Construction noise associated with the use of PME is therefore anticipated.

6.5.2 Construction works would be expected to be carried out in non-restricted hours (0700-1900). No percussive piling would be expected according to the programme in this stage. If the Contractors in future use percussive piling for some construction works or the use of PMEs within the restricted hours, CNP should be obtained from the Noise Control Authority prior to commencement of the relevant construction works.

Methodology

6.5.3 The construction noise impact assessment follows the procedures given in the GW-TM. For the assessment of noise from PME, the distance attenuation is determined by using the following formula:

Distance Attenuation in dB(A) = 20 log D + 8 [where D is distance in metres]

6.5.4 Sound Power Levels (SWL) of equipment are taken from Table 3 of the GW-TM. Where no SWL is given in the GW-TM, reference is made to British Standard 5228: Part 1: 2014 Code of Practice for noise and vibration control on construction and open sites or previous similar studies. For each construction activity, PMEs are grouped according to their likely concurrent usage. The plant inventory and percentage on-time utilization of the PME for the assessment has been confirmed to be practical and suitable for the proposed works.

6.5.5 Noise impact is assessed on the basis of the following assumptions:

- Noise impact at the nearest sensitive facades of the representative NSRs to the source positions is assessed;
- A +3 dB(A) façade correction is added to the predicted noise levels to account for the facade effect at each NSR; and
- All PME items required for a particular construction activity is located at the notional source position, in accordance with the GW-TM.

6.5.6 In accordance with the GW-TM, the notional source position is a position mid-way between the approximate geographical centre of the construction site and its boundary nearest to the NSR. As the size of the construction site is large such that the notional source position would be greater than 50m from the point on the site boundary nearest to the NSR. The position shall be taken to be a point 50m from that point on the site boundary measured along the line between the approximate geographical centre of the site and the point on the site boundary nearest to the NSR.

Prediction and Evaluation of Noise Impacts

6.5.7 In view of the nature of the reclamation and infrastructure works, the major construction activities would include construction of seawall, filling works, surcharging, site formation, excavation, road works, foundation, building and concreting works. Potential noise impacts generated from the use of PME such as barge, excavators, dump trucks, generators, air compressors, cranes and lorries for these construction activities would be expected.

6.5.8 Based on the latest construction programme and construction plant inventory confirmed by the engineer, the construction noise levels at NSRs are predicted. The predicted construction noise levels are summarized in below **Table 6.5.1**.

Table 6.5.1 Predicted Construction Noise Levels at NSRs

NSR ID	Description	Criteria, Leq (30min) dB(A)	Criteria (exam), Leq (30min) dB(A)	Min SPL, Leq (30min) dB(A)	Max SPL, Leq (30min) dB(A)
N2	Postgraduates Hall of HKCU	75	-	55	67
N3	Student Residence of HKCU (Wu Ho Man Yuen Building)	75	-	51	67
N5	S.K.H. Ma On Sham Holy Primary School	70	65	39	65
N6	Tak Sun Secondary School	70	65	41	63
N7	Ocean View	75	-	43	63
N8	Vista Paradiso	75	-	46	61
N9	Kam Fung Court	75	-	45	58

6.5.9 For all NSRs, at normal daytime working hours, compliance of the construction noise criteria at representative NSRs under unmitigated scenario are anticipated.

6.5.10 No adverse construction noise impact is anticipated. In case of change of construction programme and/or construction plant inventory in later stages of the Project, quantitative construction noise assessment should be carried out to demonstrate no adverse noise impact associated with the changes.

6.5.11 Good site practices listed below should be adopted to abate any potential impacts during the construction phase of the Project and should be included in the contract document:

- Only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction programme.
- Silencers or mufflers on construction equipment should be utilized and should be properly maintained during the construction programme.
- Mobile plant, if any, should be sited as far away from NSRs as possible.
- Machines and plant (such as trucks) that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum.
- Plant known to emit noise strongly in one direction should, wherever possible, be orientated so that the noise is directed away from the nearby NSRs.
- Material stockpiles and other structures should be effectively utilized, wherever practicable, in screening noise from on-site construction activities.

6.5.12 Apart from the above mentioned good site practices, the noise control requirement stated in the EPD's "Recommended Pollution Control Clauses for Construction Contracts" should be adopted and enforced by incorporation into the Contractor's construction contract.

6.6 Evaluation of Operational Road Traffic Noise, Fixed Plant Noise, and Railway Noise

6.6.1 As the development plan will be formulated under the future planning and engineering study, some planning and engineering details may not be available for comprehensive assessment on the operational road traffic, fixed plant and railway noise impact at this initial stage of the project. A detailed road traffic, fixed plant and railway noise assessment on the operation phase, will be carried out to demonstrate compliance to relevant noise criteria in the future planning and engineering study, when the development plan is formulated.

6.7 Evaluation of Operational Helicopter Noise

6.7.1 Noise associated with the proposed helipad will be generated during helicopter overflight, i.e. manoeuvring over the helipad, during approach and during take-off flight.

6.7.2 According to Annex 5 of EIAO-TM, helicopter noise impacts shall be assessed in terms of the L_{max} level, which is the maximum instantaneous sound pressure level at the noise sensitive receiver. Since all the identified NSRs are located at considerable distances (over 150 m) from the helipad, helicopter noise can be considered as a 'point' source. Therefore, the sound pressure level at NSRs can be evaluated based on standard acoustic principle of a 'point' source, i.e., the sound pressure level in any direction (in the open) will decrease at a rate of 6 dB per doubling of distance away from the source. The difference in noise levels at two different distances, d_1 and d_2, can be calculated using the following formula:

$$\text{Noise Level Difference (dB)} = 20 \log_{10} (d_1/d_2)$$

6.7.3 Based on the noise levels from the helicopter, the minimum separation required between the NSRs and the helicopter flight path, and the minimum separation between the NSRs and the helipad would be proposed, such that no adverse helicopter noise impact would be anticipated at the NSRs.

6.7.4 As a worst-case assumption, it is assumed zero vertical distance between the NSRs and the helicopter, the minimum separation would then be minimum horizontal separation distance.

Prediction and Evaluation of Noise Impacts

6.7.5 This assessment is conducted based on the new H175 helicopter model, which will operate at the proposed helipad.

6.7.6 Since the helicopter "Approach" flight mode would generate the highest noise level, the recommended buffer distance would be based on this flight mode. Therefore, it is predicted that the predicted noise level, L_{max}, would be 85 dB(A) for any NSRs located 152m away from the flight path of the helicopter.

6.7.7 The assumed relocated helipad is presented in **Figure 6.7.1**. It is estimated that the helicopter flight path will be out of the minimum buffer distance of 152m from the NSRs, hence no adverse helicopter noise impact would be anticipated at the NSRs.

6.7.8 For no-lateral-movement modes, which would performed directly over the helipad only, the minimum separation distance between the helipad and the NSRs is proposed based on the "hovering" mode.

6.7.9 The recommended buffer distance between the helipad and the NSRs is presented in **Figure 6.7.1**. Given a minimum buffer distance of 359.8m between the helipad and the NSRs, no adverse helicopter noise impact would be anticipated at the NSRs.

6.7.10 The above buffer distance between the helipad is recommended based on an assumption of 7.5 dB correction factor on top of the "approach" mode. Noise measurement will be carried out in the next stage of this Project to confirm the validity of the assumed "Hovering" mode noise performance of H175 helicopter and hence the validity of the above recommended buffer distance if H175 helicopter is available in Hong Kong.

6.7.11 With the above recommended buffer distance, no further mitigation measures is required for helicopter noise.

6.8 Conclusion

6.8.1 The assessment illustrates that the predicted construction noise impact at existing representative NSRs would comply with relevant noise criteria. No adverse construction noise impact is anticipated under unmitigated scenario.

6.8.2 Preliminary helicopter noise assessment indicated that operation helicopter noise impacts could be effectively mitigated by implementing a minimum buffer distance of about 152m between the proposed helicopter flight path and the NSRs and a minimum buffer distance of about 360m between the helipad and the NSRs. Operational helicopter noise impacts would not be anticipated, given implementation of the minimum buffer distances.

[BLANK]

7 PRELIMINARY ECOLOGICAL IMPACT ASSESSMENT

7.1 Objectives

7.1.1 The Preliminary Ecological Impact Assessment mainly covers the concerns of the stakeholders on ecological impact due to the reclamation works.

7.2 Environmental Legislation, Plans, Standards and Assessment Criteria

7.2.1 Guidelines, standards, documents and ordinances/regulations listed in below were referred to during the course of the ecological impact assessment:

- The Country Parks Ordinance (Cap. 208)
- The Forests and Countryside Ordinance (Cap. 96)
- Under the Wild Animals Protection Ordinance (Cap. 170)
- The Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586)
- The amended Town Planning Ordinance (Cap. 131)
- Chapter 10 of the HKPSG.
- Annex 8 and 16 of the EIAO-TM
- EIAO Guidance Note No. 6/2010 clarifies the requirements of ecological assessments under the EIAO.
- EIAO Guidance Note No. 7/2010
- EIAO Guidance Note No. 10/2010
- EIAO Guidance Note No. 11/2010
- The IUCN Red List of Threatened Species
- The Key Protected Wildlife Species List

7.3 Assessment Methodology

7.3.1 The PRS is situated between Shing Mun River (on the south) and Tolo Harbour (on the north). It is aligned along the shoreline between the existing STSTW and the HKSP. Marine works would be a major component of the Project. Assessment area for marine ecological impact assessment covered the marine water in Tolo Harbour and Channel WCZ (refer to **Figure 7.3.1**).

7.3.2 The immediate surrounding terrestrial areas are mostly urban developed areas including the CUHK, HKSP and residential areas in Ma On Shan (refer to **Figure 7.3.2**). Sites of conservation importance were not identified in the vicinity of the Study Area. The nearest important site is Penfold Park Egretry, which is located approximately 1.5 km southwest of the Study Area (refer to **Figure 7.3.2**). Ecological survey was conducted in 2015 and ecological impact assessment focusing on the egretry were completed in 2016.

7.3.3 A desktop review was conducted to collate and review existing ecological baseline information. The relevant available literatures are listed in **Table 7.3.1**.

Table 7.3.1 Baseline Information of Ecological Resources in the Assessment Area

Relevant Literatures	*Terrestrial Ecology*	*Corals*	*Benthos*	*Intertidal*	*Marine Mammals*
(1) Summer 2013 Report: Egretry Counts in Hong Kong with Particular Reference to the Mai Po Inner Deep Bay (Anon, 2013)	✓				
(2) Summer 2014 Report: Egretry Counts in Hong Kong with	✓				

Relevant Literatures	*Terrestrial Ecology*	*Corals*	*Benthos*	*Intertidal*	*Marine Mammals*
Particular Reference to the Mai Po Inner Deep Bay (Anon, 2014)					
(3) Monitoring of Marine Mammals in Hong Kong Waters (2014-15) Final Report (1 April 2014 to 31 March 2015 (Hung, 2015)					✓
(4) Relocation of Sha Tin Sewage Treatment Works to Caverns – Feasibility Study – Preliminary Environmental Review (PER) (DSD, 2014)		✓	✓	✓	
(5) Drainage Improvement in Sha Tin and Tai Po – EIA Report (DSD, 2007)		✓		✓	
(6) Development of a Bathing Beach at Lung Mei, Tai Po – EIA Report (CEDD, 2007)		✓	✓	✓	
(7) Ecological Status and Revised Species Records of Hong Kong's Scleractinian Corals (AFCD, 2004)		✓			
(8) The Proposed Submarine Gas Pipelines from Cheng Tou Jiao Liquefied Natural Gas Receiving Terminal, Shenzhen to Tai Po Gas Production Plant, Hong Kong – EIA Report (HKCGCL, 2003)		✓	✓	✓	
(9) Feasibility Study for Housing Development at Whitehead and Lee On in Ma On Shan, Sha Tin – EIA Report (TDD, 2002)		✓			
(10) Consultancy Study on Marine Benthic Communities in Hong Kong (AFCD, 2002)			✓		

Ecological Survey

7.3.4 The following ecological surveys have been carried out for this Study:-

- Dive Survey
- Benthos Survey
- Intertidal Survey
- Ardeied Flight-line Survey
- Reconnaissance Site Visit

7.4 Description of Baseline Condition

Marine Ecology

Coral Communities

7.4.1 Spot-check dives were conducted at two sites (SC1 and SC2) (refer to **Figure 7.3.2**). The GPS coordinates, route distance, maximum depth, minimum depth, bottom substrate and bottom visibility of each survey site are summarized in **Table 7.4.1**.

Table 7.4.1 GPS Coordinates, Route Distance, Maximum Depth, Minimum Depth, Bottom Substrate and Bottom Visibility of Spot-Check Dive Sites SC1 to SC2

Site	GPS Coordinates (Starting Point)	Route Distance (m)	Min. Depth (m)	Max. Depth (m)	Bottom Substrate	Visibility (m)
SC1	E 114°13'03.29" N 22°24'28.96"	2400	1.5	4	Artificial	1

					Seawall and Sloping Boulders	
SC2	E 114°12'49.29" N 22°25'36.11"	2300	4	6.5	Mud and Sand	0.5 - 1

7.4.2 SC1 was mainly composed of artificial sloping boulders and vertical seawall. SC2 was composed of muddy and sandy bottom along the survey route. Substrates beyond the maximum depth are all muddy and with visibility less than 0.5 m.

7.4.3 Isolated patches of hard coral *Oulastrea crispata* colonies were recorded on the slopping boulders at SC1, while no coral was recorded in SC2. All coral colonies recorded are commonly found in Hong Kong waters. *Oulastrea crispata* colonies were found to be small to medium in size (about 2 cm to 25 cm in diameter). On average, the coral coverage in the survey site was low (around 1% or less to 5%) and all of them were in fair condition.

7.4.4 The other physical parameters of the REA transects are summarized in **Table 7.4.2** below.

Table 7.4.2 GPS Coordinates, Maximum Depth, Bottom Substrate and Bottom Visibility of the Four Rapid Ecological Assessment (REA) Transects

Transect	GPS Coordinates (Starting Point)	GPS Coordinates (End Point)	Max. Depth (m)	Bottom Substrate	Visibility (m)
1	E 114°12'49.59" N 22°24'43.03"	E 114°12'51.31" N 22°24'47.08"	6	Artificial Sloping Boulders	1.5
2	E 114°12'53.62" N 22°24'53.27"	E 114°12'51.81" N 22°24'58.72"	7	Artificial Sloping Boulders	1
3	E 114°12'53.42" N 22°25'10.38"	E 114°12'53.33" N 22°25'18.03"	4	Artificial Sloping Boulders	1
4	E 114°12'54.82" N 22°25'25.62"	E 114°12'52.80" N 22°25'32.68"	3	Artificial Sloping Boulders	1.5

7.4.5 The ecological and substratum attributes of the REA transects are given in **Table 7.4.3**. Sparse coverage of hard coral was recorded in all transects (6 – 10% in REA1 and REA2, 1 – 5% REA3 and REA4). The substratum along the transects was mainly made up of artificial boulders.

7.4.6 All the four transects supported a sparse and patchy cover of hard coral (6 – 10% in REA1, REA2 and 1 – 5% in REA3 and REA4). Only one species of hard coral was recorded along the transects. A total of 231, 124, 98 and 66 colonies of *Oulastrea crispata* coral colonies were recorded in REA1, REA2, REA3 and REA4 respectively during the REA survey, and most of them were grown on seawall and rocks surfaces. The coral colonies were of small size (about 2 to 10 cm in diameter) in REA1, REA2 and REA4, and small to medium size (about 2 to 25 cm in diameter) in REA3. All the coral colonies were in fair condition.

7.4.7 Most of the coral colonies were attached to large boulders which were non-movable. Only a total of 72 colonies from the four transects were feasible for translocation (i.e. attached to movable boulders less than 50 cm in diameter). All the coral colonies attached to movable boulders were the common pioneer species *Oulastrea crispata* of low ecological value and they were all recorded in fair health condition. Translocation of these coral colonies is recommended to avoid direct loss. It is suggested to translocate the coral colonies within Tolo Harbour as far as possible (e.g. Plover Cove) from the reclamation site to avoid high sedimentation rate during the construction phase.

Table 7.4.3 Ecological and Substratum Attributes of the REA Transects

Ecological Attributes	REA 1	REA 2	REA 3	REA 4
Hard Coral	1	1	0.5	0.5
Dead Coral	0	0	0	0
Octocoral (Soft corals black and gorgonians)	0	0	0	0
Anemone Beds	0	0	0	0
Dead Standing Corals	0	0	0	0

Other Benthos (sponges, zoanthids, ascidinas and bryozoans)	0.5	0.5	0.5	0.5
Macro-algae	0	0	0	0
Substratum Attributes	**REA 1**	**REA 2**	**REA 3**	**REA 4**
Hard Substrata				
Bedrock/continuous pavement	0	0	0	0
Boulder Blocks (diam.>50cm)	5	5	5	4
Boulder Blocks (diam.<50cm)	1	1	1	2
Rubble	0	0	0	1
Other	0	0	0	0
Soft Substrata				
Sand	0	0	0	1
Mud/Silt	0	0	0	0
Mud	0	0	0	0

* Rank of percentage cover: 0 = None recorded; 0.5 = 1-5%; 1 = 6-10%; 2 = 11-30 %; 3 = 31-50%; 4= 51-75 %; 5 = 76-100%.

Table 7.4.4 Ranks of Taxon Abundance along the REA Transects

Ecological Attributes	REA 1	REA 2	REA 3	REA 4
Oulastrea crispata	3	3	3	3
Sponges	3	3	3	3
Bryozoan	3	3	3	3
Saccostrea cucullata	3	3	3	3
Perna viridis	3	3	3	2
Common Black Sea Cucumber	2	1	1	1

* Rank of Abundance: 0 = Absent; 1 = Rare; 2 = Uncommon; 3 = Common; 4= Abundant; 5 = Dominant.

7.4.8 Other than isolated patches of small coral colonies, common marine invertebrate such as sponges, bryozoans, rock oyster *Saccostrea cucullata*, common green mussel *Perna viridis*, and tubeworm *Sabellastarte* japonica were recorded along the REA transects. No other rare or species of conservation importance (including Spotted Seahorse) were recorded during survey.

Benthos Communities

7.4.9 Benthos survey was conducted at three sampling sites (B1 to B3) during both wet and dry seasons in May and November 2015 (refer to **Figure 7.3.2**). Sampling points were selected at coastal areas of MLS inside Inner Tolo Harbour. The sediments were mainly made up of soft mud (~90-95%) at all sampling sites. The sediment collected in wet season was grey in colour, with a thin, brown surface observed at B2 and B3. Mild to moderate level of hydrogen sulphite smell was detected from sediments at all sampling sites collected, which indicated moderate content of organic matter inside the sediments. Sediments collected from dry season were similar with that in wet season, except for B3 which showed black colour indicating anoxic condition.

7.4.10 A total of 11 benthos fauna from the phylum of Mollusca, Annelida and Arthropoda were recorded (refer to **Table 7.4.5**). They were identified to 4 taxa (2 polychaete species, 1 bivalve taxon and 1 unidentified juvenile shrimp). All species are commonly found in Hong Kong. No fauna was recorded from dry season samplings. No benthic species of conservation importance were recorded.

Table 7.4.5 Total Abundance and Biomass of Each Phylum

Phylum	No. of individuals	Percentage (%)	Biomass (g)	Percentage (%)
Wet Season (May 2015)				
Mollusca	5	45	0.8842	95
Annelida	4	36	0.0312	3
Arthropoda	2	18	0.0130	1
Total	**11**	-	**0.9284**	-
Dry Season (November 2015)				
No fauna recorded				

7.4.11 The fauna recorded at each sampling sites are presented in **Table 7.4.6**. From the wet season sampling, no fauna was recorded at B1. The total abundances were very low at B2 (2 ind.) and B3 (9 ind.). There was neither dominant nor abundant taxon at all sampling sites. Bivalve *Barbatia* sp. (7 – 10 ind./m^2 at B2 and B3) and polychaete *Alitta succinea* (10 ind./m^2 at B3) were the relatively common fauna in the surveyed area. No fauna were recorded from dry season samplings.

Table 7.4.6 List of Fauna at Each Sampling Site

Sampling Site	Group	Taxa	Density (ind./m^2)	Biomass (g/m^2)	Relative abundance (%)
Wet Season (May 2015)					
B1	-	No fauna collected	-	-	-
B2	B	*Barbatia* sp.	7	1.02	100
B3	B	*Barbatia* sp.	10	1.93	33
	P	*Alitta succinea*	10	0.10	33
	S	Unidentified juvenile shrimp	7	0.04	22
	P	*Sigambra hanaokai*	3	0.01	11
Dry Season (November 2015)					
B1	-	No fauna recorded	-	-	-
B2	-	No fauna recorded	-	-	-
B3	-	No fauna recorded	-	-	-

Note:
(1) B = Bivalve, P = Polychaete, S = Shrimp.

7.4.12 For the wet season sampling, the species number (1 – 4 spp./0.3 m^2), density (7 – 30 ind./m^2) and biomass (0.95 – 1.31 g/m^2) were very low at B2 and B3. Since there was only one taxon recorded at B2, species diversity (*H'*) and species evenness (*J*) could not be calculated. At B3, the species diversity (*H'*) was low (1.31) but the species evenness (*J*) was high (0.95). Such high evenness was due to the low number of species recorded (4 spp./0.3 m^2), contributing to an apparently even distribution of specimen recorded, which might not represent the true status of the benthic community. No fauna was recorded from dry season sampling. Details on the number of species, abundance, biomass, Shannon-weaver Diversity Index (*H'*) and Pielou's Species Evenness (*J*) recorded at each sampling sites are presented in **Table 7.4.7**.

Table 7.4.7 Number of Species, Abundance, Biomass, Species Diversity and Evenness at Each Sampling Site

Sampling Site	B1	B2	B3
Wet Season (May 2015)			
Number of species (spp./0.3 m^2)	N/A	1	4
Abundance (ind./m^2)	N/A	7	30
Biomass (g/m^2)	N/A	1.02	2.08
Species diversity (*H'*)	N/A	N/A	1.31
Species evenness (*J*)	N/A	N/A	0.95
Dry Season (November 2015)			
No fauna recorded			

7.4.13 A territory-wide benthic survey was commissioned by AFCD and conducted by the Centre for Coastal Pollution and Conservation, City University of Hong Kong in 2001. A site approximately 1 km north of the PRS was sampled during the survey (Benthic Sampling Station 104) (AFCD, 2002). Information obtained from the survey was further analysed by Shin *et al.* (2004), and the benthic community was spatially divided into four groups in Hong Kong waters (North-eastern waters, Eastern and Southern waters, Victoria Harbour, Deep Bay). Waters of 'Eastern and Southern waters' group was characterized as unpolluted while that of other groups suffered from long-term sewage pollution (EPD, 2006). The PRS occurs within the 'North-eastern waters' group. **Table 7.4.8** presents the mean *H'* and *J* values of benthic communities of the four groups and current survey area. Based on the results of sampling, the mean *H'* of the three sampling sites was 0.44 only, much lower than other

three polluted water groups 'North-eastern waters', 'Victoria Harbour' and 'Deep Bay', reflecting the long-term stress of organic enrichment and low oxygen condition on the benthic communities. Since the *J* value could not be calculated for B1 and B2 while it was not representative at B3, the mean *J* value was omitted. Both *H'* and *J* values were not available for dry season as no benthic fauna was recorded from the sampling.

Table 7.4.8 Mean Species Diversity (*H'*) and Species Evenness (*J*) of Benthic Communities at Different Waters

		MLS (Current Survey)	Benthic Sampling Station 104 (1)	North-eastern (2)	Eastern & Southern (2)	Victoria Harbour (2)	Deep Bay (2)
H'	Wet Season	0.44	2.81	1.42	2.87	1.79	1.46
	Dry Season	N/A	0.63	0.36	0.82	1.64	2.32
J	Wet Season	N/A	0.90	0.73	0.82	0.47	0.53
	Dry Season	N/A	0.39	0.83	0.81	0.44	0.73

Note:
(1) AFCD (2002).
(2) Shin *et al.* (2004).

