

Hong Kong Offshore LNG Terminal - Works associated with the subsea gas pipeline for Lamma Power Station (LPS) and the associated Gas Receiving Station (GRS) in LPS

Pipeline Construction Plan

6 January 2021

Project No.: 0505354

Document details	
Document title	Hong Kong Offshore LNG Terminal - Works associated with the subsea gas pipeline for Lamma Power Station (LPS) and the associated Gas Receiving Station (GRS) in LPS
Document subtitle	Pipeline Construction Plan
Project No.	0505354
Date	6 January 2021
Version	1
Author	RY
Client Name	The Hongkong Electric Company Limited

Document history

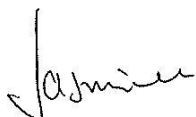
	Revision	Author	Reviewed by	ERM approval to issue		Comments
				Name	Date	
	0	RY	RC	JN	18/6/2020	N/A
	1	RY	RC	JN	6/1/2021	N/A

Signature Page

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Pipeline Construction Plan



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Hong Kong Offshore LNG Terminal - Works associated with the subsea gas pipeline for Lamma Power Station (LPS) and the associated Gas Receiving Station (GRS) in LPS

Environmental Certification Sheet

FEP-02/558/2018/A


Reference Document/Plan

Document/ Plan to be Certified/ Verified:	Pipeline Construction Plan
Date of Report:	6 January 2021
Date received by ET:	6 January 2021
Date received by IEC:	7 January 2021


Reference EP Requirement

EP Condition:	Condition No. 2.8 of FEP-02/558/2018/A
Content:	<i>Pipeline Construction Plan</i>
<p>The Permit Holder shall, no later than 1 month before the commencement of construction of the Project, submit 3 hard copies and 1 electronic copy of a pipeline construction plan of the Project to the Director for approval. The pipeline construction plan shall include but not limited to a detailed schedule, sequence and programme of different work fronts for carrying out the dredging and jetting works and cofferdam construction works for laying the subsea gas pipeline of the Project. The programming of the dredging and jetting works shall take into account the peak calving season of Chinese White Dolphin and peak occurrence season of Finless Porpoise, with a view to minimizing the impacts to marine ecology as far as practicable. The dredging and jetting works shall be carried out in accordance with the information as contained in the approved pipeline construction plan.</p>	

ET Certification

I hereby certify that the above referenced document/ plan complies with the above referenced condition of FEP-02/558/2018/A.	
Mr Raymond Chow, Environmental Team Leader:	 Date: 6 January 2021

IEC Verification

I hereby verify that the above referenced document/ plan complies with the above referenced condition of FEP-02/558/2018/A.	
Mr Arthur Lo, Independent Environmental Checker:	 Date: 12 January 2021

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1. INTRODUCTION

1.1 Background

To support the increased use of natural gas in Hong Kong from 2020 onwards, Castle Peak Power Company Limited (CAPCO) and The Hongkong Electric Co., Ltd. (HK Electric) have identified that the development of an offshore liquefied natural gas (LNG) receiving terminal in Hong Kong using Floating Storage and Regasification Unit (FSRU) technology ('the Hong Kong Offshore LNG Terminal Project') presents a viable additional gas supply option that will provide energy security through access to competitive gas supplies from world markets. The Hong Kong Offshore LNG Terminal Project will involve the construction and operation of an offshore LNG import facility to be located in the southern waters of Hong Kong, a double berth jetty, and subsea pipelines that connect to the gas receiving stations (GRS) at the Black Point Power Station (BPPS) and the Lamma Power Station (LPS).

The Environmental Impact Assessment (EIA) Report for the Hong Kong Offshore LNG Terminal Project was submitted to the Environmental Protection Department (EPD) of the Hong Kong Special Administrative Region Government in May 2018. The EIA Report (EIAO Register No. AEIAR-218/2018) was approved by EPD and the associated Environmental Permit (EP) (EP-558/2018) was issued in October 2018. An application for Further Environmental Permits (FEP) was made on 24 December 2019 to demarcate the works between the different parties. The following FEPs were issued on 17 January 2020 and the EP under EP-558/2018 was surrendered on 5 March 2020:

- the double berth jetty at LNG Terminal under the Hong Kong LNG Terminal Limited, joint venture between CAPCO and HK Electric (FEP-01/558/2018/A) ⁽¹⁾;
- the subsea gas pipeline for the BPPS and the associated GRS in the BPPS under CAPCO (FEP-03/558/2018); and
- the subsea gas pipeline for the LPS and the associated GRS in the LPS under HK Electric (FEP-02/558/2018/A) ⁽²⁾.

The location plan for the works associated with the subsea gas pipeline for the LPS and the associated GRS in the LPS ('the Project') is provided in *Figure 1.1* and the detailed sections of the LPS pipeline route is shown in *Figure 1.2*.

1.2 Objectives of the Pipeline Construction Plan

This *Pipeline Construction Plan* for the Project has been prepared in accordance with Condition 2.8 of the Further Environmental Permit FEP-02/558/2018/A.

(1) Application for variation of an environmental permit for FEP-01/558/2018 was undertaken and the latest FEP (FEP-01/558/2018/A) was issued on 6 November 2020.

(2) Application for variation of an environmental permit for FEP-02/558/2018 was undertaken and the latest FEP (FEP-02/558/2018/A) was issued on 22 December 2020.

FEP No. FEP-02/558/2018/A, Condition 2.8:

“The Permit Holder shall, no later than 1 month before the commencement of construction of the Project, submit 3 hard copies and 1 electronic copy of a pipeline construction plan of the Project to the Director for approval. The pipeline construction plan shall include but not limited to a detailed schedule, sequence and programme of different work fronts for carrying out the dredging and jetting works and cofferdam construction works for laying the subsea gas pipeline of the Project. The programming of the dredging and jetting works shall take into account the peak calving season of Chinese White Dolphin and peak occurrence season of Finless Porpoise, with a view to minimizing the impacts to marine ecology as far as practicable. The dredging and jetting works shall be carried out in accordance with the information as contained in the approved pipeline construction plan.”

The key objective of this *Pipeline Construction Plan* is to include a detailed schedule, sequence and programme of different work fronts for carrying out the dredging and jetting works for laying the subsea gas pipeline of the Project. Based on the latest design, the pre-installed pipeline at KP 17.4 will be used for the LPS Pipeline tie-in and thus cofferdam construction works are not required for the LPS Pipeline shore approach.

The *Pipeline Construction Plan* will be reviewed and updated as appropriate, throughout the course of the construction works to confirm that it remains current with the latest detailed information.