Intertidal Communities

7.4.14 Intertidal ecological survey was conducted at the coastline of Tolo Harbour area on 16 and 17 June 2015 during wet season, and 17 November 2015 during dry season. Three intertidal sampling sites (T1 – T3) were surveyed. T1 was located at the Ma On Shan side of Tolo Harbour, T2 was located at MLS area and T3 was located at Science Park area (refer to **Figure 7.3.2**). T1 was composed of artificial vertical seawall, while T2 and T3 were composed of artificial slopping boulders.

7.4.15 Referring to **Table 7.4.9**, T1 showed the lowest number of species among the three surveyed sites while T2 and T3 showed the highest. All the species recorded during the walk-through survey are common and no species of conservation importance were recorded.

Table 7.4.9 Intertidal Species Recorded during the Walk-Through Survey

Species Name	Distribution in Hong Kong	Wet Season			Dry Season		
		T1	T2	T3	T1	T2	T3
Encrusting Algae							
Kyrtuthrix maculans	Common	x	x	x	x	x	x
Hildenbrandia rubra	Very Common	x	x	x	x	x	x
Erect Algae							
Gelidium pusillum	Common	x	x	x	x	x	x
Ulva sp.	Very Common		x			x	
Sessile Invertebrates							
Barnacles							
Balanus amphitrite	Very Common	x	x	x	x	x	x
Bivalves							
Saccostrea cucullata	Very Common	x	x	x	x	x	x
Barbatia virescens	Common	x	x	x	x	x	x
Isognomon isognomum			x			x	
Perna viridis	Common	x	x	x	x	x	x
Sea-anemones							
Haliplanella lineata	Common		x	x		x	x
Mobile Invertebrates							
Sea Slaters							

Species Name	Distribution in Hong Kong	Wet Season			Dry Season		
		T1	T2	T3	T1	T2	T3
Ligia exotica	Common	x	x	x	x	x	x
True Crab							
Metopograpsus frontalis	Common		x	x		x	x
Chiton							
Acanthopleura japonica	Very Common	x	x	x	x	x	x
Limpets/False Limpets							
Cellana toreuma	Very Common	x	x	x	x	x	x
Patelloida pygmaea	Very Common	x	x	x	x	x	x
Siphonaria japanica	Common	x	x	x	x	x	x
Periwinkle							
Echinolittorina trochoides	Very Common	x	x	x	x	x	x
Echinolittorina radiata	Very Common	x	x	x	x	x	x
Echinolittorina vidua	Common		x	x		x	x
Planaxid Snails							
Planaxis sulcatus	Common	x	x	x	x	x	x
Topshells							
Monodonta labio	Very Common	x	x	x	x	x	x
Whelks							
Thais clavigera	Very Common	x	x	x	x	x	x
Morula musiva	Very Common	x	x	x	x	x	x
	Total No. of Species	**18**	**23**	**21**	**18**	**23**	**21**

7.4.16 During quantitative line transect survey conducted during the wet season, 15 to 17 species were recorded at the three transects; while quantitative line transect survey during dry season recorded 15 to 17 species at each transect. All the species recorded during the survey were either very common or common in Hong Kong. No species of conservation importance were recorded.

Terrestrial Ecology

Ardeid Flight Line Survey

7.4.17 During the flight line survey, undertaken from April to July 2015, Black-crowned Night Heron, Chinese Pond Heron, Great Egret and Little Egret were recorded. A total of 208 flight lines of breeding ardeids from the egretry were recorded. It was found that ardeids generally flying at a height of less than 20 m. Most of the ardeids were recorded flying northeast and south from the egretry, towards the eastern and southern bank of Shing Mun River, and towards the river next to Mui Tsz Lam Road. Ardeids were also observed landing on the intertidal shoreline at the southern boundary of the PRS.

7.4.18 Most (70.7%) of the ardeids were recorded perching, transiting or foraging outside the PRS. Only 4.3% of the breeding ardeids were recorded flying across the PRS while 12.5% used flight line which crosses a short distance over the southern corner of the PRS. It was observed that a small portion of arheids landed within the PRS, perching on piers and artificial sloping boulders. No foraging ardeids were observed within the PRS.

7.4.19 Species of conservation importance recorded from current survey has been summarized in the following **Table 7.4.10**.

Table 7.4.10 Species of Conservation Importance Recorded within the Assessment Area

Species	Distribution in Hong Kong	Protection Status	Recorded Locations
Flora			
Silver-back Artocarpus (*Artocarpus hypargyreus*)	Common [1]	Near Threatened [4] Vulnerable [5]	Plantation
Butulang Canthium (*Canthium dicoccum*)	Common [1]	Vulnerable [5]	Plantation
Small Persimmon (*Diospyros vaccinioides*)	Very common [1]	Critically Endangered [5]	Plantation
Luofushan Joint-fir (*Gnetum luofuense*)	Very common [1]	Near Threatened [5]	Plantation

Species	Distribution in Hong Kong	Protection Status	Recorded Locations
Fauna			
Avifauna			
Great Egret (*Ardea alba*)	Common [2]	PRC (RC) [6]	Developed Area [9] Intertidal Habitat
Little Egret (*Egretta garzetta*)	Common [2]	PRC (RC) [6]	Developed Area [9] Intertidal Habitat
Black Kite (*Milvus migrans*)	Common [2]	(RC) [6] Class II [7]	Plantation [9] Developed Area [9]
Hard Coral			
Oulastrea crispata	Common [3]	Cap. 586 [8]	Subtidal Hard Substrate Habitat

Note:
(1) Corlett *et al.* (2000)
(2) AFCD (2015)
(3) Chan *et al.* (2005)
(4) Fu & Chin (1992). China Plant Red Data Book – Rare and Endangered Plants
(5) IUCN (2015). IUCN Red List Version 2015.4
(6) Fellowes *et al.* (2002): RC=Regional Concern; PRC=Potential Regional Concern
Letter in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence
(7) List of Wild Animals under State Protection (promulgated by State Forestry Administration and Ministry of Agriculture on 14 January, 1989)
(8) Cap. 586 – Protection of Endangered Species of Animals and Plants Ordinance
(9) Recorded in-flight

7.5 Impact Identification and Evaluation

Construction Phase

Direct Impact

Direct Impact to Sites of Conservation Importance

7.5.1 Given the distances between the PRS and the sites of conservation importance (e.g. Kei Ling Ha Mangal SSSI, Ting Kok SSSI, Hoi Ha Wan SSSI, CPA, Penfold Park Egretry), these sites would not be directly impacted by the reclamation at PRS.

Habitat Loss – Marine

7.5.2 The PRS would result in direct loss of low value marine habitats (no more than 60 ha) including subtidal hard substrate habitat (artificial vertical seawall and artificial sloping boulders) and subtidal soft substrate habitat (soft bottom seabed). The loss of these subtidal habitats would be permanent. Due to the low ecological value and the low abundance of wildlife currently supported by both subtidal habitats, the impact from habitat loss is anticipated to be minor.

7.5.3 No natural intertidal shoreline would be impacted by the reclamation. The PRS would result in the direct loss of low value artificial shoreline of artificial vertical seawall and artificial sloping boulders (approximately 2 km). Due to the low ecological value and low abundance of wildlife currently supported by the artificial intertidal habitat, impact from loss of intertidal habitat is anticipated to be minor. It should be noted that intertidal artificial seawall would be re-provided along the shoreline of PRS.

7.5.4 While two avifauna species of conservation importance including Great Egret and Little Egret were recorded at intertidal artificial shoreline habitat within the PRS, such habitat is very common in Hong Kong and readily available within the Assessment Area and its vicinity. Both species were also recorded utilizing such intertidal habitat outside the PRS. Given that these habitats are common outside the PRS, and similar intertidal shoreline habitat would be re-provided, only minor impact to the two avifauna species is anticipated.

Habitat Fragmentation – Marine Ecology

7.5.5 The proposed reclamation would be undertaken adjacent to the existing shoreline. No habitat fragmentation of subtidal seabed is anticipated.

7.5.6 The existing subtidal seawall and intertidal shoreline to the northwest (along HKSP) and to the south (along Shing Mun River) would be fragmented upon the reclamation. As artificial

seawall would be re-provided upon the reclamation, the future seawall would form a continuous line with the existing seawall. The fragmentation impact of subtidal seawall and intertidal shoreline would be temporary and anticipated to be minor.

Habitat Loss and Fragmentation – Terrestrial Ecology

7.5.7 As construction would be limited to marine works, with no land-based works, no habitat loss or fragmentation of terrestrial habitats (developed area and plantation) are expected.

Direct Injury / Mortality

7.5.8 The reclamation would lead to inevitable loss of hard coral species Oulastrea crispata, which was recorded on subtidal seawall and boulder surfaces within the PRS. This species is currently protected under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586), and is a common pioneer species in Hong Kong waters. Due to its abundance in Hong Kong, the loss of this species is anticipated to be minor.

Indirect Impact

Disturbance to Sites / Species of Conservation Importance

7.5.9 Given the distance between the marine sites of conservation importance (Kei Ling Ha Mangal SSSI, Ting Kok SSSI, Hoi Ha Wan SSSI, CPA) and the PRS, indirect impact such as noise, air quality/dust, and glare during the reclamation is not anticipated.

7.5.10 Penfold Park Egretry exists approximately 1.5 km southwest of the PRS, with developed area (e.g. Sha Tin Sewage Treatment Works, Tolo Highway) situated between the Egretry and the PRS. Given its distance with the PRS, indirect impacts (e.g. air quality/dust, noise, vibration, or glare during the potential reclamation) to the Egretry are not anticipated.

7.5.11 Potential disturbance impacts from the reclamation on the ardeids in Penfold Park Egretry include obstruction of flight paths and disturbance resulting from construction activities, leading to potential displacement of flight path (ardeids selecting different routes to their destination, or flying at a greater height to avoid tall machineries/structures in the construction site). This would potentially cause an increase in energy exertion of the ardeids, thus potentially affecting their foraging and breeding success.

7.5.12 No foraging ardeids were observed within the PRS. About 70% of the ardeids were recorded perching, transiting or foraging outside the PRS. The reclamation would not result in major obstruction of flight paths, and the ardeids arse anticipated to utilize alternative flight paths in the vicinity (e.g. flying across CUHK). Minor impact is anticipated from the reclamation on the flight route of breeding ardeids.

Construction Disturbance – Terrestrial Ecology

7.5.13 Noise, vibration, air quality/dust, and glare impacts would be generated during the construction phase of the Project but would only impact habitats adjacent to the PRS. As plantation habitat and developed area in the vicinity of the PRS are regarded as of low ecological values, impacts to these habitats are anticipated to be very minor. Nonetheless, standard good site practice should be put in place during construction to further minimize potential disturbance impact to the terrestrial habitats.

Construction Disturbance – Marine Ecology

7.5.14 Potential indirect impact to the marine habitats resulting from underwater shockwave and acoustic disturbance is possible.

7.5.15 Subtidal habitats within the Assessment Area are regarded as of low ecological values and support low abundance of wildlife, with no known acoustically sensitive organisms existing within the Assessment Area. The impact from the underwater disturbance from construction works is anticipated to be minor.

Impact on Marine Water Quality

7.5.16 Filling will be required for the construction of the PRS. Potential indirect impacts to water quality such as increased levels of SS due to dredging/filling and surface runoff from construction site would be expected. Thus, the marine sites of conservative importance (e.g. coral colonies, mangrove communities, Kei Ling Ha Mangal SSSI and Ting Kok SSSI etc.) may experience indirect impacts due to changes in water quality and increased sedimentation from the marine works. Strategic mitigation measures including integrated use of leading seawall and silt curtains to enclose the marine construction works, non-dredging method, control of fines content in fill material and control of production rates for marine works are suggested to minimize the indirect water quality impacts.

Operation Phase

Indirect Impact

Disturbance to Sites / Species of Conservation Importance

7.5.17 Given their distance from the PRS, no sites of conservation importance occurring in the vicinity of the PRS would be indirectly impacted by air quality / dust, and noise disturbance during the operation phase of the PRS.

7.5.18 Penfold Park Egretry is surrounded by well-developed residential areas and Penfold Park. Ardeids utilizing the Egretry are likely acclimatized to the existing level of night-time light in the area. Given the distance between the Egretry and the PRS (1.5 km), insignificant impact is anticipated on the Egretry due to the increase of night-time light during the operation of PRS.

7.5.19 Potential disturbance impacts from the operation of PRS on the ardeids in Penfold Park Egretry include increase of local vehicles and human activities, as well as obstruction of flight paths by developments such as residential buildings. There could be potential displacement of flight path (ardeids selecting different routes to their destination, or flying at a greater height to avoid buildings). This would potentially cause an increase in energy exertion of the ardeids, thus potentially affecting their foraging and breeding success.

7.5.20 70.7% of the breeding ardeids from Penfold Park Egretry utilize area outside the PRS. Low percentage of ardeids utilizing flight line between Penfold Park Egretry and the Centre Island (4.3%) would be obstructed due to the reclamation, while increase in energy exertion of ardeids in flight line between Penfold Park Egretry and Ma On Shan Promenade is expected to be minor due to the short distance impacted. The operation of PRS would not result in major obstruction of flight paths, and the ardeids are anticipated to utilize alternative flight paths in the vicinity (e.g. flying across the CUHK). Minor impact is anticipated from the operation of the PRS on the breeding ardeids.

Disturbance to Terrestrial Habitats

7.5.21 Given the low ecological values of existing habitats and the existing level of disturbance from developed area in the vicinity (e.g. road traffic and railway traffic from East Rail Line), additional disturbance impact from the operation of PRS is anticipated to be very minor.

Impact to Marine Water Quality

7.5.22 Possible indirect water quality changes during operational phase could arise from the potential change in the flow regime of Tolo Harbor due to the change in coastline

configuration caused by the PRS. To minimize the water quality impacts, all the sewage effluent and wastewater to be generated from the PRS during the operational phase will be collected and diverted to the public sewerage system for proper treatment and disposal. No direct discharge of sewage effluent into the marine environment would be allowed and hence no adverse water quality impact upon the marine ecological resources would be anticipated from sewage generated from new population.

Evaluation of Ecological Impact

7.5.23 Potential ecological impacts on habitats and Penfold Park Egretry associated with the construction and the operation of the Project have been evaluated in accordance with the EIAO-TM Annex 8, as presented in the following **Table 7.5.1** to **Table 7.5.6**.

Table 7.5.1 Evaluation of Ecological Impacts to Subtidal Hard Substrate Habitat within the Assessment Area

Criteria	Subtidal Hard Substrate Habitat
Habitat Quality	Low
Species	1 hard coral species of conservation importance (*Oulastrea crispata*) recorded
Size / Abundance	Approximately 2 km of artificial vertical seawall would be lost
Duration	Direct impact (loss of artificial vertical seawall within PRS) would be temporary – given artificial seawall would be re-provided at future shoreline of PRS
Reversibility	Direct impact (loss of artificial vertical seawall within PRS) would be reversible – given artificial seawall would be re-provided at future shoreline of PRS
Magnitude	Low
Overall Impact Evaluation	**Minor**

Table 7.5.2 Evaluation of Ecological Impacts to Soft Bottom Habitat within the Assessment Area

Criteria	Soft Bottom Habitat
Habitat Quality	Low
Species	No species of conservation importance recorded
Size / Abundance	No more than 60 ha of seabed would be lost
Duration	Direct impact (loss of seabed within PRS) would be permanent
Reversibility	Direct impact (loss of seabed within PRS) would be irreversible
Magnitude	Low
Overall Impact Evaluation	**Minor**

Table 7.5.3 Evaluation of Ecological Impacts to Intertidal Habitat within the Assessment Area

Criteria	Intertidal Habitat
Habitat Quality	Low
Species	No rare intertidal species or intertidal species of conservation importance recorded 2 avifauna species (Great Egret and Little Egret) of conservation importance recorded
Size / Abundance	Approximately 2 km of artificial shoreline would be lost upon reclamation
Duration	Direct impact (loss of intertidal shoreline within PRS) would be temporary – given intertidal shoreline would be re-provided at future shoreline of PRS
Reversibility	Direct impact (loss of intertidal shoreline within PRS) would be reversible – given intertidal shoreline would be re-provided at future shoreline of PRS
Magnitude	Low
Overall Impact Evaluation	**Minor**

Table 7.5.4 Evaluation of Ecological Impacts to Plantation Habitat within the Assessment Area

Criteria	Plantation
Habitat Quality	Low
Species	4 flora species (*Artocarpus hypargyreus*, *Canthium dicoccum*, *Diospyros vaccinioides* and *Gnetum luofuense*) and 1 avifauna species (Black Kite) of conservation importance recorded
Size / Abundance	Habitat would not be directly affected.
Duration	*Construction Phase* Indirect impacts due to construction disturbance and increased human activities would be temporary. *Operation Phase* Increase in disturbance and human activities would be permanent.
Reversibility	Indirect impacts due to construction disturbance and increased human activities would be reversible. Indirect impacts due to disturbance and increased human activities from operation of PRS would be irreversible.
Magnitude	No significant increase in disturbance during construction and operation phases.
Overall Impact Evaluation	**Very minor**

Table 7.5.5 Evaluation of Ecological Impacts to Developed Area Habitat within the Assessment Area

Criteria	Developed Area
Habitat Quality	Low
Species	3 avifauna species (Great Egret, Little Egret and Black Kite) of conservation importance recorded
Size / Abundance	Habitat would not be directly affected.
Duration	*Construction Phase* Indirect impacts due to disturbance and increased human activities would be temporary. *Operation Phase* Increase in disturbance and human activities would be permanent.
Reversibility	Indirect impacts due to construction disturbance and increased human activities would be reversible. Indirect impacts due to disturbance and increased human activities from operation of PRS would be irreversible.
Magnitude	No significant increase in disturbance during construction and operation phases.
Overall Impact Evaluation	**Very minor**

Table 7.5.6 Evaluation of Ecological Impacts to Penfold Park Egretry

Criteria	Penfold Park Egretry
Habitat Quality	Moderate
Species	5 ardeid species (Great Egret, Little Egret, Black-crowned Night Heron, Chinese Pond Heron and Eastern Cattle Egret) of conservation importance recorded
Size / Abundance	Habitat would not be directly affected. Obstruction of flight line between Penfold Park Egretry and the Centre Island (9 individuals, 4.3%) from the reclamation. Minor obstruction of flight line between Penfold Park Egretry and Ma On Shan Promenade (26 individuals, 12.5%) from the reclamation.
Duration	*Construction Phase* Indirect impacts due to disturbance and increased human activities, and obstruction in flight path would be temporary. *Operation Phase* Increase in disturbance and human activities, and obstruction in flight path would be permanent.

Criteria	Penfold Park Egretry
Reversibility	Indirect impacts due to disturbance and increased human activities, and obstruction in flight path during construction phase would be reversible. Indirect impacts due to disturbance and increased human activities, and obstruction in flight path from operation of PRS would be irreversible.
Magnitude	Low
Overall Impact Evaluation	**Minor**

7.6 Conclusion

7.6.1 The preliminary assessment examines the flora, fauna and other components of the ecological habitats within the assessment areas. It also identifies the potential ecological impacts to the natural environment and the associated wildlife groups and habitats/species arising from the PRS.

7.6.2 Based on the survey conducted in 2015 and the assessment completed in 2016, it shows that the direct ecological impact due to the loss of marine habitats within the PRS (subtidal artificial vertical seawall, soft bottom seabed, and intertidal shoreline) is anticipated to be minor. All three habitats are assessed to be of low ecological values with low diversity and abundance of wildlife recorded. According to the dive surveys conducted, no spotted seahorse (*Hippocampus kuda*) was recorded. In addition, direct loss of a locally common hard coral species *Oulastrea crispata* within the PRS is anticipated to be of minor impact. It also shows that direct ecological impact due to habitat loss of intertidal artificial shoreline habitat within the PRS is anticipated to be of minor impact to the ardeid species. Furthermore, given the low ecological values of the marine habitats, the direct ecological impact due to fragmentation of subtidal seawall and intertidal shoreline would be of minor impact. Eco-shoreline is a kind of shoreline which provides beneficial functions to the local ecosystem through a range of active or passive solutions, whilst coastal protection. It represents a paradigm shift in the fundamental approach to sustainable and environmentally friendly construction, from "minimizing impact" to "creating ecological benefit". Eco-shorelines could also provide beautiful and natural open space for the enjoyment by public. Hence, eco-shoreline could be considered to enhance the ecological value and biodiversity after reclamation.

[BLANK]

8 PRELIMINARY LANDSCAPE AND VISUAL IMPACT ASSESSMENT

8.1 Objectives

8.1.1 The Preliminary Landscape and Visual Impact Assessment (LVIA) investigates the potential landscape and visual impacts due to the PRS. A baseline study on the existing key landscape and visual resources within the Landscape Impact Assessment study boundary of 500m from the PRS and key visual resources within the visual envelope are identified and their sensitivity is evaluated. Potential landscape and visual impact, and appropriate mitigation measures are also identified.

8.2 Assessment Methodology

General

8.2.1 The Landscape Impact Assessment Area for the landscape impact assessment includes areas within a 500m distance from the site boundary of the PRS while the Visual Study Area for the visual impact assessment is defined by its visual envelope. The landscape and visual impact study boundaries are shown in **Figures 8.3.1** and **8.3.2**.

Landscape Impact Assessment

8.2.2 The assessment of landscape impacts has involved the following procedures:-

- Identification of the baseline landscape resources (physical and cultural) and landscape characters found within the Landscape Impact Assessment Area
- Assessment of the degree of sensitivity of the landscape resources
- Identification of potential sources of landscape impacts
- Identification of the magnitude of landscape changes
- Identification of potential landscape mitigation measures
- Prediction of the significance of landscape impacts before and after the implementation of the mitigation measures
- Prediction of acceptability of impacts

Visual Impact Assessment

8.2.3 The assessment of visual impacts has involved the following procedures:-

- Identification of the Visual Envelopes during the construction and operation phases of the Project
- Identification of the VSRs within the Visual Envelopes at construction and operation phases
- Assessment of the degree of sensitivity to change of the VSRs
- Identification of relative numbers of VSRs
- Identification of potential sources of visual impacts
- Assessment of the potential magnitude of change
- Identification of potential visual mitigation measures
- Prediction of the significance of visual impacts before and after the implementation of the mitigation measures
- The assessment describes any likely negative (adverse) or unavoidable residual visual impacts to VSRs
- Prediction of acceptability of impacts

8.3 Landscape Impact Assessment (LIA)

Landscape Resources (LRs)

8.3.1 Landscape Resources which will be potentially affected by the PRS, are described and appraised together with their sensitivity analysed and evaluated. The locations of baseline landscape resources are mapped in **Figure 8.3.1**.

PRS

8.3.2 The PRS is located within **Sha Tin Hoi (LR-1)** which is considered of high amenity value. The majority of MLS shoreline is engineered artificial or disturbed shoreline.

Promenade

8.3.3 **Pak Shek Kok Promenade (LR-2)** lies on the northwest of PRS, running along Tolo Harbour, connecting with **Ma Liu Shui Promenade (LR-16)** on the west and **Ma On Shan Promenade (LR-20)** on the east. This waterfront promenade features a cycling trail connecting MLS and Sha Tin, along where public seating, viewing platform facilities and planting area are provided for leisure and is considered as high amenity value along the coastline. **Ma Liu Shui Ferry Pier (LR-14)** along waterfront provide access to water transportation.

Urban Development Areas

8.3.4 Within the LIA Study Area, the dominant LR areas are generally not of high value, mainly consisting of urban developed areas or GIC sites, and modified landscape areas with infrastructure and along major transport routes. These include the followings:

- LR-4 Science Park Development
- LR-9 Transportation
- LR-10 Amenity Planting in Hyatt Regency Hotel
- LR-12 Engineered Slope on Hillside Vegetation
- LR-13 Kau To Shan Residential Development
- LR-17 Marine Outer Waters District Headquarters and Marine North Division
- LR-18 WSD Salt Water Pumping Station
- LR-19 Sha Tin Sewage Treatment Works
- LR-23 Ma On Shan Residential Development

Open Space

8.3.5 Within most areas other than northern portion of 500m LIA Study Area, majority of LRs are considered as highly urban developed and infrastructure dominant. All public open spaces within these areas are considered to be of high amenity value due to their importance as landscape resources within the urban area. These include the followings:

- LR-3 Science Park Open Space
- LR-5 CUHK Sports Ground and Park
- LR-6 CUHK Lake Ad Excellentiam
- LR-22 Playground near Kam Tai Court

Hillside Woodlands and Streams

8.3.6 Within the LIA Study Area, there is a hillside woodland area within CUHK campus facing Tolo Harbour covered by mature trees and shrubs **(LR-7).** Another hillside woodland area at Kau To Shan falls within "Green Belt" zone under OZP where local vegetation and green backdrop out of nearby urban developed areas are found. **Streams leading from Kau To**

Shan (LR-11) and **Stream along Mui Tze Lam Road (LR-21)** are identified on the west, southwest and southeast perimeter of the LIA Study Area.

CUHK Campus (LR-8)

8.3.7 The buildings and facilities in the CUHK campus are built on hilly site of MLS with about 60% coverage of natural woodlands and landscaped areas such as natural slopes and roof gardens.

Landscape Character Areas (LCAs)

8.3.8 Landscape character zones have been identified within the LIA Study Areas in accordance with the Study on Landscape Value Mapping of Hong Kong. LCAs which will be potentially affected by the proposed reclamation area are mapped in **Figure 8.3.2**. They are

- LCA1 Sha Tin Hoi Inshore Water LCA
- LCA2 Science Park Reclamation LCA
- LCA3 The CUHK Institutional LCA
- LCA4 University Station Transportation Corridor LCA
- LCA5 STSTW Industrial Urban LCA
- LCA6 Kau To Shan Upland LCA
- LCA7 Kau To Shan Hillside to Fotan Residential Urban Fringe LCA
- LCA8 Shatin to Ma On Shan Miscellaneous Urban Fringe LCA
- LCA9 Ma On Shan Residential Urban LCA

Potential Sources of Impacts

8.3.9 PRS will have moderate to insubstantial level of impact on most of the landscape resources, except LR1, LR2, LR16 and LCA1, at different stages of its lifetime.

Construction Phase

8.3.10 During the construction phase of the PRS, potential impacts will result from the following:

(1) Reclamation and site formation works including the potential dredging, filling, decommissioning, demolishing works etc.

Operation Phase

8.3.11 During the operation phase of the Project, potential impacts will result from the following:

(1) Landscaping works and provision of open space (e.g. new screen planting, vertical green or other landscape treatment).
(2) Change of existing shoreline along MLS Promenade due to the reclamation.
(3) Potential direct loss and disturbance of marine habitats (e.g. coral species) at and in the vicinity of the PRS.

8.4 Visual Impact Assessment

Visual Envelope

8.4.1 According to EIAO Guidance Note No. 8/2010 (GN 8/2010) paragraph 3.3 (c), the visual envelope may contain areas, which are fully visible, partly visible and non-visible from the DP. It covers the view shed formed by natural/man-made features such as ridgeline or building blocks. The visual envelope of the PRS is bounded by ridgelines of MLS, Kau To Shan to the west, Ma On Shan to the east and Tolo Harbour to the North. The PRS abuts

Marine Outer Waters District Headquarters and Marine North, WSD Salt Water Pumping Station and STSTW to the south.

8.4.2 To rationalize this situation, it is necessary to identify the key viewing points and viewing areas and then to assess the potential visual impacts on those areas and their populations with consideration of the proposed development layout. The visual envelope is shown in **Figure 8.4.1**.

Visually Sensitive Receivers (VSRs)

8.4.3 Within the Visual Envelope, a number of key VSRs have been identified. VSRs are mapped in **Figure 8.4.1** and listed in below:-

- VSR1 HKSP
- VSR2 Ma Liu Shui Promenade
- VSR3 CUHK
- VSR3B United Road near University Library, CUHK
- VSR4 Marine Outer Waters District Headquarters and Marine North, WSD Salt Water Pumping Station and Sha Tin Sewage Treatment Works
- VSR5 Kam Tai Court/ Mountain Shore/ Sausalito/ La Costa/ Ocean View/ Oceanaire
- VSR6 Ma On Shan Promenade
- VSR6B Ma On Shan Promenade (Northern Part)
- VSR7 Baycrest Vista Paradiso/ Kam Fung Court/ Chung On Estate/ / Marbella
- VSR8 Hyatt Regency
- VSR9 Kau To Shan
- VSR10 Ma On Shan Country Trail
- VSR11 Ma On Shan Park
- VSR12 Mayfair by the Sea and Providence Bay
- VSR13 Chevalier Garden
- VSR14 Horizon Suite Hotel
- VSR15 Sam Mun Tsai

Potential Sources of Impact

8.4.4 Major direct impacts, including degrading of visual quality of existing view, change of viewing experience and visual incompatibility of the works with the surrounding visual context, will be resulted from the following activities:

Construction Phase

8.4.5 During the construction phase of the Project, potential impacts will result from the following:

(1) Reclamation and site formation works including the potential filling, decommissioning, demolishing works etc.
(2) Stockpiling of construction and demolition materials, including existing topsoil and shoreline, and storage of construction equipment.

Operational Phase

8.4.6 During the operation phase of the Project, potential impacts will result from the following:

(1) Landscaping works and provision of open space (e.g. new promenade, new screen planting, vertical green or other landscape treatment).
(2) Change of existing shoreline. New shoreline and promenade will be aligned the new reclaimed land.

(3) Proposed building development and building height which might have impact of visual obstruction.
(4) Potential direct loss of about 30% of water area in Sha Tin Hoi.

8.5 Landscape and Visual Mitigation Measure

8.5.1 Funding, implementation, management and maintenance of the mitigation proposals will be resolved according to the principles in EIAO TM, ETWB TCW No. 29/2004 and DEVB TCW No. 6/2015 and No. 7/2015. All mitigation proposals as listed in in **Table 8.5.1 and 8.5.2** in this report are practical and achievable.

Table 8.5.1 Construction Phase Mitigation Measures

ID No.	Construction Phase Mitigation Measures
CM1	Optimisation of construction areas and provision of temporary landscape to temporary construction site
CM2	Minimising topographical changes
CM3	Preservation of existing trees
CM4	Transplanting existing trees
CM5	Adopting non-dredging method for reclamation works
CM6	Protection of natural rivers, estuaries and streams
CM7	Preservation of natural coastline
CM8	Provision of natural rock material or planting opportunity to artificial seawall
CM10[1]	Erection of decorative screen hoarding
CM11	Lighting control to avoid glare during the construction
CM12	Screen planting

Table 8.5.2 Operation Phase Mitigation Measures

ID No.	Operation Phase Mitigation Measures
OM1	Provision of 30% Greenery will be allowed including park and linear garden along main connections to provide greening and aesthetic effect in urban context. Park shall also provide visual enjoyments for the users in the vicinity
OM2	Buildings shall be arranged in stepped profile to minimize visual obtrusiveness to surrounding context
OM3	Eco- shoreline shall be adopted to enhance the aesthetic value of the newly reclamation area as well as to generate ecological benefit in long term
OM5	Compensatory planting
OM7	Roadside planting

OM8	Aesthetic design of built development
OM9	Maximizing greening on structures
OM10	Aesthetic design to noise barrier
OM11	Lighting control to avoid glare
OM12	Re-provision of Ma Liu Shui Promenade
OM13[2]	Provision of View Corridor to avoid visual blockage
OM14	Apply natural materials with similar color tone to match with the surrounding on structures

Notes:
[1] Mitigation measures refer to Good Site Practices.
[2] The details and location of the view corridor is not yet finalized and will be further design in the next stage.

8.6 Residual Impacts

Residual landscape impacts in Construction Phase

8.6.1 In the construction phase, after the implementation of the proposed mitigation measures, there will be moderate to insubstantial residual landscape impacts on most of the landscape resources and landscape character areas. Meanwhile, substantial landscape impacts are mainly on **LR1 - Sha Tin Hoi**, **LR16 - Ma Liu Shui Promenade and LCA1 - Sha Tin Hoi Inshore Water LCA**.

Residual Impacts on LRs/ LCAs in Operation Phase

8.6.2 The PRS will have significant landscape impact to Sha Tin Hoi shoreline and cause direct loss of about 30% of water area and its related habitats without mitigation measures. During operation stage, it is important through mitigation measures to reduce and mitigate such impact, such as optimizing the construction of reclamation area and minimizing topographical changes. Reclamation method should look to avoid massive destruction to the existing seabed and its habitat in Sha Tin Hoi. Mitigation measures to restore and reconstruct eco-shoreline to the new reclaimed land is key factor to restore and regenerate the disturbed marine habitat and shoreline amenity. Despite that the loss of water area to Sha Tin Hoi is irreversible, the residual impact to Sha Tin Hoi may be reduced from 'significance' to 'moderate' after the implementation of appropriate mitigation measures in the long run.

8.6.3 The landscape impact on LR16- Ma Liu Shui Promenade will change from 'substantial' during construction stage to 'moderate' during operation stage after implementation of mitigation measures during operation stage. The re-provision of Ma Liu Shui Promenade (OM12) with provision of greening, recreational open space, seating facilities and amenity etc. along the new promenade will enhance the landscape resources and landscape character of LR16, therefore, through implementation of mitigation measures, the residual landscape impact to LR16 will become 'slight'.

8.6.4 Most of the residual impacts to other LRs / LCAs are 'slight' to 'insubstantial' after implementation of appropriate mitigation measures.

Residual Visual Impacts in Construction Phase

8.6.5 Given that the high sensitivity to change and intermediate to large magnitude of change before mitigation for VSR2, VSR5, VSR6 and VSR8, the adverse visual impacts are expected to be substantial during construction phase. Mitigation measures during construction stage is crucial to reduce such visual impact, for instance, optimizing

construction areas and provision of temporary landscape to temporary construction site (CM1), and erection of decorative screen hoarding (CM10) and provide screen planting (CM12) etc. Continuous public users along the existing VSR2 and visitors in VSR8 can be substantially mitigated by such mitigations although inevitably will suffer from the loss of direct sea view. Therefore, the visual impact during construction stage remains as substantial. Further mitigation measures during operation stage are required to reduce such impact.

8.6.6 For VSR1, VSR3, VSR3B and VSR4 the adverse visual impacts are considered moderate during construction and operation phase. As they are a relevant close distance to the PRS. Therefore, the visual impact during construction stage remains as moderate.

8.6.7 For other VSRs, the adverse visual impacts are considered as slight to moderate during construction phase. Through implementing appropriate mitigation measures, these impacts may be reduced to slight or insubstantial.

Residual Visual Impact in Operation Phase

8.6.8 The implementation of appropriate mitigation measures will improve the overall visual quality and reduce the visual impact as a result of PRS. For most of the VSRs, the visual impact ranges from moderate to slight or from slight to insubstantial.

8.6.9 Despite 8.6.5 above, the adverse visual impact to VSR2 remains as substantial during operation stage after implementation of mitigation measures during construction stage since the views from the existing Ma Liu Shui Promenade will be directly affected by the PRS in very close proximity. By incorporating the proposed mitigation measures, including aesthetic design of the building (OM8), maximization of greening on structures (OM9), provision of view corridor (OM13) etc., the residual visual impact is expected to reduce from 'substantial' to 'moderate' during operation stage. In addition, a newly constructed promenade with enhanced public facilities, greening and viewing opportunity will be provided. Majority of VSR2 users will be relocated to the new seafront promenade where their open sea view could be maintained and the substantial visual impact would be reduced during the operation stage.

8.6.10 The residual visual impact to VSR5 changes to moderate after implementation of mitigation measures during operation. Since the sensitivity to change for VSR5 is high with limited alternative view, the residual visual impact from the PRS could not be fully offset, though reduced to moderate, through mitigation measures.

8.6.11 The residual visual impact to VSR6 remains as moderate after implementation of mitigation measures since the views from the Ma On Shan promenade will be directly affected by the PRS in a close proximity. By the implementation of appropriate mitigation measures, including provision of 30% Greenery (OM1), the residual visual impact would be reduced.

8.6.12 For VSR8, similar situation to VSR 2, the views from the hotel will be directly affected by the proposed development in close proximity. To reduce such impact, the proper arrangement of the massing and height of the building, the stepped profile of the building (OM2) and the aesthetic design of the building (OM8) will be reduced the impact from 'substantial' to 'moderate'.

8.6.13 View Corridors in the planning of the new reclamation area will maintain the clear visibility to Sha Tin Hoi from VSR3. However, due to the proposed arrangement and height of buildings, it is inevitable that the view from some VSRs such as VSR3B will be partially disturbed or reduced by the new reclamation area.

8.7 Conclusion

8.7.1 The preliminary assessment reveals that the PRS will have landscape impact to the existing manmade shoreline along Sha Tin Hoi. Visual impacts, especially on a part of the residential developments and promenade on the opposite bank in Ma On Shan as well as some buildings of CUHK's campus adjacent to the PRS, will be resulted during both construction and operation phases of the PRS. However, there are no significant vegetation types or rare species identified in the Landscape Resources, and implementation of a series of appropriate mitigation measures, the new eco-shoreline aims to recreate and restore the disturbed marine habitat to Sha Tin Hoi. In addition, 30% of greenery coverage will be provided for the new development and provision of view corridors. Despite the loss of water area to Sha Tin Hoi being irreversible, the residual landscape impact to Sha Tin Hoi may be reduced from 'significant' to 'moderate' after the implementation of appropriate mitigation measures in the long run and no unacceptable landscape impact is anticipated.

8.7.2 Overall, the residual landscape and visual impacts of the PRS would be ranging from 'moderate' to 'insubstantial' in long run. To conclude, the PRS is considered preliminarily acceptable with mitigation measures. The extent of the adverse effects to be offset by the mitigation measures requires further study through a detailed LVIA based on a detailed proposal in the next stage.

9 PRELIMINARY DRAINAGE IMPACT ASSESSMENT

9.1 Objectives

9.1.1 The Preliminary DIA aims to address the concerns of the stakeholders on the drainage impact to Sha Tin Hoi and Shing Mun River due to the reclamation works.

9.1.2 For testing purpose, the preliminary DIA is conducted based on the crude assumptions made in **Section 3**.

9.1.3 The main objectives of this Preliminary DIA include:

- To carry out preliminary technical assessments on drainage aspects of the existing drainage works with the consideration of the PRS; and
- To propose new or/and upgrade the existing drainage works required to support the PRS.

9.2 Methodology and Criteria

9.2.1 The Preliminary DIA has followed ETWBTC(W) No. 2/2006 – Drainage Impact Assessment Process for Public Sector Projects and the recommendation given in the SDM.

9.2.2 Preliminary assessment is conducted on the extension of existing outfalls due to the PRS and quantified the potential impact. Recommendation for mitigation/improvement works will be suggested wherever necessary to address the impact arising from the Project.

9.2.3 The Preliminary DIA includes the preliminary design of an independent drainage works, which were proposed for collecting the surface runoff generated from the PRS and ensure no adverse hydraulic impact arising from the Reclamation.

9.2.4 Mike 11 (version 2014) has been adopted to build the hydraulic model for Shing Mun River covering the area from PRS to the Che Kung Miu section of Shing Mun River in order to assess the drainage impact to the River due to the reclamation. The peak flows for different sections under 200-year flood level return period were gathered from DSD and the Manning roughness 0.04 is adopted for the natural stream channel at the reclamation area near the outlets of Shing Mun River while 0.025 is adopted for Shing Mun River.

9.2.5 The design criteria is based on DSD's SDM (2013).

9.3 Existing Drainage System in the Vicinity of the PRS

9.3.1 In accordance with DSD drainage record plans, five existing drainage outfalls are identified discharging surface runoff from existing catchment to the PRS. It is noted that the existing five outfalls discharge water into the reclamation site and potential extension of these five outfalls is required so that the surface runoff from existing upstream catchment can be discharged without being affected by the reclamation works. The existing drainage network described above is shown in **Figure 9.3.1**.

9.3.2 With reference to the existing drainage record, PRS is mainly bounded by 7 catchments, of which 5 catchments are belonged to the existing five outfalls that contribute surface runoff to PRS. The remaining 2 catchments, one is located at the north of PRS that consists of road area and HKSP with generated surface runoff collected by existing drains running north to the discharge outfall at near HKSP; the other is located at the south of PRS mainly consists of the existing STSTW with generated surface runoff collected by existing drains.

9.4 Proposed Drainage Works for PRS

Extension of the Existing Five Outfalls

9.4.1 According to **Section 9.3.1**, five outfalls discharge surface runoff from upstream catchment to the reclamation area are required to be extended to the outer edge of the reclamation area boundary. The existing catchments of the concerned five outfalls are consist of developed and rural area.

9.4.2 In order to have less drainage reserved area raised from the proposed extension and to reserve more space to cater for future development and other underground utilities within the PRS, extension from each concerned outfall is considered to be combined together whenever it is applicable.

9.4.3 Outfall 1, 2 and 3 will be extended independently following the road path indicated under the assumed development plan. However, part of the extension of Outfall 4 and Outfall 5 will be combined together as they are close to each other and the combination of the respective extension will not cause conflict under the conceptual plan.

9.4.4 Since the catchment of existing outfalls remains unchanged, the extension of the outfalls is proposed to cater for the existing peak flow under the scenario of 200-Year Return Period. With the consideration of the additional hydraulic head loss due to the extension, the size of each extension will be determined on a case by case basis in order to maintain the hydraulic head loss within a reasonable range and ease the impact to the upstream drainage system. The details of the extensions are summarized in **Table 9.4.1.**

Table 9.4.1 Summary of the Extension of the Existing Five Outfalls

Extension Drainage	Length (m)	Size	Type	Gradient (1 in m)	Proposed Invert Level (mPD)
Outfall 1	340	2500x2500	2-Cell B.C.	450	0.74
Outfall 2	430	2200x2200	1-Cell B.C.	450	-0.68
Outfall 3	420	2500x3000	3-Cell B.C.	550	-0.99
Outfall 4	440	2900x3000	4-Cell B.C.	450	-0.98
Outfall 5	380	2600x2600	2-Cell B.C.	500	-0.71

Assumed Drainage System in PRS

9.4.5 Under the assumed drainage system within the PRS, surface runoff generated from the site will be collected by drainage pipe works running in north-south direction in future development and the peak flow will be integrated and discharged through the proposed B.C. to Sha Tin Hoi. For testing purpose, indicative trunk drains are assumed to cater the surface runoff within the PRS. It is also assumed that the whole reclamation site is paved and a runoff coefficient of 0.9 is adopted for conservative purpose.

9.4.6 According to **Section 9.4.4**, the PRS is divided by the extension B.C. mainly into 5 sections. In order to avoid confliction between the assumed drainage pipe work due to future development and the extension B.C. as well as to reserve enough cover depth for the drainage branch within PRS in future development, the overall PRS is divided into 5 catchments with 5 independent outfalls by the assumed extension B.C.

Assumed New Box Culverts

9.4.7 5 new B.C are assumed in the PRS. B.C.1 is assumed to be laid adjacent to the extension of B.C. from Outfall 1. B.C.2 and B.C.3 are assumed to be laid adjacent to the extension B.C. from Outfall 2 while B.C.4 and B.C.5 are assumed to be laid adjacent to the extension B.C. from Outfall 4 and Outfall 5 respectively. Details of the assumed B.C. under a 200-year return period are summarized in **Table 9.4.2**.

Table 9.4.2 Summary of the Details of the Assumed B.C.

Assumed B.C.	Length (m)	Size	Type	Gradient (1 in m)
B.C. 1	170	2600x2600	1-Cell B.C.	450
B.C. 2	180	2300x2300	1-Cell B.C.	450
B.C. 3	180	2400x2400	1-Cell B.C.	450
B.C. 4	200	2300x2300	1-Cell B.C.	450
B.C. 5	200	2000x2000	1-Cell B.C.	450

9.4.8 The assumed B.C. is assumed to be submerged under the 10-year and 200-year sea level with consideration of providing enough cover depth for future connections within PRS.

9.4.9 The designed flood level of the assumed trunk drainage system is examined in two scenario under a 200-year return period. Results are summarized in **Table 9.4.3**.

Table 9.4.3 Summary of the Designed Flood Level of the Proposed B.C.

Assumed B.C.	Scenario 1	Scenario 2
	200-year rain + 10-year sea level	10-year rain + 200-year sea level
B.C. 1	4.06	4.96
B.C. 2	4.04	4.94
B.C. 3	4.09	4.96
B.C. 4	4.07	4.96
B.C. 5	3.97	4.91

9.5 Impact Assessment

Extension of the Existing Five Outfalls

9.5.1 All the assumed extensions have larger hydraulic capacity to cater for the immediate upstream peak flow under a 200-year return period and to ease the hydraulic impact by limiting the additional head loss as far as possible.

9.5.2 The additional hydraulic head loss raised by the extension ranges from 0.03 to 1.03m. In order to quantify the influence caused by the additional head loss, flood level at the place with low ground level at the downstream of each outfall is estimated.

9.5.3 **Table 9.5.1** summarized estimated flood level and the freeboard after the outfall extension. The results indicate that the freeboard at those sensitive locations with low ground level still has more than 300mm, which can fulfil the requirement stated in the Drainage Manual. In conclusion, the additional hydraulic head loss caused by the outfall extension is insignificant to the existing drainage condition.

Table 9.5.1 Estimated Flood Level and the Freeboard at Sensitive Area

Sensitive Area	Existing Flood Level (mPD)	Estimated Flood Level (mPD)	Existing Ground Level (mPD)	Estimated Freeboard after Extension (m)
Location 1	4.85	4.98	5.6	0.62
Location 2	5.04	5.07	5.5	0.43
Location 3	4.87	5.10	5.9	0.80
Location 4	5.02	5.51	6.3	0.79
Location 5	4.78	4.94	5.3	0.36

9.5.4 According to the sub-catchment plan, five independent B.C. are sized to have enough capacity to cater for the surface runoff from the proposed catchments in PRS respectively.

9.5.5 According to **Table 9.4.3**, the maximum designed flood level for the proposed B.C. is estimated as about +5mPD. The site formation level of the PRS shall take into account the required freeboard, climate change effect and allowance for future development connection in the next stage.

9.6 Impact to Shing Mun River

9.6.1 A hydraulic model has been built up for Shing Mun River to assess the water level increase due to the PRS. Two scenarios under 200-year flood level return period have been modelled for Shing Mun River before and after the reclamation in order to calculate the water level increase.

9.6.2 It is found that that maximum additional water level increase due to the PRS is in an approximate range from 3cm to 6cm along Shing Mun River. The additional increase in water level is considered to be localized and manageable. The hydraulic performance of Shing Mun River and its upstream channels especially at some low laying areas in the vicinity of Shing Mun River should be reviewed in details in further study.

9.7 Proposed Mitigation Measures

9.7.1 The below mitigation measures can be proposed as the improvement works of the existing drainage system to relief the possible water level increase at the upstream branch area if required in the detailed design stage:

- Increase the size of the existing upstream drains
- Relining of the existing upstream B.C.

Short /Long Term Measures for Shing Mun River

9.7.2 The flooding risk for the following sensitive locations shall be assessed in details in the next stage, in order to identify the most effective measures for the low lying areas along Shing Mun River:

(a) Fo Tan Nullah and Siu Lek Yuen Nullah.
(b) Upstream section of Shing Mun River from Heung Fan Liu to Tai Wai.
(c) Subways adjacent to Shing Mun River and also the branch nullah.

9.7.3 To reduce the impact to the low laying areas in the vicinity of Shing Mun River due to the reclamation works. The following short / long term measures could be explored to relieve the potential flooding situation in the detailed design stage:

- Erection of flood wall to low laying areas
- Provide pumping facilities
- Set up warning system to the public

9.7.4 The proposed size and locations of the above drainage improvement works should be further reviewed and studied. Furthermore, combination of the above measures could also be evaluated in the next stage.

9.8 Conclusion

Extension of Existing Five Outfalls

9.8.1 The preliminary assessment reveals that the five outfalls at the existing shoreline of MLS would be required to extend to the reclamation boundary of the PRS. The overall cross section of each B.C. extension is enlarged and having larger capacities to cater for the immediate upstream peak flow under 200-year return period. The results indicated that the freeboard at those sensitive locations with low ground level still has more than 300mm, while branch drainage system at upstream of these box culverts need further investigation at next stage. In conclusion, the additional head loss caused by the outfall extension is insignificant to the existing drainage condition.

Proposed B.C. within MLS Reclamation Site

9.8.2 The PRS is divided into five catchments mainly by the proposed extension B.C. of existing outfalls and five B.C. are proposed to cater for these catchment respectively. All the proposed B.C. have enough capacity to cater for the surface runoff from PRS and no adverse impact was found. Due to the back water effects, the maximum water level at the most upstream of the proposed B.C. within the PRS is estimated as about +5mPD under 200-year return period. The site formation level of the PRS will take into account the required freeboard and climate change effect in the next stage.

Impact to Shing Mun River

9.8.3 A Mike 11 model has been built up to assess the impact to Shing Mun River due to the reclamation. It is found that that maximum additional water level increase due to the PRS is in an approximate range from 3cm to 6cm along Shing Mun River. The additional increase in water level is considered to be localized and manageable. The hydraulic performance of Shing Mun River and its upstream channels especially at some low laying areas in the vicinity of Shing Mun River should be reviewed in details in further study.

Recommendation

9.8.4 Mitigation measures to improve the existing drainage system in the vicinity of PRS such as enlarging the cross section of the existing B.C., re-lining of the existing upstream system are suggested if the improvement works is required.

9.8.5 Some drainage improvement works to improve the hydraulic performance for Shing Mun River have been explored. However, they are required to be studied and reviewed in details in the next stage of the Project.

9.8.6 The site formation level of the PRS shall take into account the required freeboard, climate change effect and allowance for future development connection in the next stage of the Project.

9.8.7 The drainage impact brought about by climate change effect has not been included in this feasibility study stage but shall be assessed in the next stage of the Project.

[BLANK]

10 PRELIMINARY SEWERAGE IMPACT ASSESSMENT

10.1 Objectives

10.1.1 This Preliminary SIA has been prepared to address the concerns of the stakeholders on the sewerage impact due to the reclamation works.

10.1.2 The main objectives of this Preliminary SIA include:

- To investigate the need for pumping stations and associated rising mains to serve the PRS;
- To review the existing sewerage facilities and propose required sewerage facilities within the Study Area; and
- To identify and evaluate the sewerage impact and propose cost effective measures for mitigation of the identified impact arising from the PRS.

10.2 Description of Existing and Planned Sewerage Facilities

Existing major sewerage works

10.2.1 Based on the existing DSD drainage record plans, there is no public sewer connected to the PRS at present.

10.2.2 Four existing sewage rising mains are laid to the west of the PRS running along the Tolo Highway and eventually discharged the flow to the existing STSTW, of which two are from Pak Shek Kok No. 3 SPS with size of 500mm in diameter, while the others are from CUHK's SPS with size of 450mm in diameter and 250mm in diameter respectively.

10.2.3 Existing twin 1,200mm in diameter rising mains discharged from Ma On Shan SPS are identified at east of the PRS running in adjacent to Ma On Shan Road to the existing STSTW.

10.2.4 Two existing SPSs, namely, Shui Chong Street SPS and Sha Tin Main SPS, are at the south side of the PRS. Shui Chong Street SPS is connected by twin 600mm in diameter rising mains running along the south side of existing STSTW and Sha Tin Main SPS is connected by twin 1,400mm in diameter rising mains running along the west bank of Shing Mun River, all the rising mains transport the sewage flow to the existing STSTW.

Existing submarine pipes of THEES

10.2.5 A 1,000mm in diameter submarine pipeline of THEES connected from the existing Tai Po Effluent Pumping Station (TPEPS) and ended adjacent to the MOWDIST MNDIV, HKPF goes through the PRS. [redacted]

Existing submarine outfall

10.2.6 Two 2,500mm in diameter submarine outfall pipes started near the MOWDIST MNDIV, HKPF collect the treated effluent from existing STSTW to Sha Tin Hoi, which goes through the PRS and the treated effluent is finally discharged adjacent to the boundary of PRS during emergency situation. Diversion of the outfall pipe is required to avoid the conflict between the outfalls and the PRS.

Planned sewerage works under Agreement No. CE 30/2014 (DS)

10.2.7 According to the findings under the Agreement No. CE 30/2014 (DS) – Relocation of Sha Tin Sewage Treatment Works to Caverns: Caverns and Sewage Treatment Works –

Investigation, Design and Construction, the existing STSTW will be relocated to the Cavern near A Kung Kok Street and the upstream sewage rising mains of the existing STSTW from the pumping stations will be modified to convey the raw sewage to the relocated STSTW in Cavern.

10.3 Estimated Sewage Flow for the PRS and Vacated Site

10.3.1 The PRS will comprise with both residential and commercial development to achieve housing need and to enhance employment capacities. The PRS and the vacated site of STSTW (Vacated Site) will subject to further planning in future study, and hence the population and employment for the PRS and Vacated Site are based on the crude assumptions made in **Section 3**.

10.3.2 Further, this report is carried out based on EPD's Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning (GESF). This includes the unit flow factors (Tables T-1 and T-2) used to estimate the average dry weather flow (ADWF) generated from the development areas and the peaking factors (Table T-5) used to include stormwater allowance in the design and hence to calculate the peak flow.

10.3.3 The total sewage flow (ADWF) is 12,527 m^3/day, of which 8,372 m^3/day for PRS and 4,155 m^3/day for Vacated Site.

10.4 Assumed Sewage/Sewerage Facilities within PRS

Assumed Sewerage Scheme

10.4.1 The sewage flow generated from PRS is assumed to be collected by a main gravity sewer running in North-South direction within PRS.

10.4.2 In order to avoid deep gravity sewer system, two SPSs are assumed to collect the sewage flow from the assumed main gravity sewer. The two SPSs are interconnected and sewage flow from the PRS will be integrated and pumped to the Intermediate SPS planned under Agreement No. CE 30/2014 (DS). The sewage flow will convey with that from other SPSs and further pumped to the relocated STSTW in cavern as planned under Agreement No. CE 30/2014 (DS).

Assumed Main Gravity Sewers within PRS

10.4.3 With reference to the Preliminary DIA of this Study, it is noted that the PRS will be mainly divided into five sections by the proposed extension B.C.. In order to coordinate with the proposed drainage system within PRS, main gravity sewers within PRS are proposed to avoid clashing with the extension B.C. and sufficient cover depth will be reserved to cater for the branches of sewer from future developments.

10.4.4 In order to reduce intersection between the proposed sewers and the B.C. extension as shown in the Preliminary DIA and to ensure sufficient separation for the sewers which go over the future B.C. extension, the overall PRS is divided into three sewage catchments, of which one is served by an independent sewer. It is assumed that the population distributes evenly over the PRS in this preliminary SIA and the sewage flow from each catchment is estimated proportional to its area.

Assumed SPSs and Rising Mains for PRS

10.4.5 In order to avoid deep gravity sewers, two SPSs, namely MLS North Pumping Station and MLS South Pumping Station, are assumed to pump raw sewage flow from PRS to the planned Intermediate SPS under Agreement No. CE 30/2014 (DS) through twin rising mains. The design capacity of MLS North Pumping Station and MLS South Pumping Station are 0.1 m^3/s and 0.21 m^3/s respectively.

10.4.6 A twin 250mm diameter rising mains are assumed to connect MLS North Pumping Station with MLS South Pumping Station and a twin 300mm diameter rising mains are proposed to connect MLS South Pumping Station with the planned Intermediate SPS under Agreement No. CE 30/2014 (DS). The proposed rising mains are sized to maintain the designed velocity within the range of 1 to 2 m/s as required in DSD SDM under the normal condition when twin-rising main is working. Under maintenance or emergency condition, it is assumed that only one rising main is working and the velocity for a single rising main is designed to maintain not higher than 3m/s.

10.4.7 Sewage flow generated from the Vacated Site is assumed to be transported to the planned Intermediate SPS under Agreement No. CE 30/2014 (DS) by gravity sewers. Details of these sewers will subject to further design in other study.

10.5 Impact to Existing Sewerage/Sewage Facilities

10.5.1 There is no existing or planned public sewers and sewage facilities that are connected to the subject site at present.

10.5.2 According to **Section 10.2**, a 1,000mm in diameter submarine rising main of THEES and twin 2,500mm in diameter submarine outfall pipes are identified to have conflicts with PRS, which are required for diversion. The 1,000mm in diameter submarine rising main of THEES is required to be diverted for the sections within PRS. The submarine rising main of THEES is assumed to be diverted to inland and run along the western boundary of PRS. The twin 2,500mm in diameter submarine outfall pipes are suggested to shift to the east side of the PRS. The above preliminary diversion scheme is subject to further study on the feasibility and coordination with the DSD departments for the impact on existing/planed sewerage/sewage facilities.

10.5.3 According to **Section 10.4**, both sewage flow from PRS and Vacated Site will be conveyed to the planned Intermediate SPS and pumped to the relocated STSTW for treatment under Agreement No. CE 30/2014 (DS).

10.5.4 The total estimated sewage ADWF planned for PRS and Vacated Site under Agreement No. CE 30/2014 (DS) is checked. The estimated total sewage ADWF from the PRS and Vacated Site of this Preliminary SIA Report is about 12,600m^3 which is smaller than the planned flow under Agreement CE 30/2014 (DS). Thus, the flow generated from PRS and Vacated Site will not have adverse impact to the design capacity of the relocated STSTW in Cavern and relevant sewerage/sewage facilities.

10.6 Conclusion

10.6.1 A 1,000mm in diameter submarine rising main of THEES and twin 2,500mm in diameter submarine outfall pipes at Sha Tin Hoi are identified to have conflicts with PRS. It will be assessed and with necessary mitigation measures proposed in the future EIA study if diversion is preferred after the review.

10.6.2 The total ADWF from PRS and Vacated Site is estimated as about 12,600 m^3/d.

10.6.3 The PRS is divided into three sewage catchments and each will be served by gravity sewer system. Considering the existing B.C. will be extended across PRS to discharge surface runoff to Sha Tin Hoi, these B.C. will become barriers to the gravity pipes. Hence two SPSs and associated rising mains are proposed in PRS.

10.6.4 MLS North Pumping Station with designed peak flow of 0.1 m^3/s and MLS South Pumping Station with designed peak flow of 0.21 m^3/s are proposed to pump the sewage flow from the PRS to the planned Intermediate SPS under Agreement No. CE 30/2014 (DS).

10.6.5 Estimated total sewage ADWF is smaller than the planned capacity under Agreement No. CE 30/2014 (DS), no adverse impact is noted on both existing and planned sewerage and sewage facilities due to the PRS and Vacated Site in this Preliminary SIA.

11 HYDRAULIC STUDY ON SHA TIN HOI AND SHING MUN RIVER

11.1 Objectives

11.1.1 In addition to the Preliminary DIA, the hydraulic study mainly aims to address the concerns of the stakeholder on the effect of spring tidal and extreme storm surge at Shing Mun River and Sha Tin Hoi due to the reclamation works.

11.2 Study Approach

11.2.1 A hydraulic modelling study is conducted to ensure that the PRS has no unacceptable effects with respect to flooding due to tides combined with storm surge. Both existing condition and the existence of PRS are considered in the model and used to determine the change.

11.2.2 Normal tidal processes which exclude any significant storm surge effects are not expected to lead to flooding issues. In addition to the normal tidal process, the modelling study provides a realistic worst case representation of storm surge conditions that could be experienced during the passage of a tropical cyclone. A review of published information relating to such events experienced within Hong Kong waters was therefore undertaken to provide information on their significance within Tolo Harbour and ultimately the study locations at MLS.

11.2.3 The study made use of an existing numerical model configured using the Delft3D software. This existing model was designed for the preliminary investigation of water quality processes and providing an accurately resolving the area of the reclamation was not therefore essential.

11.2.4 The existing Delft3D model was adapted to suit the specific requirements of the study which included the following modifications:

- Locally enhanced grid resolution covering the area of the reclamation and extending into the Shing Mun River;
- Interpolation of the latest available bathymetric data onto the refined grid to ensure seabed features in the raw data are represented in the model;
- Selection of an appropriate time-step to maintain numerical stability; and
- Conversion of the seaward model boundary condition to a time-varying water level thus allowing a surge profile to be imposed at this location.

11.3 Tides and Storm Surge

11.3.1 The main objective of the study is to quantify the change in currents and storm surge characteristics as a result of the PRS. For the development to proceed, it will be necessary to confirm that there will be no unacceptable effects with respect to flooding due to tides and storm surge as a result of the reclamation.

11.3.2 The Hong Kong Observatory (HKO) has an established monitoring station at Tai Po Kau, identified as tide station on navigation chart HK3101. Tai Po Kau is within Tolo Harbour approximately 4km north-west of Sha Tin Hoi. The highest astronomical tide (HAT) of 2.73 mCD is by definition the highest water level predicted to occur within a given year and provides a useful reference level for the assessment of surge levels.

11.3.3 During a typhoon event persistent gale force winds blowing towards Hong Kong are experienced as the cyclone depression tracks across the open sea towards the land. Wind-

induced water circulation occurs in response to these strong winds which can also lead to significant increases in water elevation above normal tidal conditions (storm surge), thereby increasing the risk of flooding within coastal areas.

11.3.4 Analysis of detailed records held by HKO for cyclones that occurred in 2015 showed that such events persisted from 33 hours up to 141 hours in the case of tropical cyclone Linfa. It was noted that 'super-typhoons' (or 'SuperT' events) typically last for 48 hours with wind speeds reaching in excess of 185 km/hr (i.e. more than 51.4m/s). The HKO maintains records of historical storm surge levels, and it can be seen that tropical cyclone 'Hope' produced a slightly higher surge height than estimated for 'Wanda' given as 3.23 mCD.

11.3.5 The proposed approach for the simulation of a realistic extreme surge condition is therefore consider a surge height similar in magnitude to one the largest events that have been experienced in Tolo Harbour. This would suggest a surge height of approximately 3.2m which in a worst-case scenario would coincide with high spring tides. Considering a worst-case condition will ensure that the maximum magnitude of change due to the proposed reclamation is established.

11.4 Model Results

11.4.1 Model scenario tests were undertaken during a sequence of spring tides with a surge applied in combination with the astronomic tides along the seaward boundary across Mirs Bay. Separate tests were carried out with and without river flows activated to allow sensitivity to wet/dry season conditions to be taken into consideration.

11.4.2 The results provided from the model assume a standard 'glass walls' approach meaning that a frictionless vertical barrier is applied around the land boundary of the model. The crest height of defences and the topography of low-lying areas susceptible to flooding are not therefore included in the model. This can be expected to result in an over-prediction of extreme sea levels. It is not therefore recommended that the absolute value of predicted water levels are applied in any further analysis or design without undertaking a more detailed calibration exercise. However, this does not affect the reliability of predicted changes derived from the comparison of baseline (existing) and development (reclamation included) scenarios.

Normal Spring Tidal Conditions

11.4.3 Model results have been analysed over a sequence of 'normal' spring tide conditions (i.e. spring tidal levels excluding the influence of storm surge) to assess changes in peak water level and maximum current speed due to the proposed reclamation.

Change in Water Levels

11.4.4 The predicted change in high water level is less than threshold of ± 0.01m. This confirms that the PRS will have no effect on normal tidal water levels.

Change in Current Speed

11.4.5 There are minor local changes in maximum current speeds close to the development near the entrance to the Shing Mun River.

11.4.6 The increase in current speed near the entrance of Shing Mun River is approximately 0.02m/s in an area where the peak spring current typically reaches 0.04m/s during low flow

conditions. The low magnitude of change in an area where the tidal component of flow is also very low confirms that the predicted change due to the reclamation is not significant.

11.4.7 The area where currents are decreased along the eastern edge of the reclamation is assumed to be related to the locally increased currents as described above. Following construction of the reclamation the main flow is focused towards the eastern side of the channel resulting in a reduction along the western side.

Combination of Normal Spring Tides and Extreme Storm Surge

11.4.8 Model results for a storm surge acting in combination with a sequence of 'normal' spring tides have been analysed to assess changes in peak water level and current speeds due to the PRS.

Change in Water Levels

11.4.9 Local increases in water level are predicted to occur adjacent to the reclamation extending further upstream along the main channel and branches. The predicted changes are investigated in more detail to establish the significance of predicted changes.

11.4.10 The largest increase in the peak surge level occurs adjacent to the reclamation which reduces towards the seaward end of the river channel with further reductions along its length. An increase of up to 5 cm close to the PRS is predicted. Although there is also an increase within the river channel, this varies from 3 cm at the seaward end reducing to 1 cm at the upstream limit of the model.

Change in Current Speed

11.4.11 Comparisons of current speeds between baseline and scheme after reclamation, it is noted that the current patterns downstream and seaward of the reclamation are modified leading to local increase and decreases in current speed in the range ±0.15m/s.

11.4.12 Additional vector plots have been prepared for both normal tidal conditions and storm surge conditions (**Figure 11.4.1**) to help understand the predicted changes in currents during a storm surge.

11.4.13 Under normal tidal conditions the vector plots with and without the reclamation are broadly similar. However, under storm conditions the change in the alignment of the shoreline has resulted in the generation quite different current patterns, as shown for the local area during the ebb phase of the tide. During a storm surge tidal characteristics are 'suppressed' by the dominant surge and wind forcing.

11.5 Conclusion

11.5.1 The Delft3D model has been adopted and the changes resulting from the PRS, with respect to flooding due to tides combined with storm surge, have been evaluated. Key findings from the study are summarized as below:-

(a) Under normal spring tidal conditions:

- there is no detectable changes in peak water levels; and
- there are minor local increases and decreases in peak current speeds, typically within the range ±0.02m/s.

(b) Under combined normal spring tidal and storm surge conditions:

- peak water levels are increased by 5 cm near the PRS;
- peak water levels are increased by between 1 – 3 cm within the Shing Mun River channel;
- current patterns downstream and seaward of the reclamation are modified leading to local increases and decreases in current speed in the range ±0.15m/s; and
- peak current speeds within the Shing Mun River channel upstream of the reclamation are unaffected.

11.5.2 The predicted changes in hydraulic conditions have been assessed for an extreme storm surge condition representative of a Super Typhoon. Typical flow pattern in Tolo Harbour near the PRS is indicated in **Figure 11.4.1**. The changes during a less severe event can be expected to be of a reduced magnitude. In addition, under normal spring tidal conditions, there is no detectable change in peak water levels and only a minor change in peak current speeds as a result of the reclamation. In these circumstances there will therefore be no discernible influence on the flood risk within areas upstream of the section of the Shing Mun River that is represented in the model.

12 PRELIMINARY TRAFFIC AND TRANSPORT IMPACT ASSESSMENT

12.1 Objectives

12.1.1 The Preliminary Traffic and Transport Impact Assessment (TTIA) mainly covers the concerns of the stakeholders due to the reclamation works on the following aspects:

- To forecast traffic flow and pattern generated and attracted within the area of influence (AOI);
- To estimate the traffic demand generated by the assumed developments at the PRS and assesses its traffic impact on the adjacent road system;
- To assess the likely traffic and transport impacts on both the road network capacity, traffic circulation and develop traffic and transport improvement schemes, where appropriate, to mitigate any traffic and transport impacts; and
- To recommend traffic and transport arrangements/measures including the proposed infrastructure.

12.2 Area of Influence

12.2.1 The proposed AOI is shown in **Figure 12.2.1**. It covers the major road links (e.g. Tolo Highway (between Pak Shek Kok and Tai Po), Tai Po Road – Sha Tin Section, Tate's Cairn Highway, Tate's Carin Tunnel, Lion Rock Tunnel, etc.).

12.3 Potential Reclamation Site

Parking and Loading / Unloading Provision

12.3.1 The provision of the internal transport facilities for the developments at the PRS shall be provided in accordance with the HKPSG. Since the current development schedule is still at preliminary stage, the provision of internal transport facilities shall be agreed with the authority at the detailed design stage.

Public Transport Facilities and Arrangement

12.3.2 To facilitate the addition of public transport demand from the developments at the PRS, PTIs and bus laybys are assumed within the PRS. The new PTIs could enable the operation of new bus services including a feeder bus services to either East Rail Line or Ma On Shan Line railway station.

New Roads and Junctions

12.3.3 New roads and junctions are explored for technical assessment purpose. New roads connecting to the Science Park Road and the future road at the Vacated Site shall be provided within the PRS to serve the developments. The details are described in the paragraphs below.

Internal Roads within the PRS

12.3.4 It is proposed to provide dual-2 distributor road, running north-south direction within the PRS with a cul-de-sac to the north and connecting to the possible future internal road of the Vacated Site to the south. Roundabout junctions along this internal distributor road are proposed to enable east-west traffic movements for connecting to the Science Park Road and also to the new road across Shing Mun River.

Connection to External Distributor Road

12.3.5 With the PRS, it would be prudent to consider the connection arrangement to enable the traffic movements from PRS to the opposite bank of Shing Mun River. The connection could be either making use of the existing T6 Bridge or a new district distributor in the form of an at-grade road or a bridge. For the purpose of the preliminary technical assessment at this initial stage, a new bridge in parallel with the existing T6 Bridge and a new southbound viaduct located east of the existing TCH are assumed for connecting to PRS in the north, Tolo Highway in the west and TCH in the southeast.

12.3.6 The assumed new bridge is of dual-2 lanes carriageway standard connecting to new roundabout of Tolo Highway southbound slip road / Science Park Road / MLS Internal Road to the north and Tate's Cairn Highway (between T6 Bridge and Shek Mun Interchange) to the south.

12.3.7 To facilitate the connection with the assumed new bridge with 2 traffic lanes on both bounds, it is assumed to widen the road section of the Tate's Cairn Highway (between Shatin Twin Bridge (a footpath cum cycle track bridge) and Shatin Hospital) from 3 to 4 traffic lanes. In addition, a slip road connecting the new bridge southbound and Ma On Shan Road northbound is assumed for the motorist heading to Ma On Shan.

New / Modification of Road Junctions

12.3.8 Due to the proposed internal roads of the PRS, new junctions are formed in order to connect to the existing road network and to the assumed new bridge. The new junctions include (i) Science Park Road / MLS Internal Road, (ii) Tolo Southbound Slip Road / Science Park Road / MLS Internal Road / assumed new bridge and (iii) MLS Internal Road / assumed new bridge Slip Roads / STSTW Internal Road.

12.3.9 The proposed new junction of Science Park Road / MLS Internal Road would improve the accessibility from the PRS onto the local road network, especially for the northern portion of the PRS.

12.3.10 The proposed new roundabout of Tolo Highway Southbound Slip Road / Science Park Road / MLS Internal Road / assumed new bridge could improve the accessibility of the PRS and Science Park area, (i) from the Tolo Highway southbound and (ii) to/from the nearby areas. The alignment of the road arms of the Science Park Road located on the north and south of the new roundabout are modified to match with the existing road.

12.3.11 The proposed new roundabout of MLS Internal Road / assumed new bridge Slip Roads / STSTW Internal Road will provide a more direct route between the Vacated Site / the PRS and the nearby areas.

12.3.12 In addition to the above, the mini-roundabout of Chak Cheung Street / Sui Cheung Street shall be converted into a priority junction due to the possible future reduction of traffic movements at this junction. The existing arm of Sui Cheung Street at this roundabout (connecting to the public transport area) can be realigned to connect to the future internal local roads of the PRS.

Pedestrian and Cyclist Strategy

Pedestrian Strategy

12.3.13 In general, provision of pedestrian facilities would follow the requirements of HKPSG for different types of development. Convenient pedestrian facility network would be provided

to enhance the connectivity between MTR East Rail Line University Station, PTIs and the major pedestrian generators/ attractors in order to facilities modal interchange including walk mode. The provision of pedestrian facility networks within large public and private residential estates or other developments and their linkages to transport nodes would be considered.

12.3.14 In general, footpath would be provided along both kerb sides of district distributors and local roads to ensure the connectivity between developments. Moreover, in order to provide a present walking environment, 3.5m wide amenity zone would be provided for planting. The proposed footpaths width shall comply with the requirements as stipulated in Table 3.4.11.1, Vol 2 of TPDM.

12.3.15 In order to create a convenient pedestrian walking environment, grade-separated pedestrian facilities, such as subways or footbridges, would be provided across roundabouts. Signal controlled crossing would also be provided at the signalized junctions and/or mid-block location if necessary.

12.3.16 A waterfront promenade will be proposed along the eastern side of the PRS, which is located next to the Shing Mun River. The waterfront promenade shall link up to the existing walkway and cycle track in the vicinity. The provision of landscape deck, cover walkway, cycle park, etc., would be considered.

Cyclist Strategy

12.3.17 Residential and commercial / Science Park developments are proposed within the PRS. It is believed that some residents may travel to/from work on bicycle. The remaining shall be to/from the rail station / PTI and direct to work located outside the PRS. Therefore cycling within the PRS would not only be for leisure purpose but also for commuting purpose. A cycle track network linking MTR East Rail Line University Station, proposed PTIs, major residential/commercial developments, G/IC facilities would be provided so that cycling would be one of the environmentally friendly transport modes in the PRS.

12.3.18 Cycle track would be provided along one side of the district distributors and some of the local roads. The cycle track network would integrate with the existing cycle tracks to the north and south of the PRS. The proposed cycle track network would provide connectivity between major developments and PTI.

12.3.19 A more present cycling environment would be provided to encourage cycling mode to share the road-based public transport demand. The proposed cycle track shall be designed in accordance to the guidelines from HKPSG and TPDM.

12.3.20 Similar to pedestrian facility network, a convenient cycle track network with grade-separated crossing facilities, such as subways or footbridges, and at-grade signal control crossing would be provided to cross roads, roundabouts and junctions.

12.3.21 In addition, cycling supporting facilities such as cycle parking areas would likely be provided at the proposed waterfront promenade, near the PTIs and major residential developments within the PRS. The provision of cycle parking spaces would refer to the HKPSG guidelines.

Possible Footpath and Cycle Connection

12.3.22 A possible footpath and cycle track across the Shing Mun River for connection between the PRS and Ma On Shan will be considered. This linkage could enhance the existing footpath and cycle track connectivity between the east and west side of the Shing Mun River.

12.4 Traffic Forecast

12.4.1 The assumed completion year for the PRS is Year 2036. The study scenarios assessed are summarised in **Table 12.4.1**.

Table 12.4.1 Study Scenarios

No.	Design Year - Scenario Generation	Road Network				
		Planned Network	Tai Po Road Widening	Road T4	Assumed New Bridge	New Roads by PRS
1	2036 - reference	✓	✓	✓		
2	2036 - design	✓	✓	✓	✓	✓

Remark:
a. The implementation programme of Widening of Tai Po Road (Sha Tin Section) and Road T4 are under review.
b. "Planned Network" refers to the key planned network in 2021 – 2036 (e.g. Widening of Tolo Highway/Fanling Highway between Island House Interchange and Fanling (Stages 1 and 2), Link Road to Liantang/Heung Yuen Wai Cross-Boundary Control Point, Central Kowloon Route, Central – Wan Chai Bypass and Island Eastern Corridor Link, etc.) apart from Tai Po Road Widening and Road T4.
c. "Assumed New Bridge" is a new road which connects the Tate's Cairn Highway and the PRS.

Transport Modelling Approach

12.4.2 To produce robust traffic forecasts that would be responsive to dynamic changes in future land use and infrastructure development, a two-tier modeling approach was adopted for this TTIA. The two-tier model structure comprises a strategic territorial model in the upper tier and a local area traffic model in the lower tier.

12.5 Traffic Impact Assessment

Traffic Assessment for Year 2036 without the PRS

12.5.1 The traffic forecast for Year 2036 without the PRS is based on assumed road infrastructures in **Table 12.4.1**. Road link capacity assessment result indicates traffic queues at the following road links in particular during the AM peak hour in Year 2036:

(i) Tolo Highway (between Tai Po and Pak Shek Kok southbound)
(ii) T6 Bridge
(iii) Tate's Cairn Highway (between T6 Bridge and Shek Mun Interchange) southbound
(iv) Tate's Cairn Tunnel southbound
(v) Lion Rock Tunnel southbound

12.5.2 The road junction assessment for Year 2036 without the PRS is based on the following junctions which have been improved in 2021 – 2026:

(i) Roundabout of Chak Cheung Street / Tolo Highway Slip Road;
(ii) Roundabout of Chak Cheung Street / Science Park Road / Tolo Highway Slip Road;
(iii) Shek Mun Interchange;
(iv) Fo Tan Road / Yuen Wo Road;
(v) Tai Chung Kiu Road / Banyan Bridge (Fo Tan Road);
(vi) Tai Chung Kiu Road / Siu Lek Yuen Road;
(vii) Sha Tin Rural Committee Road / Yuen Wo Road; and
(viii) Sha Tin Wai Road / Tai Chung Kiu Road

12.5.3 It is estimated that all the key junctions will be operated within capacity during the AM and PM peak hours in Year 2036 without the PRS.

Traffic Assessment for Year 2036 with the PRS

12.5.4 The road link capacity assessment for Year 2036 is based on some assumed major road networks such as Road T4, Widening of Tai Po Road and road connections with the PRS.

12.5.5 Road link capacity assessment result indicates that the traffic condition of Tolo Highway (between Tai Po and Pak Shek Kok) southbound, Tate's Cairn Highway southbound, Tate's Cairn Tunnel southbound and Lion Rock Tunnel southbound will be similar in Year 2036 with or without the development of PRS.

12.5.6 It is estimated that the AM peak hour traffic flow (southbound) at Tate's Cairn Tunnel and Lion Road Tunnel will be slightly reduced without the PRS (Tate's Carin Tunnel reduced from 4,935 to 4,915 pcu/hr and Lion Road Tunnel reduced from 4,970 to 4,960 pcu/hr). This is due to the proposed employment hub at the PRS which will increase the percentage of the self-containment within the New Territories and affect the prevailing travel pattern in the road network, including the traffic distribution to/from different part of the urban area. The AM peak hour traffic flow (southbound) of Tolo Highway (between Pak Shek Kok and Tai Po) will be slightly increased by about 100 pcu/hr. The expected traffic impact is manageable and can be addressed in the future planning and engineering study.

12.5.7 The proposed new roundabout of MLS Internal Road / Assumed New Bridge Slip Roads / STSTW Internal Road will provide an additional vehicular access to/from the Vacated Site. Thus, the traffic flow to/from the Vacated Site at the junction of Sui Cheung Street / Kiu Ha Road will be reduced. Hence, the junction of Sui Cheung Street / Kiu Ha Road will operate within capacity in year 2036 with the PRS.

Rail Line Assessment

12.5.8 The rail line to serve the PRS would be the East Rail Line (ERL) and Ma On Shan Rail Line (MOSRL). The estimate line of capacities of ERL and MOSRL in upper bound capacity and lower bound capacity are summarised in **Table 12.5.1**.

Table 12.5.1 Capacity of East and Ma On Shan Rail Line

Railway Line	Maximum Capacity (pphpd)	Desirable Capacity (pphpd)	
		Upper bound	Lower bound
ERL	80,000	72,000	56,000
MOSRL	75,000	68,000	53,000
Total capacity	155,000	140,000	109,000

Note: pphpd – passenger per person per direction

12.5.9 It is noted that the peak period would appear during morning peak period as people heading to work or student going to school would be concentrated on the morning peak. Based on the STM, the public transport demand generated from the PRS would be around 4,100 persons in the AM peak hour.

12.5.10 With reference to the total public transport demand of the PRS, line capacity if using lower bound capacity and the remaining railway lines capacity in Year 2036 AM peak heading to Kowloon bound is more than 15,000, it can be concluded that the rail line can cater the 100% of total public transport demand generated from the PRS.

12.6 Conclusion

12.6.1 The assumed year of completion for testing purpose is Year 2036. The scenarios with and without the PRS have been assessed.

12.6.2 With the employment node in-placed in the PRS, it is estimated that the traffic pattern of the district would be changed where those people heading to urban bound would be diverted to the employment node, i.e. towards MLS or remain within the Sha Tin district. Hence, the background traffic flow heading to urban bound would be reduced thus allow some buffer for the development traffic from the PRS. As a result, the traffic impact due to the PRS on the concerned road links would be minimized. With the changing of traffic pattern, the home job imbalance will be redressed.

12.6.3 For the railway, the assessment year shall be taken as Year 2036. It is noted that the peak period would appear during morning peak period as people heading to work or student going to school would be concentrated on the morning peak. With reference to the total public transport demand of the PRS, line capacity if using lower bound capacity and the remaining railway lines capacity in Year 2036 AM peak heading to Kowloon bound, it can be concluded that the rail line can cater the 100% of total public transport demand generated from the PRS.

12.6.4 In conclusion, no insurmountable traffic impact is anticipated due to the PRS.

13 PRELIMINARY TRANSPORT INFRASTRUCTURE STUDY

13.1 Objectives

13.1.1 In connection with the findings of the Preliminary TTIA, this Transport Infrastructure Study investigates the supporting transport infrastructures required due to the reclamation works.

13.1.2 The main objectives of Report on Preliminary Transport Infrastructure Study are as follows:-

- To identify if there is a need for new transport infrastructures based on the recommendation made under the Preliminary TTIA as indicated in **Figure 13.1.1**; and
- To recommend convenient and efficient transport modes among MLS reclamation and other major facilities and residential areas in Ma On Shan, Sha Tin, etc., to improve the local connectivity of Sha Tin district.

13.2 Assumed New Bridge

13.2.1 With the PRS, it would be prudent to consider the connection arrangement to enable the traffic movements from PRS to the opposite bank of Shing Mun River. The connection could be either making use of the existing T6 Bridge or a new district distributor in the form of an at-grade road or a bridge. For the purpose of the preliminary technical assessment at this initial stage, a new bridge in parallel with the existing T6 Bridge and a new southbound viaduct located east of the existing Tate's Cairn Highway are assumed for connecting to PRS in the north, Tolo Highway in the west and Tate's Cairn Highway in the southeast.

Road Layout Plan and Vertical Profile

General

13.2.2 The assumed new bridge is of dual-2 lanes carriageway standard with 7.3m wide per bound connecting to new roundabout of Tolo Highway southbound slip road / Science Park Road / MLS Internal Road to the north and Tate's Cairn Highway (between T6 Bridge and Shek Mun Interchange) to the south. The proposed design speed along the main line and associated slip roads is 70km/h, except a section of slip road to be connected to Hang Tai Road in Ma On Shan, the design speed is reduced to 50km/h due to site constraint.

Alignment and Proposed Connections

13.2.3 The assumed new bridge is aligned along the western and southern boundary of the PRS, in order to maximise the development potential of the PRS. The road section along the southern boundary is elevated and continues across the Shing Mun River. The elevated road would enable the provision of an at-grade roundabout with road arms linking the internal roads of STSTW and the PRS with the slip roads of assumed new bridge.

13.2.4 For the southbound carriageway of the assumed new bridge, it will continue to be elevated across the Shing Mun River and connects onto the Tate's Cairn Highway. Along the assumed new bridge southbound, a slip road will be provided for the motorist heading to Ma On Shan. To facilitate the above slip road, the existing one-way "bus only" lane connecting Ning Tai Road and Ma On Shan Road is proposed to be shifted southward.

13.2.5 The northbound road carriageway of the assumed new bridge will commence from the Tate's Cairn Highway northbound (between the Shek Mun Roundabout and T6 Bridge), pass through the existing slip roads of the T6 Bridge and continue across the Shing Mun River

and along the southern and western boundary of the PRS. It will connect to the new roundabout of Tolo Highway southbound slip road / Science Park Road.

13.2.6 The proposed alignment along the mainline of the assumed new bridge and its adjoining slip roads complied with the guidelines from TPDM.

13.2.7 The critical design parameters of the assumed new bridge are summarized in **Table 13.2.1**.

Table 13.2.1 Design Parameters of Assumed New Bridge

Design Requirement	TPDM Standard	Assumed New Bridge
Road Configuration	-	Dual-2 lane
Design Speed for Mainline	70km/hr	70km/hr
Max gradient %	4% desirable 8% absolute	7.5%
Vertical Crest Curve	K = 30 desirable K = 17 absolute minimum	30 - 55
Vertical Sag Curve	K = 20 desirable K = 20 absolute minimum	20 – 26
Horizontal Curvature	Absolute minimum R1 = 88m Normal minimum R3 = 175m	125 m

Slip Road Alignment Constraints

Slip Road (from assumed new bridge WB to Tate's Cairn Highway SB)

13.2.8 The horizontal curvature for the road section of assumed new bridge WB to Tate's Carin Highway SB has adopted the radius of 125m, which is R2 for the design speed of 70km/h.

13.2.9 The horizontal curvature of R3 for design speed 70km/h is 175m radius. If R3 is adopted, the interface with the railway line would be higher. In addition, taking into account the necessary vertical clearance above the railway line, the extend of the elevated road section and merging section would need to be extended around 300m southward of the Tate's Cairn Highway when compared to adopting R2.

Slip Road (from assumed new bridge WB to Ma On Shan Road NB)

13.2.10 For the provision of a slip road connection from the assumed new bridge to Ma On Shan Road, it is proposed to adopt a smaller radius on the road alignment in order to minimise the noise / visual impact to the existing school / residential developments along Hang Tai Road in Ma On Shan as far as practical. To maintain a wider separation gap between the assumed new bridge and the existing developments, the proposed radius shall be 63m.

13.2.11 According to Transport Planning and Design Manual (TPDM) Volume 2, Chapter 4.6, Table 4.6.7.1, the absolute minimum slip road curve radius of a slip road with design speed of 60 km/h is 63m. Hence, the post speed for this section of slip road should be reduced to 50 km/h.

Bus Only Lane Slip Road (from Ning Tai Road to Ma On Shan Road NB)

13.2.12 For the re-provision of the existing one-way "bus only" lane slip road connecting Ning Tai Road and Ma On Shan Road, the sag curve K value of below the absolute minimum had been adopted due to site constrain. According to TPDM Vol.2 Chapter 3 paragraph 3.11.6.3, the desirable minimum K value for a single track road is 3 and the vertical curve should be at least 10m long. The sag curve for this Bus Only Lane slip road had adopted a K value of

3 and the length of vertical curve is 24m, therefore it could comply with the TPDM requirement of a single track road.

13.2.13 The above issues on the horizontal curvature, traffic speed and K value could be reviewed in the design stage.

Headroom and Span Constraints

Headroom Requirement

13.2.14 The elevated section of assumed new bridge will cross over the PRS, Shing Mun River, at-grade Ma On Shan MTR Railway Line, and slip roads of existing Tate's Cairn Highway. According to the requirement of TPDM, the requirement of headroom underneath the bridge deck should be not less than 5.1m. For bridge deck of slip roads that will cross over the at-grade Ma On Shan MTR Railway Line, overhead pole and electric wires within the railway line reserve are observed. The requirement of headroom at this section should be confirmed with the respective maintenance authority.

13.2.15 Shing Mun River is a navigation channel. For assumed new bridge to be cross over the Shing Mun River, the requirement of headroom should make reference to the nearby Tate's Cairn Highway.

Special Span Requirement Design

13.2.16 The span of assumed new bridge is in general 40m. For the existing Tate's Cairn Highway across Shing Mun River, there are 2 supports locating within the river channel. In order to have minimal adverse impact on the hydraulic performance of Shing Mun River, same arrangement of assumed new bridge should also be adopted when across Shing Mun River. There also will be another section of slip road which a longer span is expected – slip road to be cross over the Ma On Shan MTR Railway Line and Tate's Cairn Highway.

Environmental Constraints

13.2.17 While the traffic noise impact to existing and planned NSRs in MLS and Ma On Shan arising the assumed new bridge could be a concern, the land use planning at PRS and ex-STSTW is to be further developed at the next stage of the Study. Subject to the detailed noise impact assessment to be conducted, to alleviate potential traffic noise impact, the following mitigation measures could be considered:

- Building setback between assumed new bridge and future building block;
- Special building designs such as single aspect buildings;
- Provision of a series of noise tolerant buildings, such as commercial buildings with central air conditioning (i.e. not using openable windows for ventilation). This provision could also serve as a shield to protect the noise sensitive receiver behind; and
- Install noise barrier along the main line of assumed new bridge.

Structural Form

13.2.18 The main line of assumed new bridge will be in form of concrete beam grids structure at spacing of 40m. Under preliminary design, prestressed concrete should be used for the main 40m long longitudinal beam to sustain a higher portion of loadings, whereas reinforced concrete can be used for the secondary 20m long transverse beam. The proposed depth of the grid structure will be at least 2.5m.

Land Requirement

13.2.19 The assumed new bridge and its associated slip roads route through the area to be under the PRS, Shing Mun River Channel and G/IC sites in Area 73 of Shatin. These G/IC sites are currently under short term tenancy and could be relocated if necessary. All proposed highway infrastructures will be located within government land and no land resumption will be required.

Other Local Junction Improvements in PRS

13.2.20 Due to the proposed internal roads of the PRS, new junctions are formed in order to connect to the existing road network and to the assumed new bridge. The new junctions include:

(i) Science Park Road / MLS Internal Road;

(ii) Tolo Highway Southbound Slip Road / Science Park Road / MLS Internal Road / Assumed New Bridge; and

(iii) MLS Internal Road / Assumed New Bridge Slip Roads / STSTW Internal Road

13.3 Roads and Footpaths

13.3.1 The design of the highway infrastructure in PRS has taken into account the current requirement in TPDM. In line with the latest requirements, the adopted standards for all roads in PRS are summarized in **Table 13.3.1**.

Table 13.3.1 Design Speed and Standard Adopted for All Roads in PRS

Type of Route	Design Speed (km/h)	Max. Gradient (%)	Vertical Curvature		Horizontal Curvature
			Crest	Sag	Min. Inner Radius
All At-grade district distributor roads	50	4%	10	13	44
All At-grade local distributor roads	50	4%	10	13	44

Road Configurations

Carriageways

13.3.2 The configurations of the road hierarchy adopted in the layout design have been summarized in **Table 13.3.2**.

Table 13.3.2 Configurations of Road Hierarchy in PRS

Proposed Road	Width of Carriageway / No. of Lane	Width of Footpath / Amenity
District Distributor	7.3m / dual-2 lane	6.5m / 3.5m
Local Distributor	7.3m / single-2 lane	6.5m / 3.5m

Footways

13.3.3 The PRS internal pedestrian walkways including footpaths along road sides and pedestrian access roads to / from the developments are designed in accordance with the design criteria stipulated in the TPDM.

13.3.4 According to TPDM Volume 2 Chapter 3 Table 3.4.11.1, 3.5m and 4.5m footpaths are required to provide for high density residential development and commercial developments respectively for urban area.

13.3.5 The proposed footpaths width shall comply with the requirements as stipulated in Table 3.4.11.1, Vol 2 of TPDM. Therefore, the widths of the internal walkways within the PRS are considered sufficient to cater for the pedestrian demands in the normal peak, and also sufficient space for utilities installation.

Cycle Track

13.3.6 There is an existing cycle track network connecting Shatin, MLS and Science Park. The cycle track along MLS section is currently along the waterfront. When part of the Sha Tin Hoi is reclaimed, the existing cycle track could be re-located to the future promenade such that the cycling experience along this waterfront could be maintained.

13.3.7 Cycling within PRS would not only be for leisure purpose but also for commuting purpose, especially between major public transport hub and activity nodes. A cycle track network linking future light railway stations, PTI, major residential/commercial developments, activity centres, G/IC facilities and market would be provided so that cycling would be one of the environmentally friendly transport mode in the PRS.

13.3.8 Safety is of paramount importance when designing a cycle track for new development. When designing the cycle track extension, it is proposed to segregate the cycle track from other users to enable the safety and comfort of all users. If feasible, cycle track should be separated from vehicular roads shielding off by plantings such that the cyclists would enjoy a vehicle-free and smoke-free cycling experience.

13.3.9 Similar to pedestrian facility network, a convenient cycle track network with grade-separated crossing facilities, such as subways or footbridges, and at-grade signal control crossing would be provided to cross roads, roundabouts and junctions.

13.3.10 A more present cycling environment would be provided to encourage cycling mode to share the road-based public transport demand. According to HKPSG and TPDM, desirable minimum 4m wide 2-way cycle track would be provided at the PRS.

Possible Pedestrian cum Cycle Track Connection to Ma On Shan

13.3.11 Apart from the footpath and cycle track network within the development, there are also opportunities to enhance the connectivity, especially for pedestrians/cyclists, (i) along the shoreline; (ii) between the MLS site and Ma On Shan; and (iii) between MLS site and the University Station.

13.4 Conclusion

13.4.1 Internal roads within the PRS and connections to the PRS with a new road/bridge and 3 new junctions at Science Park Road, Tolo Highway and the vacated site of STSTW are proposed to serve the development. In general, the design of the road hierarchy within the PRS emphasizes strong integration of road network with land use. The road network is more site specific to prevent unnecessary through traffic traveling across the PRS.

13.4.2 Footpath associated with amenity strip is proposed to provide within the PRS. Cycle track is also proposed to connect to the existing cycle track network connecting Shatin, MLS and HKSP. The design standard shall comply with HKPSG and TPDM.

13.4.3 There are also opportunities to enhance the connectivity, especially for pedestrians/cyclists, (i) along the shoreline; (ii) between the PRS and Ma On Shan; and (iii) between the PRS and the University Station.

[BLANK]

14 CONCLUSION

14.1 Summary Findings

14.1.1 This purpose of the Study is to examine the technical issues raised by the stakeholders related to the PRS.

Summary of Key Assumptions

14.1.2 Taking into account the nearby developments and opportunities, the crude assumptions were as detailed in **Section 3** made under the Study in order to facilitate the preliminary technical assessments on the PRS. The reclamation extent, land uses and scale of development are to be further explored and ascertained in the future planning and engineering study.

Water Quality

14.1.3 The preliminary assessment shows that the major water quality impact associated with marine-based construction is the elevation of SS within the marine water column. For land-based construction works, the potential water quality impacts from the land-based construction works are associated with the general construction activities, construction site run-off, accidental spillage, and sewage effluent from construction workforce. It is concluded that with the implementation of the recommended mitigation measures, no adverse water quality impacts due to the construction works of the PRS would be expected.

14.1.4 The preliminary assessment indicates that (1) no significant change in current velocities at Tolo Harbour and Shing Mun River were predicted with presence of the PRS, and hence no significant change in flow discharge in absolute terms is anticipated; (2) no other significant deviations of water quality modelling results predicted between this Study and that in the EIA study brief no. ESB-273/2014 for STCSTW, and hence no change / update in the findings of the EIA study of STCSTW; and (3) no direct discharge of sewage effluent to marine environment and hence no adverse water quality impact is anticipated from sewage generated from the developments of the PRS. Hence, no adverse water quality impact in Tolo Harbour is anticipated. With proper implementation of the recommended mitigation measures, it is anticipated that the water quality impacts associated with the non-point source discharge from road surfaces and developed areas of the PRS would be minimized.

Air Quality

14.1.5 The preliminary assessment shows that the air quality impacts from the construction works of the PRS would mainly be related to fugitive dust emissions generated by various construction activities, including excavation, sand filling above water, site formation, spoil/material handling, transportation and removal, stockpiling, wind erosion etc., at all potential works areas. With the implementation of mitigation measures specified in the Air Pollution Control (Construction Dust) Regulation, proposed dust suppression measures and good site practices regularly checked by regular site environmental audits, no significant impact of dust at the ASRs in the vicinity of the construction site is anticipated.

14.1.6 The odour patrol results show that there is no odour impact arising from the existing Shing Mun River. According to the water quality modelling results, the DO concentration at Shing Mun River would comply with the criteria of water quality objects with the presence of the PRS. It would in turn deter the anaerobic condition and avoid hydrogen sulphide generation from the sediment at the riverbed. Hence, no adverse odour impact from the PRS is expected.

Noise Impact

14.1.7 The preliminary assessment covers the area within 300m from the PRS. Some NSRs at Ma On Shan which are located outside the 300m assessment boundary from the PRS have also been assessed in this Study since (1) they are the first layer NSRs to the east which could demonstrate construction noise compliance at these NSRs and (2) they are located within 300m from helicopter flight path of the planned helipad.

14.1.8 The preliminary assessment illustrates that the predicted construction noise impact at existing representative NSRs would comply with relevant noise criteria. No adverse construction noise impact is anticipated under unmitigated scenario.

Ecological Impact

14.1.9 The preliminary assessment shows that the direct ecological impact due to the loss of marine habitats within the PRS (subtidal artificial vertical seawall, soft bottom seabed, and intertidal shoreline) is anticipated to be minor. In addition, direct loss of a locally common hard coral species *Oulastrea crispata* within the PRS is anticipated to be of minor impact. It also shows that direct ecological impact due to habitat loss of intertidal artificial shoreline habitat within the PRS is anticipated to be of minor impact to the ardeid species. Furthermore, given the low ecological values of the marine habitats, the direct ecological impact due to fragmentation of subtidal seawall and intertidal shoreline would be temporary and of minor impact.

14.1.10 Indirect impacts from construction disturbance are anticipated to be very minor on terrestrial habitats (plantation habitat and developed area) in the vicinity of the PRS and the indirect impact from the reclamation on the flight lines of breeding ardeids is anticipated to be minor, given the low percentage of ardeids and the short distance of flight path impacted and the presence of alternative flight paths in the vicinity. Only minor ecological impacts are anticipated from the PRS.

Landscape and Visual Impact

14.1.11 The preliminary assessment reveals that the PRS will have landscape impact to the existing manmade shoreline along Sha Tin Hoi. Visual impacts, especially on a part of the residential developments and promenade on the opposite bank in Ma On Shan as well as some buildings of CUHK's campus adjacent to the PRS, will be resulted during both construction and operation phases of the PRS. However, there are no significant vegetation types or rare species identified in the Landscape Resources, and implementation of a series of appropriate mitigation measures, the new eco-shoreline aims to recreate and restore the disturbed marine habitat to Sha Tin Hoi. In addition, 30% of greenery coverage will be provided for the new development and provision of view corridors. Despite the loss of water area to Sha Tin Hoi being irreversible, the residual landscape impact to Sha Tin Hoi may be reduced from 'significant' to 'moderate' after the implementation of appropriate mitigation measures in the long run and no unacceptable landscape impact is anticipated.

14.1.12 With implementation of the proposed mitigation measures, the residual visual impacts for Visual Sensitive Receivers (VSRs) in close proximity shall be reduced ranging from 'moderate' to 'insubstantial' in long term. For the remaining VSRs at distant, 'slight' to 'insubstantial' level of residual visual impact are anticipated.

14.1.13 Overall, the residual landscape and visual impacts of the PRS would be ranging from 'moderate' to 'insubstantial' in long run. To conclude, the PRS is considered preliminary acceptable with mitigation measures. The extent of the adverse effects to be offset by the

mitigation measures requires further study through a detailed LVIA based on a detailed proposal in the next stage.

Drainage Impact

14.1.14 The assessment reveals that the overall cross section of each B.C. extension along the shoreline of MLS is enlarged to have larger capacities to cater for the immediate upstream peak flow under 200-year return period. The results indicated that the freeboard at those sensitive locations with low ground level still has more than 300mm. In conclusion, the additional head loss caused by the outfall extension is insignificant to the existing drainage condition.

14.1.15 The PRS is divided into five catchments mainly by the proposed extension B.C. of existing outfalls and five B.C. are proposed to cater for these catchment respectively. All the proposed B.C. have enough capacity to cater for the surface runoff from the PRS and no adverse impact was found. Due to the back water effects, the maximum water level at the most upstream of the proposed B.C. within the PRS is estimated as +5mPD under 200-year return period. The site formation level of the PRS will take into account the required freeboard and climate change effect in the next stage.

14.1.16 A Mike 11 model has been built up to assess the impact to Shing Mun River due to the PRS. It is found that the additional water level increase due to the PRS is ranged from 3 cm to 6 cm along the Shing Mun River. The additional increase in water level is considered to be localized and manageable. Therefore, the PRS will unlikely cause any unacceptable increase in the potential flood risk to the drainage system along Shing Mun River.

Sewerage Impact

14.1.17 The assessment shows that a 1000mm dia. submarine rising main of THEES and twin 2500mm dia. submarine outfall pipes are identified to have conflicts with the PRS. The MLS North Pumping Station with designed peak flow of 0.1 m^3/s and MLS South Pumping Station with designed peak flow of 0.21 m^3/s are proposed to pump the sewage flow from PRS to the planned Intermediate SPS under Agreement No. CE 30/2014 (DS). In addition, twin 250mm dia. rising mains are proposed to connect MLS North Pumping Station with MLS South Pumping Station and twin 300mm dia. rising mains are proposed to connect MLS South Pumping Station with the planed Intermediate SPS under Agreement No. CE 30/2014 (DS). Since the estimated total sewage ADWF from the PRS and existing STSTW Redevelopment is 12,527 m^3/d which is smaller than the planned value under Agreement No. CE 30/2014 (DS), as such no adverse impact is found on both existing and planned sewerage and sewage facilities due to the subject development in this Preliminary SIA.

14.1.18 The assessment recommends the above-mentioned 1000mm dia. submarine rising main of THEES and twin 2500mm to be diverted or demolished upon further review.

Hydraulic on Sha Tin Hoi and Shing Mun River

14.1.19 The Delft3D model has been adopted and the changes resulting from the PRS, with respect to flooding due to tides combined with storm surge, have been evaluated. Key findings from the Study are summarized as below:-

Under normal spring tidal conditions:

- There is no detectable changes in peak water levels; and
- There are minor local increases and decreases in peak current speeds, typically within the range ±0.02m/s.

Under combined normal spring tidal and storm surge conditions:

- Peak water levels are increased by about 5 cm near the reclamation;
- Peak water levels are increased by between 1 – 3 cm within the Shing Mun River channel
- Current patterns downstream and seaward of the reclamation are modified leading to local increases and decreases in current speed in the range ±0.15m/s; and
- Peak current speeds within the Shing Mun River channel upstream of the reclamation are unaffected

14.1.20 The predicted changes in hydraulic conditions have been assessed for an extreme storm surge condition representative of a Super Typhoon. The changes during a less severe event can be expected to be of a reduced magnitude. In addition, under normal spring tidal conditions, there is no detectable change in peak water levels and only a minor change in peak current speeds as a result of the reclamation. In these circumstances there will therefore be no discernible influence on the flood risk within areas upstream of the section of the Shing Mun River that is represented in the model.

Traffic and Transport Impact

14.1.21 With the employment node in-placed in the PRS, the traffic pattern of the district would be changed where those people heading to urban bound would be diverted to the employment node, i.e. towards MLS or remain within the Sha Tin district. Hence, the background traffic flow heading to urban bound would be reduced thus allow some buffer for the development traffic from the PRS. As a result, the traffic impact due to the PRS on the concerned road links would be minimized. With the changing of traffic pattern, the self-containment of the district would be increased accordingly.

14.1.22 Road link capacity assessment result indicates that the traffic flow of Tolo Highway (between Tai Po and Pak Shek Kok) southbound, Tate's Cairn Tunnel southbound and Lion Rock Tunnel southbound will be similar during the AM peak hour in Year 2036 with or without the developments of the PRS. The traffic flow of Tolo Highway (between Pak Shek Kok and Tai Po) AM peak southbound will be slightly increased only. It is expected that such minor impact can be addressed in the future planning and engineering study. With the developments of the PRS, the traffic flow of Tate's Cairn Tunnel AM peak southbound, Lion Rock Tunnel AM Peak southbound and PM peak northbound are slightly reduced in Year 2036 when comparing with the Reference Case.

14.1.23 According to the junction analysis results with the PRS, all key junctions will operate within capacity during the AM and PM peak hours in year 2036. In conclusion, no insurmountable traffic impact is anticipated due to the PRS.

Transport Infrastructure

14.1.24 For the PRS itself, district distributors, local distributors together with a new road/bridge and 3 new junctions are proposed to serve the development. In general, the design of the road hierarchy within the PRS emphasizes strong integration of road network with land use. The road network is more site specific to prevent unnecessary through traffic traveling across the PRS.

14.1.25 Footpath associated with amenity strip is proposed to provide within the PRS. Cycle track is also proposed to connect to the existing cycle track network connecting Shatin, MLS and HKSP. The design standard shall comply with HKPSG and TPDM.

14.1.26 There are also opportunities to enhance the connectivity, especially for pedestrians/cyclists, (i) along the shoreline; (ii) between the PRS and Ma On Shan; and (iii) between the PRS and the University Station.

14.2 Way Forward

14.2.1 Based on the technical assessments, it is concluded that the PRS will unlikely lead to insurmountable technical issues and it can provide opportunities to meet the overall development needs at both territory and community levels.

14.2.2 Further to the crude assumptions made in the preliminary technical assessments, further studies on planning and engineering should be conducted. More detailed investigation and assessments should be carried out to firm up the development proposal and land use planning, covering aspects such as marine traffic, land traffic and transport, drainage, sewage, etc. Statutory EIA should be carried out to ascertain the environmental acceptability of the development proposal and to explore further mitigation/ enhancement measures.

14.2.3 The locals and relevant stakeholders on the proposed development should be consulted on the proposed development and their views should be sought to formulate the land use proposals. Community engagement shall be allowed in the next stage to seek community's views prior to the finalization of land use theme of the development of MLS reclamation.

[BLANK]

Figures

ISO A1 841mm x 594mm

Project Management Initials: Designer: Checked: Approved:

838000 E

840000 E

842000 E

832000 N

830000 N

TOLO HARBOUR

HONG KONG SCIENCE PARK

THE CHINESE UNIVERSITY OF HONG KONG

MA ON SHAN

SHA TIN HOI

TOLO HIGHWAY

TATE'S CAIRN HIGHWAY

SHA TIN SEWERAGE TREATMENT WORKS

PENFOLD PARK

SHA TIN

SHING MUN RIVER

N

LEGEND:

POTENTIAL RECLAMATION SITE

AECOM

PROJECT
項目

STUDY ON TECHNICAL ISSUES RELATED TO POTENTIAL RECLAMATION SITE AT MA LIU SHUI - FEASIBILITY STUDY

CLIENT
業主

CEDD 土木工程拓展署 Civil Engineering and Development Department

CONSULTANT
工程顧問公司

AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS
分判工程顧問公司

ISSUE/REVISION
發出

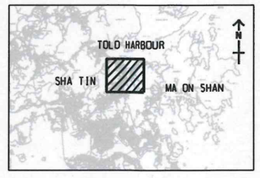
I/R 修訂	DATE 日期	DESCRIPTION 修訂事宜	CHK. 核對

STATUS
狀況

SCALE 比例: A3 1 : 20000

DIMENSION UNIT 尺寸單位: METRES

KEY PLAN 索引圖 A3 1 : 1000000



PROJECT NO. 項目編號: 60340462

AGREEMENT NO. 合約編號: CE 66/2014 (CE)

SHEET TITLE 圖紙名稱

POTENTIAL RECLAMATION SITE AT MA LIU SHUI (PRS)

SHEET NUMBER 圖紙編號

60340462/FR/FIGURE 2.1.1

Plot File by: HoKTT 3/21/2018
PATH: P:\Projects\60340462\DRAWING\REPORT\FR\FR_401.dgn

Project Management Initials: Designer: Checked: Approved: ISO A3 297mm x 420mm

Proposed Eco-shoreline
建議的生態海岸線

Ma Liu Shui Reclamation - about 60 ha
馬料水填海 - 約60公頃

0 100m 200m 500m

Plot File by: jlnG
PATH: P:\2015\20315041_Ma_Liu_Shui\05GRAPHICS\5.4Proj_Graphics\Report_Graphics\Baseline Review Report\CAD\From WUD\T7_gw.dwg
06/03/2015

AECOM

PROJECT
項目

STUDY ON TECHNICAL ISSUES RELATED TO POTENTIAL RECLAMATION SITE AT MA LIU SHUI - FEASIBILITY

CLIENT
業主

土木工程拓展署
CEDD Civil Engineering and Development Department

CONSULTANT
工程顧問公司

AECOM Asia Company Ltd.
www.aecom.com

ISSUE/REVISION
修訂

I/R 修訂	DATE 日期	DESCRIPTION 內容摘要	CHK. 核核

STATUS
階段

SCALE
比例

DIMENSION UNIT
尺寸單位

KEY PLAN
索引圖

PROJECT NO.
項目編號

CONTRACT NO.
合約編號

60340462

CE66/2014/(CE)

SHEET TITLE
圖紙名稱

ASSUMED RECLAMATION EXTENT OF THE PRS

SHEET NUMBER
圖紙編號

60340462/FR/FIGURE 3.1.1

ISO A1 841mm x 594mm

Approved:

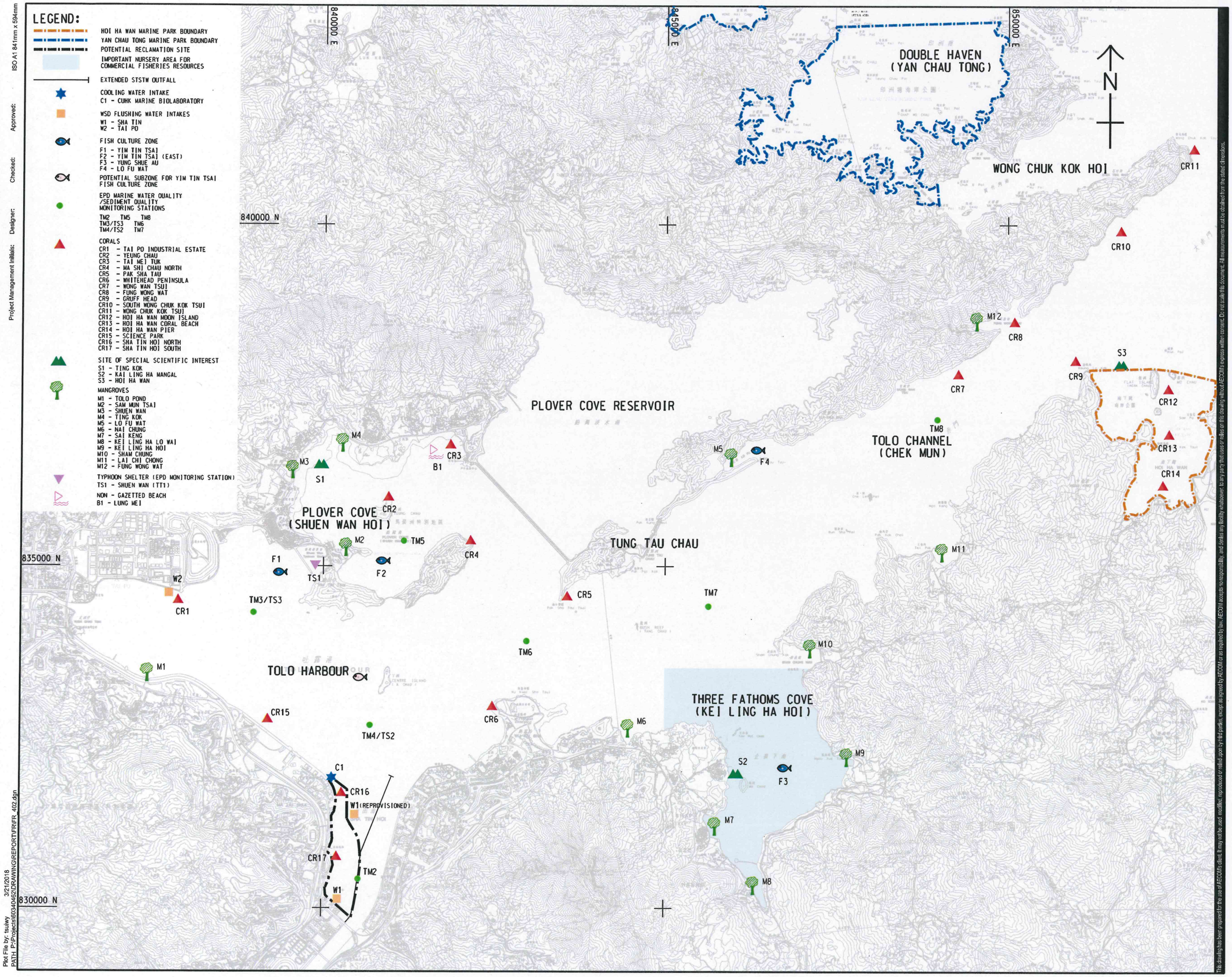
Checked:

Designer:

Project Management Initials:

LEGEND:

- HOI HA WAN MARINE PARK BOUNDARY
- YAN CHAU TONG MARINE PARK BOUNDARY
- POTENTIAL RECLAMATION SITE
- IMPORTANT NURSERY AREA FOR COMMERCIAL FISHERIES RESOURCES
- EXTENDED STSTW OUTFALL
- COOLING WATER INTAKE
  - C1 - CUHK MARINE BIOLABORATORY
- WSD FLUSHING WATER INTAKES
  - W1 - SHA TIN
  - W2 - TAI PO
- FISH CULTURE ZONE
  - F1 - YIM TIN TSAI
  - F2 - YIM TIN TSAI (EAST)
  - F3 - YUNG SHUE AU
  - F4 - LO FU WAT
- POTENTIAL SUBZONE FOR YIM TIN TSAI FISH CULTURE ZONE
- EPD MARINE WATER QUALITY /SEDIMENT QUALITY MONITORING STATIONS
  - TM2 TM5 TM8
  - TM3/TS3 TM6
  - TM4/TS2 TM7
- CORALS
  - CR1 - TAI PO INDUSTRIAL ESTATE
  - CR2 - YEUNG CHAU
  - CR3 - TAI MEI TUK
  - CR4 - MA SHI CHAU NORTH
  - CR5 - PAK SHA TAU
  - CR6 - WHITEHEAD PENINSULA
  - CR7 - WONG WAN TSUI
  - CR8 - FUNG WONG WAT
  - CR9 - GRUFF HEAD
  - CR10 - SOUTH WONG CHUK KOK TSUI
  - CR11 - WONG CHUK KOK TSUI
  - CR12 - HOI HA WAN MOON ISLAND
  - CR13 - HOI HA WAN CORAL BEACH
  - CR14 - HOI HA WAN PIER
  - CR15 - SCIENCE PARK
  - CR16 - SHA TIN HOI NORTH
  - CR17 - SHA TIN HOI SOUTH
- SITE OF SPECIAL SCIENTIFIC INTEREST
  - S1 - TING KOK
  - S2 - KAI LING HA MANGAL
  - S3 - HOI HA WAN
- MANGROVES
  - M1 - TOLO POND
  - M2 - SAM MUN TSAI
  - M3 - SHUEN WAN
  - M4 - TING KOK
  - M5 - LO FU WAT
  - M6 - NAI CHUNG
  - M7 - SAI KENG
  - M8 - KEI LING HA LO WAI
  - M9 - KEI LING HA HOI
  - M10 - SHAM CHUNG
  - M11 - LAI CHI CHONG
  - M12 - FUNG WONG WAT
- TYPHOON SHELTER (EPD MONITORING STATION)
  - TS1 - SHUEN WAN (TT1)
- NON - GAZETTED BEACH
  - B1 - LUNG MEI



Plot File by: tsuiwy 3/21/2018
PATH: P:\Projects\60340462\DRAWING\REPORT\FR\FR_402.dgn

AECOM

PROJECT
項目

STUDY ON TECHNICAL ISSUES RELATED TO POTENTIAL RECLAMATION SITE AT MA LIU SHUI - FEASIBILITY STUDY

CLIENT
客戶

土木工程拓展署
CEDD Civil Engineering and Development Department

CONSULTANT
土木顧問公司

AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS
分判工程顧問公司

ISSUE/REVISION
修訂

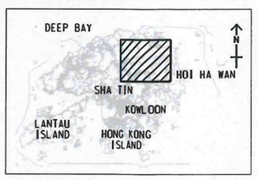
I/R 修訂	DATE 日期	DESCRIPTION 內容摘要	CHK. 核核

STATUS
階段

SCALE 比例: A3 1 : 50000

DIMENSION UNIT 尺寸單位: METRES

KEY PLAN 索引圖 A3 1 : 2000000



PROJECT NO. 項目編號: 60340462

AGREEMENT NO. 協議編號: CE 66/2014 (CE)

SHEET TITLE
圖紙名稱

MARINE WATER SENSITIVE RECEIVERS IN TOLO HARBOUR

SHEET NUMBER
圖紙編號

60340462/FR/FIGURE 4.4.1

ISO A1 841mm x 594mm

Approved:

Checked:

Designer:

Project Management Initials:

836000 E

838000 E

840000 E

COVE HILL
(KAU TO SHAN)

FO TAN

TR17

FO TAN NULLAH

TR17L

SHING MUN RIVER

828000 N

TR19I

SIU LEK YUEN NULLAH

TR23A

SHA TIN

MA ON SHAN COUNTRY PARK

R3

R2a

R2b

R1

R2c

N

TR23L

TR19C

TR19A

TR19

826000 N

KY1

TR20B

LEGEND:

■ ID NUMBER OF INLAND WATER BODIES NEAR THE PROJECT WORKS

R1 - SHING MUN RIVER
R2a, R2b, R2c - STREAM ALONG/AROUND MUI TSZ LAM ROAD
R3 - MA TAI STREAM

● EPD RIVER MONITORING STATIONS

TR17 - FO TAN NULLAH
TR17L - FO TAN NULLAH(DOWNSTREAM)
TR19 - SHING MUN MAIN CHANNEL
TR23L - SIU LEK YUEN NULLAH
TR23A - SIU LEK YUEN NULLAH (MAIN NULLAH)
KY1 - KWUN YAM SHAN STREAM
TR19 - TAI WAI NULLAH
TR19A - TAI WAI NULLAH (DOWNSTREAM)
TR19C - TAI WAI NULLAH (MIDDLE)
TR20B - TIN SUM NULLAH

Plot File by: HoKTT 3/21/2018
PATH: P:\Projects\60340462\DRAWING\REPORT\FR\FR_403.dgn

AECOM

PROJECT
項目

STUDY ON TECHNICAL ISSUES RELATED TO POTENTIAL RECLAMATION SITE AT MA LIU SHUI - FEASIBILITY STUDY

CLIENT
業主

CEDD 土木工程拓展署 Civil Engineering and Development Department

CONSULTANT
工程咨詢公司

AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS
分判工程咨詢公司

ISSUE/REVISION
發放

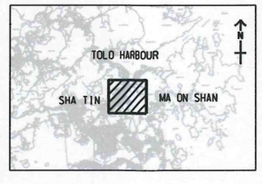
I/R 發放	DATE 日期	DESCRIPTION 內容概要	CHK. 核對

STATUS
狀態

SCALE 比例
A3 1 : 20000

DIMENSION UNIT 尺寸單位
METRES

KEY PLAN 索引圖 A3 1 : 1000000



PROJECT NO. 項目編號
60340462

AGREEMENT NO. 協議編號
CE 66/2014 (CE)

SHEET TITLE
圖紙名稱

INLAND WATER BODIES NEAR THE PRS

SHEET NUMBER
圖紙編號

60340462/FR/FIGURE 4.4.2

ISO A1 841mm x 594mm

Approved:

Checked:

Designer:

Project Management Initials:

838800 E

840000 E

841200 E

831600 N

830400 N

HONG KONG SCIENCE PARK

THE CHINESE UNIVERSITY OF HONG KONG

MA ON SHAN

SHA TIN HOI

TOLO HIGHWAY

TATE'S CAIRN HIGHWAY

KAU TO SHAN

(44.45)

(44.44)

(44.43)

(45.44)

(45.43)

A01

A02

A03

A04

A05

A06

A07

A08

A09

A11

A12

A13

A14

A15

A16

A17

A18

A19

A20

N

LEGEND:

POTENTIAL RECLAMATION SITE

A01 AIR SENSITIVE RECEIVER

500m ASSESSMENT AREA

(45,44) PATH GRID

Plot File by: tsuiwy 3/21/2018
PATH: P:\Projects\60340462\DRAWING\REPORT\FR\F_703.dgn

AECOM

PROJECT
項目

STUDY ON TECHNICAL ISSUES RELATED TO POTENTIAL RECLAMATION SITE AT MA LIU SHUI - FEASIBILITY STUDY

CLIENT
業主

CEDD 土木工程拓展署 Civil Engineering and Development Department

CONSULTANT
下盾顧問公司

AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS
分判下盾顧問公司

ISSUE/REVISION
修訂

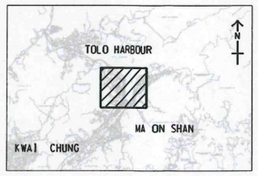
I/R 修訂	DATE 日期	DESCRIPTION 內容說明	CHK. 核查

STATUS
現狀

SCALE 比例
A3 1 : 12000

DIMENSION UNIT 尺寸單位
METRES

KEY PLAN 索引圖 A3 1 : 500000



PROJECT NO. 分包編號
60340462

AGREEMENT NO. 協議編號
CE 66/2014 (CE)

SHEET TITLE
圖紙名稱

LOCATION OF REPRESENTATIVE AIR SENSITIVE RECEIVER DURING CONSTRUCTION PHASE

SHEET NUMBER
圖紙編號

60340462/FR/FIGURE 5.4.1

ISO A1 841mm x 594mm

Approved:

Checked:

Designer:

Project Management Initials:

838800 E

840000 E

841200 E

831600 N

830400 N

HONG KONG SCIENCE PARK

THE CHINESE UNIVERSITY OF HONG KONG

MA ON SHAN

SHA TIN HOI

TOLO HIGHWAY

TATE'S CAIRN HIGHWAY

KAU TO SHAN

(44.45)

(44.44)

(44.43)

(45.44)

(45.43)

A01

A02

A03

A04

A05

A06

A07

A08

A10

A11

A12

A13

A14

A15

A16

A17

A18

A19

A20

N

LEGEND:

POTENTIAL RECLAMATION SITE

AIR SENSITIVE RECEIVER

500m ASSESSMENT AREA

PATH GRID

Plot File by: lsulwy 3/21/2018
PATH: P:\Projects\60340462\DRAWING\REPORT\FR\FR_706.dgn

AECOM

PROJECT
項目

STUDY ON TECHNICAL ISSUES RELATED TO POTENTIAL RECLAMATION SITE AT MA LIU SHUI - FEASIBILITY STUDY

CLIENT
客戶

土木工程拓展署
CEDD Civil Engineering and Development Department

CONSULTANT
土木顧問公司

AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS
分判土木顧問公司

ISSUE/REVISION
發放

I/R 發放	DATE 日期	DESCRIPTION 內容摘要	CHK. 核對

STATUS
狀況

SCALE
比例

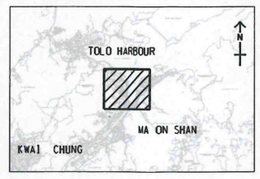
A3 1 : 12000

DIMENSION UNIT
尺寸單位

METRES

KEY PLAN
索引圖

A3 1 : 500000



PROJECT NO.
項目編號

60340462

AGREEMENT NO.
協議編號

CE 66/2014 (CE)

SHEET TITLE
圖紙名稱

LOCATION OF REPRESENTATIVE AIR SENSITIVE RECEIVER DURING OPERATION PHASE

SHEET NUMBER
圖紙編號

60340462/FR/FIGURE 5.4.2

ISO A1 841mm x 594mm

Approved:

Checked:

Designer:

Project Management Initials:

838000 E

840000 E

842000 E

832000 N

830000 N

TOLO HARBOUR

吐露港

Y洲
CENTRE ISLAND
(A CHAU)

HONG KONG SCIENCE PARK

MA LIU SHUI

SHA TIN HOI

THE CHINESE UNIVERSITY OF HONG KONG

MA ON SHAN

N1

N2

N3

N4

N5

N6

N7

N8

N9

TOLO HIGHWAY

TATE'S CAIRN HIGHWAY

SHA TIN SEWERAGE TREATMENT WORKS

SHING MUN RIVER

WU KAI SHA

LEGEND:

POTENTIAL RECLAMATION SITE

300m STUDY AREA BOUNDARY

REPRESENTATIVE NOISE SENSITIVE RECEIVERS

N

Plot File by: tsuiwy
3/21/2018
PATH: P:\Projects\60340462\DRAWING\REPORT\FR\FR_707.dgn

AECOM

PROJECT
項目

STUDY ON TECHNICAL ISSUES RELATED TO POTENTIAL RECLAMATION SITE AT MA LIU SHUI - FEASIBILITY STUDY

CLIENT
客戶

土木工程拓展署
CEDD Civil Engineering and Development Department

CONSULTANT
土木工程顧問公司

AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS
分判工程顧問公司

ISSUE/REVISION
修訂

I/R 修訂	DATE 日期	DESCRIPTION 內容摘要	CHK. 核對

STATUS
階段

SCALE 比例	DIMENSION UNIT 尺寸單位
A3 1 : 20000	METRES

KEY PLAN
索引圖

PROJECT NO. 項目編號	AGREEMENT NO. 協議編號
60340462	CE 66/2014 (CE)

SHEET TITLE
圖紙名稱

LOCATIONS OF REPRESENTATIVE NOISE SENSITIVE RECEIVERS

SHEET NUMBER
圖紙編號

60340462/FR/FIGURE 6.4.1

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

836800 E

840000 E

841200 E

N

831600 N

830400 N

TOLO HIGHWAY

TAI PO ROAD (MA LIU SHUI)

MA ON SHAN ROAD

MA ON SHAN

SHA TIN HOI

MA LIU SHUI

ASSUMED RELOCATED HELIPAD

POTENTIAL RECLAMATION SITE

152m OFF-SET FROM ADJACENT RESIDENTIAL DEVELOPMENT

152m

EXISTING HELIPAD (TO BE RELOCATED)

Disclaimer:
The assumed relocated helipad shown in this figure is crude assumption only and is subjected to review in the next stage of the study.

Plot File by: HoKTT
PATH: P:\Projects\60340462\DRAWING\REPORT\FR\FR_101.dgn
3/15/2018

AECOM

PROJECT
項目

STUDY ON TECHNICAL ISSUES RELATED TO POTENTIAL RECLAMATION SITE AT MA LIU SHUI - FEASIBILITY STUDY

CLIENT
主主

CEDD 土木工程拓展署 Civil Engineering and Development Department

CONSULTANT
(T程顧問公司

AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS
分判工程顧問公司

ISSUE/REVISION
修訂

IR 修訂	DATE 日期	DESCRIPTION 內容摘要	CHK. 核對
-	MAR.18	FIRST ISSUE	DY

STATUS
階段

SCALE 比例
A1 1 : 60000

DIMENSION UNIT 尺寸單位

KEY PLAN
索引圖

60340462 CE 66/2014 (CE)

PROJECT NO. 項目編號

CONTRACT NO. 合約編號

SHEET TITLE
圖紙名稱

EXISTING AND ASSUMED HELIPADS

SHEET NUMBER
圖紙編號

60340462/FR/Figure 6.7.1

ISO A1 841mm x 594mm

Approved:

Checked:

Designer:

Project Management Initials:

840000 E

845000 E

850000 E

840000 N

835000 N

830000 N

DOUBLE HAVEN
(YAN CHAU TONG)

YAN CHAU TONG MARINE PARK

WONG CHUK KOK HOI

WONG CHUK KOK TSUI

SOUTH WONG CHUK KOK TSUI

FUNG WONG WAT

GRUFF HEAD

WONG WAN TSUI

HOI HA WAN
MOON ISLAND

HOI HA WAN
CORAL BEACH

HOI HA WAN PIER

PLOVER COVE RESERVOIR

TOLO CHANNEL
(CHEK MUN)

LO FU WAT

TAI MEI TUK

YEUNG CHAU

PLOVER COVE
(SHUEN WAN HOI)

MA SHI CHAU NORTH

TUNG TAU CHAU

YIM TIN TSAI
(EAST)

YIM TIN TSAI

TAI PO INDUSTRIAL ESTATE

TOLO HARBOUR

WHITEHEAD
PENINSULA

THREE FATHOMS COVE
(KEI LING HA HOI)

YUNG SHUE AU

LEGEND:

- COASTAL PROTECTION AREA
- TING KOK SSSI
- KAI LING HA MANGAL SSSI
- MARINE PARK
- MANGROVE
- CORAL
- MARINE FISH CULTURE ZONE

Plot File by: HoKTT 3/21/2018
PATH: P:\Projects\60340462\DRAWING\REPORT\FR\FR_702.dgn

AECOM

PROJECT
項目

STUDY ON TECHNICAL ISSUES RELATED TO POTENTIAL RECLAMATION SITE AT MA LIU SHUI - FEASIBILITY STUDY

CLIENT
客戶

CEDD 土木工程拓展署 Civil Engineering and Development Department

CONSULTANT
工程顧問公司

AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS
分判工程顧問公司

ISSUE/REVISION
修訂

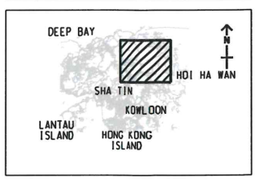
I/R 修訂	DATE 日期	DESCRIPTION 事項簡述	CHK. 核對

STATUS
現狀

SCALE 比例: A1 1 : 50000

DIMENSION UNIT 尺寸單位: METRES

KEY PLAN 索引圖 A1 1 : 2000000



PROJECT NO. 項目編號: 60340462

AGREEMENT NO. 合約編號: CE 66/2014 (CE)

SHEET TITLE
圖紙名稱

MARINE ECOLOGICAL RESOURCES AND SITES OF CONSERVATION IMPORTANCE

SHEET NUMBER
圖紙編號

60340462/FR/FIGURE 7.3.1

ISO A1 841mm x 594mm

Approved:

Checked:

Designer:

Project Management Initials:

838000 E

840000 E

842000 E

832000 N

830000 N

TOLO HARBOUR

HONG KONG SCIENCE PARK

THE CHINESE UNIVERSITY OF HONG KONG

SHA TIN SEWAGE TREATMENT WORKS

PENFOLD PARK

SHA TIN

MA ON SHAN

SHING MUN RIVER

TOLO HIGHWAY

TATE'S CAIRN HIGHWAY

T1

T2

T3

B1

B2

B3

SC1

SC2

REA1

REA2

REA3

REA4

N

LEGEND:

- POTENTIAL RECLAMATION SITE
- SPOT CHECK DIVE SURVEY TRANSECT
- REA TRANSECT
- INTERTIDAL SURVEY
- BENTHIC SURVEY
- PENFOLD PARK EGRETRY

Plot File by: HoKTT 3/21/2018
PATH: P:\Projects\60340462\DRAWING\REPORT\FRIR_701.dgn

AECOM

PROJECT
項目

STUDY ON TECHNICAL ISSUES RELATED TO POTENTIAL RECLAMATION SITE AT MA LIU SHUI - FEASIBILITY STUDY

CLIENT
客戶

CEDD 土木工程拓展署 Civil Engineering and Development Department

CONSULTANT
土木工程顧問公司

AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS
分判土木工程顧問公司

ISSUE/REVISION
發放

I/R 發放	DATE 日期	DESCRIPTION 事件簡要	CHK. 核對

STATUS
現況

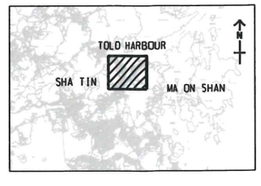
SCALE
比例

A1 1 : 20000

DIMENSION UNIT
尺寸單位

METRES

KEY PLAN
索引圖 A1 1 : 1000000



PROJECT NO.
項目編號

60340462

AGREEMENT NO.
協議編號

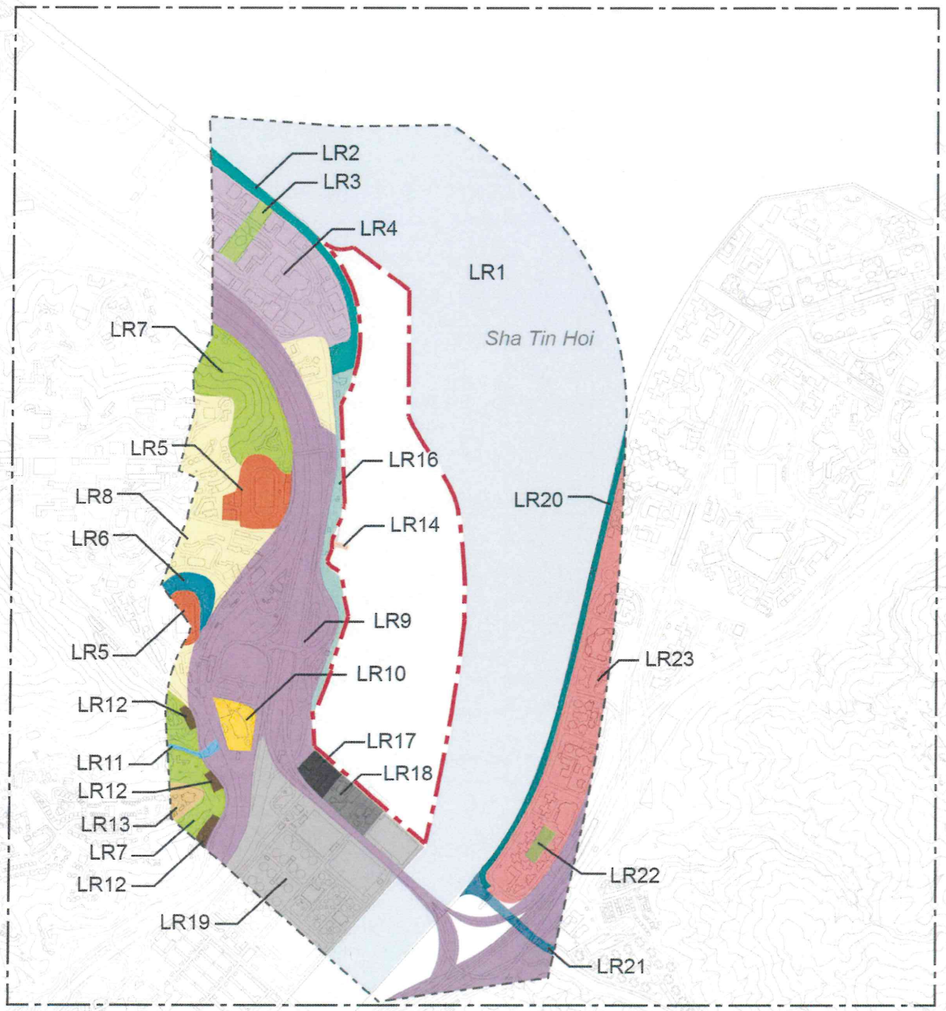
CE 66/2014 (CE)

SHEET TITLE
圖紙名稱

PROPOSED RECLAMATION SITE AND LOCATIONS FOR MARINE ECOLOGICAL SURVEYS

SHEET NUMBER
圖紙編號

60340462/FR/FIGURE 7.3.2



Legend:

- Study Area
- Potential Reclamation Area
- Limit of Landscape Study

LR1	Sha Tin Hoi
LR2	Pak Shek Kok Promenade
LR3	Science Park Open Space
LR4	Science Park Development
LR5	CUHK Sports Ground and Park
LR6	CUHK Lake Ad Excellentiam
LR7	Hillside Woodland
LR8	CUHK Campus
LR9	Transportation
LR10	Amenity Planting in Hyatt Regency Hotel
LR11	Kau To Hang River
LR12	Engineered Slope with Hillside Vegetation
LR13	Kau To Shan Residential
LR14	Ma Liu Shui Ferry Pier
LR16	Ma Liu Shui Promenade
LR17	Marine Outer Waters District Headquarters and Marine North Division
LR18	WSD Salt Water Pumping Station
LR19	Sha Tin Sewage Treatment Works
LR20	Ma On Shan Promenade
LR21	Stream along Mui Tsz Lam
LR22	Playground near Kam Tai Court
LR23	Ma On Shan Residential Development

0 200m 400m 800m

AECOM

PROJECT
項目
STUDY ON TECHNICAL ISSUES RELATED TO POTENTIAL RECLAMATION SITE AT MA LIU SHUI - FEASIBILITY

CLIENT
業主
CEDD 土木工程拓展署 Civil Engineering and Development Department

CONSULTANT
工程顧問公司
AECOM Asia Company Ltd.
www.aecom.com

ISSUE/REVISION
修訂

I/R 修訂	DATE 日期	DESCRIPTION 內容摘要	CHK. 核對
	DD-MM-YY	DESCRIPTION 1	XXX

STATUS
階段
PRELIMINARY

SCALE 比例

DIMENSION UNIT 尺寸單位
METRES

KEY PLAN
索引圖

PROJECT NO. 項目編號
60340462

CONTRACT NO. 合約編號
CE66/2014/(CE)

SHEET TITLE
圖紙名稱
LANDSCAPE RESOURCES OF SHA TIN, MA ON SHAN AND PAK SHEK KOK AREAS

SHEET NUMBER
圖紙編號
60340462/FR/Figure 8.3.1

Project Management Initials: Designer: Checked: Approved: ISO A3 297mm x 420mm

Tolo Harbour

LCA1
Sha Tin Hoi

LCA2

LCA3

LCA4

LCA5

LCA6

LCA7

LCA8

LCA9

Shing Mun River

Legend:

- Study Area
- Potential Reclamation Site
- Limit of Landscape Study
- LCA1 Sha Tin Hoi Inshore Water LCA
- LCA2 Science Park Reclamation LCA
- LCA3 The Chinese University of Hong Kong Institutional LCA
- LCA4 University Station Transportation Corridor LCA
- LCA5 Sha Tin Sewage Treatment Works Industrial Urban LCA
- LCA6 Kau To Shan Upland LCA
- LCA7 Kau To Shan Hillside to Fotan Residential Urban Fringe LCA
- LCA8 Shatin to Ma On Shan Miscellaneous Urban Fringe LCA
- LCA9 Ma On Shan Residential Urban LCA

0 200m 400m 800m

Plot File by: JinG 09/03/2015
PATH: P:\2015\2015041_Ma_Liu_Shui\05GRAPHICS\5.4Proj_Graphics\Report_Graphics\Baseline Review Report\CAD\From WUD\T7_gw.dwg

AECOM

PROJECT
項目

STUDY ON TECHNICAL ISSUES RELATED TO POTENTIAL RECLAMATION SITE AT MA LIU SHUI - FEASIBILITY

CLIENT
業主

土木工程拓展署
CEDD Civil Engineering and Development Department

CONSULTANT
工程顧問公司

AECOM Asia Company Ltd.
www.aecom.com

ISSUE/REVISION
修訂

I/R 修訂	DATE 日期	DESCRIPTION 內容摘要	CHK. 複核
	DD-MM-YY	DESCRIPTION 1	XXX

STATUS
現狀

PRELIMINARY

SCALE
比例

DIMENSION UNIT
尺寸單位

METRES

KEY PLAN
索引圖

PROJECT NO.
項目編號

60340462

CONTRACT NO.
合約編號

CE66/2014/(CE)

SHEET TITLE
圖紙名稱

LANDSCAPE CHARACTER AREA OF SHA TIN, MA ON SHAN AND PAK SHEK KOK AREAS

SHEET NUMBER
圖紙編號

60340462/FR/Figure 8.3.2

Legend:

- Study Area
- Potential Reclamation Site
- Visually Sensitive Receiver (VSR)
- Visual Envelope

VSR1 Hong Kong Science Park

VSR2 Ma Liu Shui Promenade

VSR3 CUHK

VSR3B United Road near University Library, CUHK

VSR4 Marine Outer Waters District Headquarters and Marine North, WSD Salt Water Pumping Station, Sha Tin Sewage Treatment Works

VSR5 Kam Tai Court / Mountain Shore / Sausalito / La Costa / Ocean View / Oceanaire

VSR6 Ma On Shan Promenade

VSR7 Baycrest Vista Paradiso / Kam Fung Court / Chung On Estate / Marbella

VSR8 Hyatt Regency

VSR9 Kau To Shan

VSR10 Ma On Shan Country Trail

VSR11 Ma On Shan Park

VSR12 Mayfair by the Sea and Providence Bay

VSR13 Chevalier Garden

VSR14 Horizon Suite Hotel

VSR15 Sam Mun Tsai

0 400m 800m 1600m

AECOM

PROJECT
STUDY ON TECHNICAL ISSUES RELATED TO POTENTIAL RECLAMATION SITE AT MA LIU SHUI - FEASIBILITY

CLIENT
土木工程拓展署 Civil Engineering and Development Department

CONSULTANT
AECOM Asia Company Ltd.
www.aecom.com

ISSUE/REVISION

I/R	DATE	DESCRIPTION	CHK.
	DD-MM-YY	DESCRIPTION 1	XXX

STATUS
PRELIMINARY

SCALE
DIMENSION UNIT
METRES

KEY PLAN

PROJECT NO. 60340462
CONTRACT NO. CE66/2014/(CE)

SHEET TITLE
VISUAL SENSITIVE RECEIVERS OF SHA TIN, MA ON SHAN AND PAK SHEK KOK AREAS

SHEET NUMBER
60340462/FR/Figure 8.4.1

ISO A3 297mm x 420mm
Approved:
Checked:
Designer:
Project Management Initials:

Plot File by: JinG 06/03/2015
PATH: P:\2015\2015041_Ma_Liu_Shui\05GRAPHICS\5.4Proj_Graphics\Report_Graphics\Baseline Review Report\CAD\From WUD\T7_gw.dwg

ISO A1 841mm x 594mm

Project Management Initials: Designer: Checked: Approved:

838000 E

840000 E

842000 E

832000 N

830000 N

TOLO HARBOUR

LEGEND:

POTENTIAL RECLAMATION SITE

EXISTING DRAINAGE PIPE

N

HONG KONG SCIENCE PARK

THE CHINESE UNIVERSITY OF HONG KONG

MA ON SHAN

Location 1

Location 2

Location 3

Location 4

Location 5

Outfall 1 — 1-cell 2650mmx2650mm I.L: 1.5mAD

Outfall 2 — 1050 mm (diameter) I.L: 0.28mAD

Outfall 3 — 2-cell 2500mmx3000mm I.L: -0.228mAD

Outfall 4 — 4-cell 2500mmx2500mm I.L: 0mAD

Outfall 5 — 2-cell 2600mmx2600mm I.L: 0.05mAD

TOLO HIGHWAY

TATE'S CAIRN HIGHWAY

SHA TIN SEWERAGE TREATMENT WORKS

PENFOLD PARK

SHA TIN

SHING MUN RIVER

Plot File by: CAOPA 2017/2/24
PATH: P:\PROJECTS\60340462\0\Drawing\REPORT\PDIA\PDIA_403.dgn

AECOM

PROJECT 項目

STUDY ON TECHNICAL ISSUES RELATED TO POTENTIAL RECLAMATION SITE AT MA LIU SHUI - FEASIBILITY STUDY

CLIENT 業主

土木工程拓展署 CEDD Civil Engineering and Development Department

CONSULTANT 工程顧問公司

AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS 分判工程顧問公司

ISSUE/REVISION 修訂

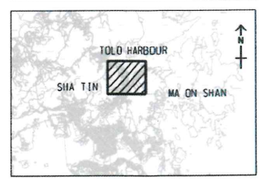
I/R 修訂	DATE 日期	DESCRIPTION 內容摘要	CHK. 核對

STATUS 現狀

SCALE 比例: A3 1 : 20000

DIMENSION UNIT 尺寸單位: METRES

KEY PLAN 索引圖 A3 1 : 1000000



PROJECT NO. 項目編號: 60340462

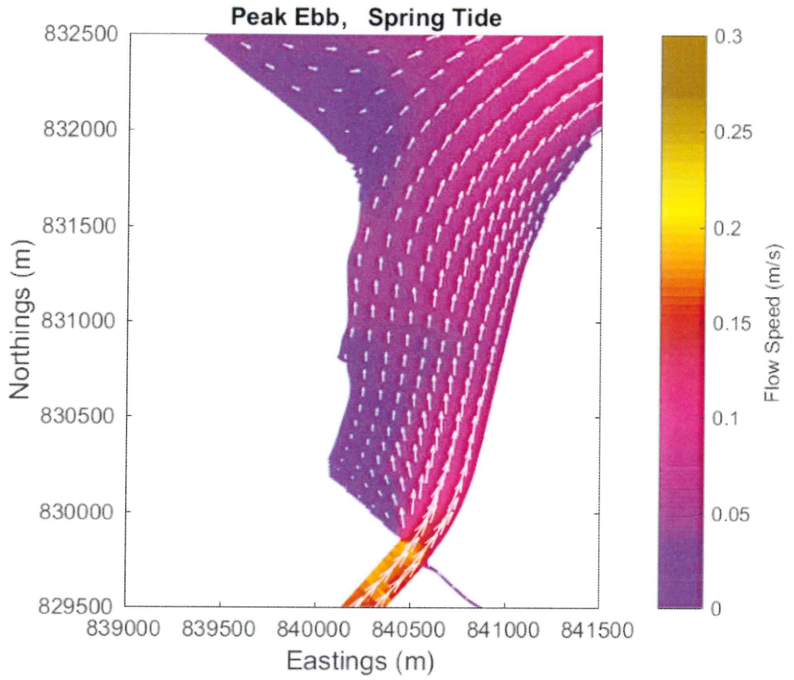
AGREEMENT NO. 協議編號: CE 66/2014 (CE)

SHEET TITLE 圖紙名稱

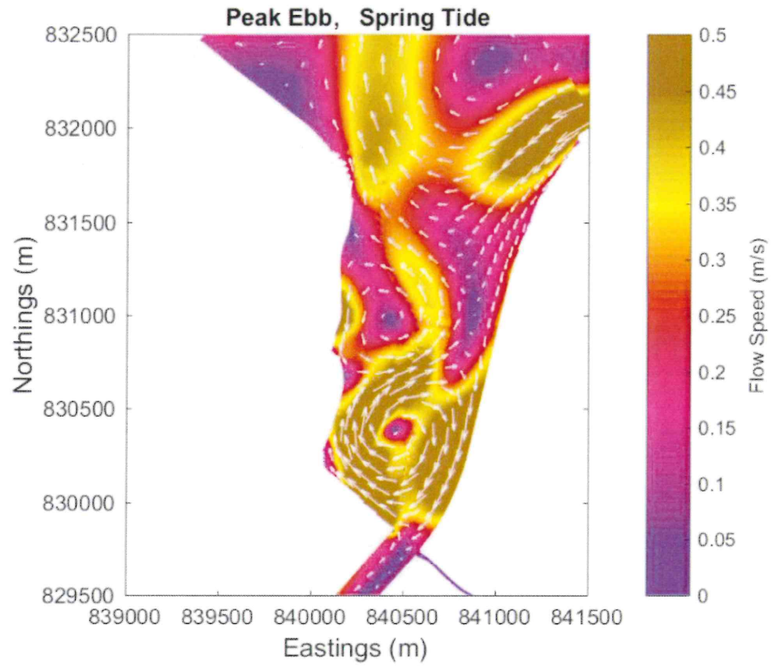
EXISTING DRAINAGE LAYOUT PLAN

SHEET NUMBER 圖紙編號

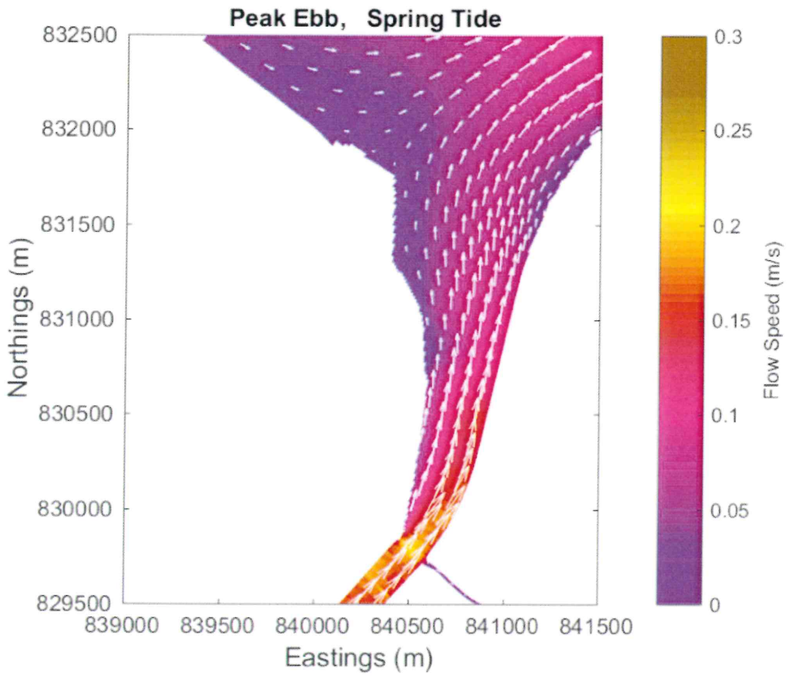
60340462/FR/Figure 9.3.1



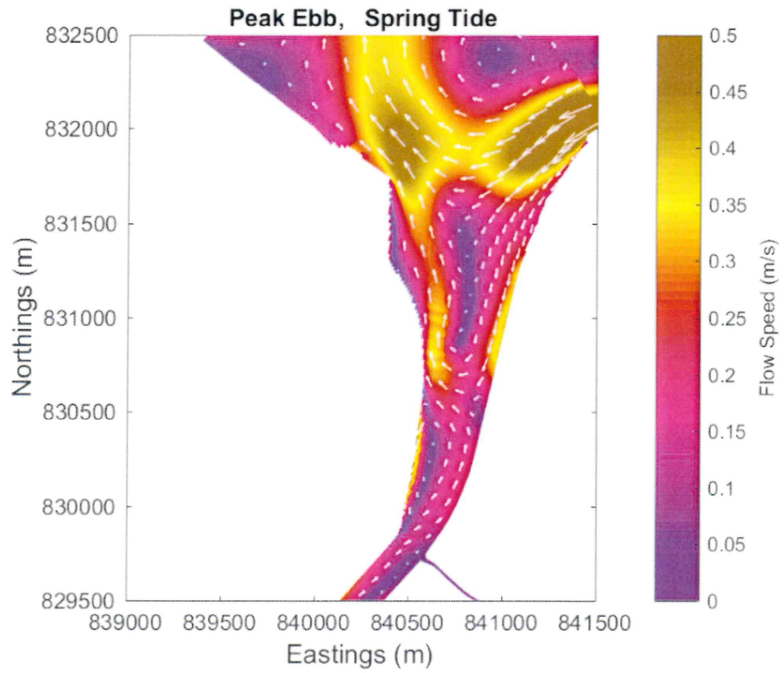
Normal Spring Tidal Conditions (Without Reclamation)



Surge Tide Conditions (Without Reclamation)



Normal Spring Tidal Conditions (With Reclamation)



Surge Tide Conditions (With Reclamation)

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

Plot File by: zhaoht 2017/2/24
PATH: P:\PROJECTS\60340462\Drawing\REPORT\PDIA\PDIA_404.dgn

AECOM

PROJECT
STUDY ON TECHNICAL ISSUES RELATED TO POTENTIAL RECLAMATION SITE AT MA LIU SHUI - FEASIBILITY STUDY

CLIENT
CEDD 土木工程拓展署 Civil Engineering and Development Department

CONSULTANT
AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS

ISSUE/REVISION

I/R	DATE	DESCRIPTION	CHK.

PROJECT NO. 60340462
AGREEMENT NO. CE 66/2014 (CE)

SHEET TITLE
CURRENT VECTOR PLOTS

SHEET NUMBER
60340462/FR/FIGURE 11.4.1

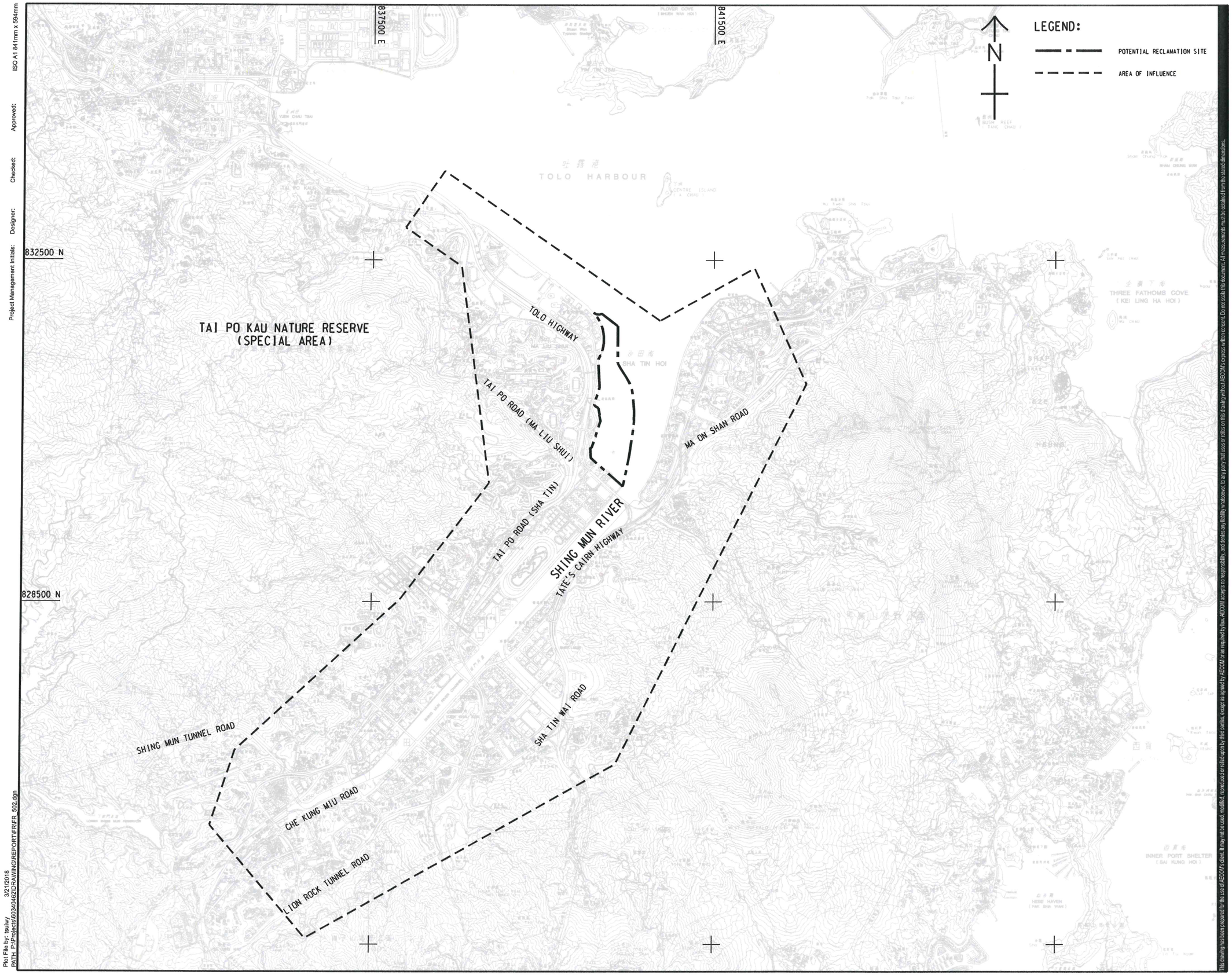
ISO A1 841mm x 594mm

Approved:

Checked:

Designer:

Project Management Initials:



Plot File by: tsuiwy 3/21/2018
PATH: P:\Projects\60340462\DRAWING\REPORT\FR\FR_502.dgn

AECOM

PROJECT
項目

STUDY ON TECHNICAL ISSUES RELATED TO POTENTIAL RECLAMATION SITE AT MA LIU SHUI - FEASIBILITY STUDY

CLIENT
委主

土木工程拓展署
CEDD Civil Engineering and Development Department

CONSULTANT
下屬顧問公司

AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS
分判下的顧問公司

ISSUE/REVISION
修訂

I/R 修訂	DATE 日期	DESCRIPTION 內容簡要	CHK. 核對

STATUS
階段

SCALE
比例

A1 1:3000

DIMENSION UNIT
尺寸單位

METRES

KEY PLAN
索引圖

PROJECT NO.
方案編號

60340462

AGREEMENT NO.
協議編號

CE 66/2014 (CE)

SHEET TITLE
圖紙名稱

PROPOSED AREA OF INFLUENCE

SHEET NUMBER
圖紙編號

60340462/FR/FIGURE 12.2.1

TOLO HIGHWAY

THE CHINESE UNIVERSITY OF HONG KONG

MA ON SHAN

SAI SHA ROAD

MA ON SHAN ROAD

PROPOSED NEW JUNCTION

PROPOSED NEW ROUNDABOUT

FUTURE CHAK CHEUNG STREET ROUNDABOUT BY OTHER PROJECT

PROPOSED NEW ROUNDABOUT

TATE'S CAIRN HIGHWAY

Ex-STSTW Site

ASSUMED NEW BRIDGE PARALLEL TO EXISTING T6

Legend:

- Potential Reclamation Area
- Proposed Waterfront Promenade cum Cycle Track
- Potential Eco-Shoreline

Disclaimer:
The proposed layout shown in this figure is crude assumption only and is subjected to review in the next stage of the study.

0 100m 200m 500m

AECOM

PROJECT
項目

STUDY ON TECHNICAL ISSUES RELATED TO POTENTIAL RECLAMATION SITE AT MA LIU SHUI - FEASIBILITY STUDY

CLIENT
業主

土木工程拓展署
CEDD Civil Engineering and Development Department

CONSULTANT
工程顧問公司

AECOM Asia Company Ltd.
www.aecom.com

ISSUE/REVISION
修訂

I/R 修訂	DATE 日期	DESCRIPTION 內容摘要	CHK. 核對

STATUS
階段

SCALE 比例

DIMENSION UNIT 尺吋單位

KEY PLAN
索引圖

PROJECT NO. 項目編號
60340462

CONTRACT NO. 合約編號
CE66/2014/(CE)

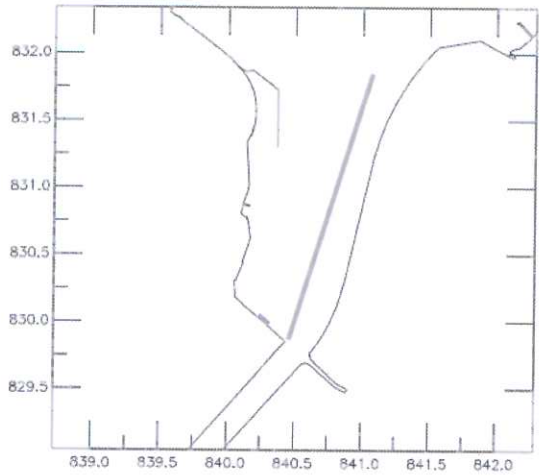
SHEET TITLE
圖紙名稱
INDICATIVE ROAD LAYOUT PLAN

SHEET NUMBER
圖紙編號
60340462/FR/FIGURE 13.1.1

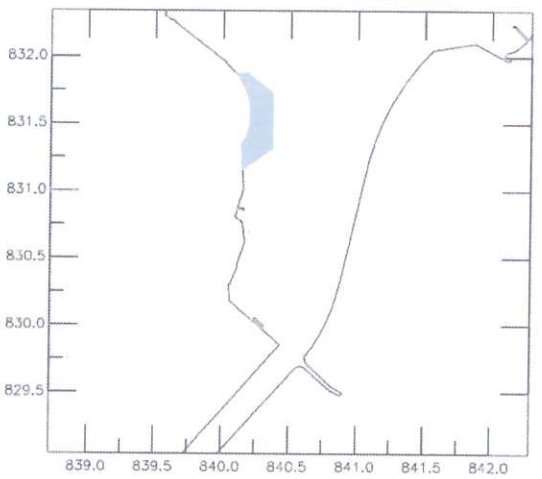
Plot File by: JinG 06/03/2015
PATH: P:\2015\2015041 Ma Liu Shui\05GRAPHICS\5.4Proj. Graphics\Report_Graphics\Baseline Review Report\CAD\From WUD\T7 gw.dwg

Appendix

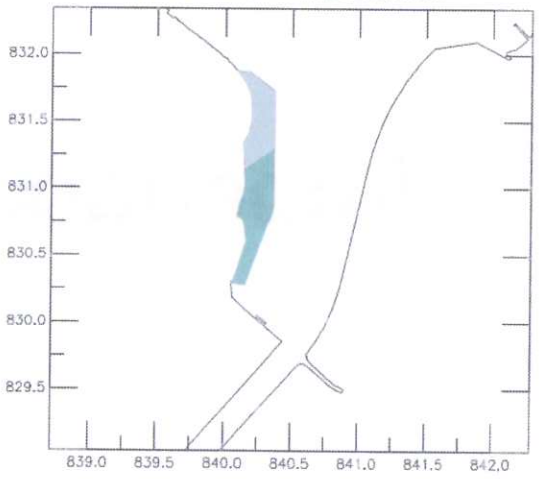
Re provision of STSTW Submarine Outfall



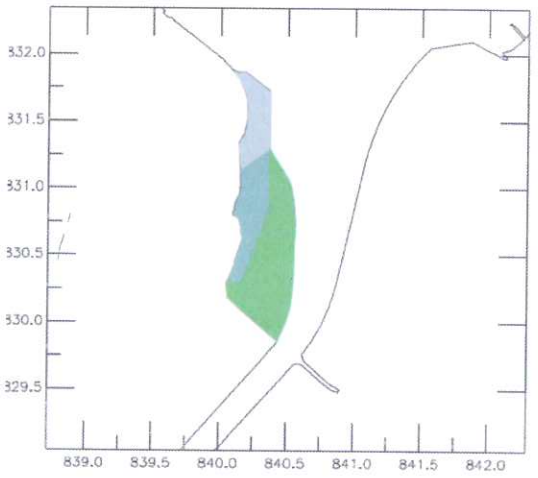
Phase 1a Reclamation of the PRS



Phase 1b Reclamation of the PRS

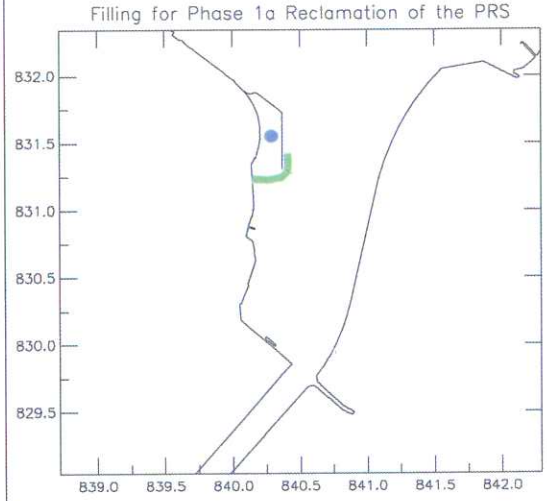


Phase 2 Reclamation of the PRS

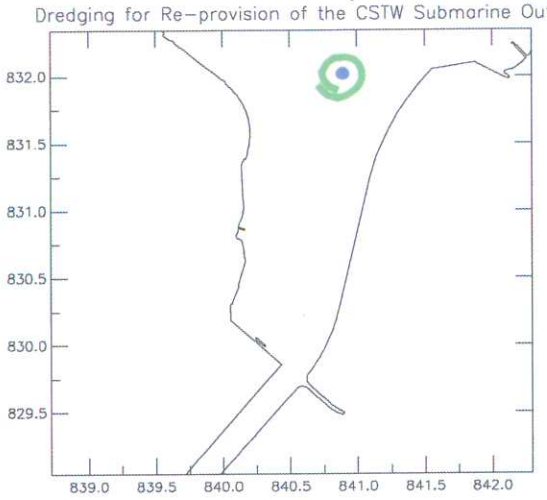


Stage 1a Reclamation Extent
Stage 1b Reclamation Extent
Stage 2 Reclamation Extent
Seawall
Re-provision of STSTW submarine outfall

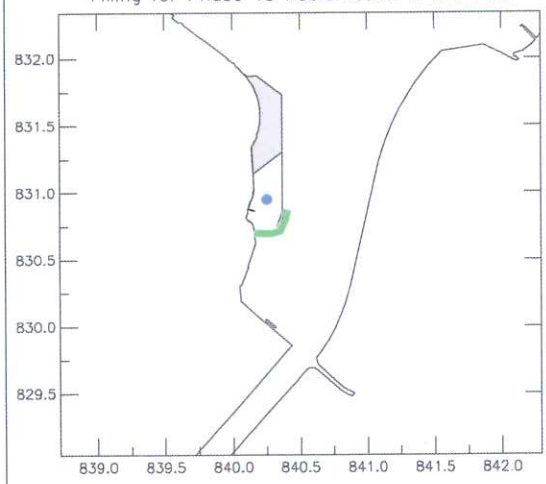
Filling for Phase 1a Reclamation of the PRS



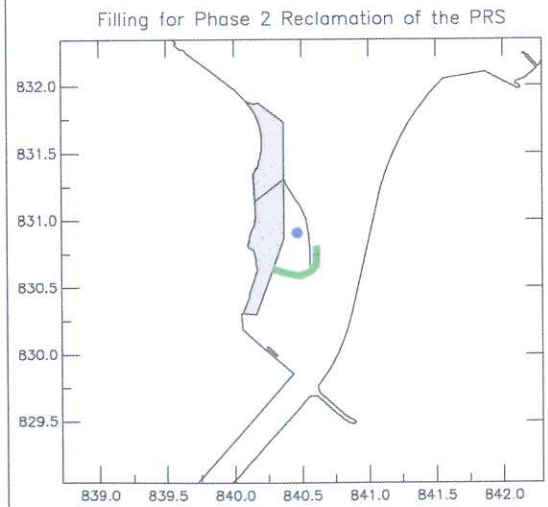
Dredging for Re-provision of the CSTW Submarine Oufall



Filling for Phase 1b Reclamation of the PRS



Filling for Phase 2 Reclamation of the PRS



Seawall
Silt Curtain
Sediment Release Points
Reclaimed Land

Agreement No. CE 66/2014 (CE) Study on Technical Issues Related to Potential Reclamation Site at Ma Liu Shui – Feasibility Study Diagram for Proposed Mitigation Measures (Indicative) for Construction of Reprovisioned CSTW Submarine Outfall & PRS Phase 1a, 1b and 2	Annual	NOV 17
	Figure 00	
AECOM	/GPP/	MLS-construct-v1a.ssn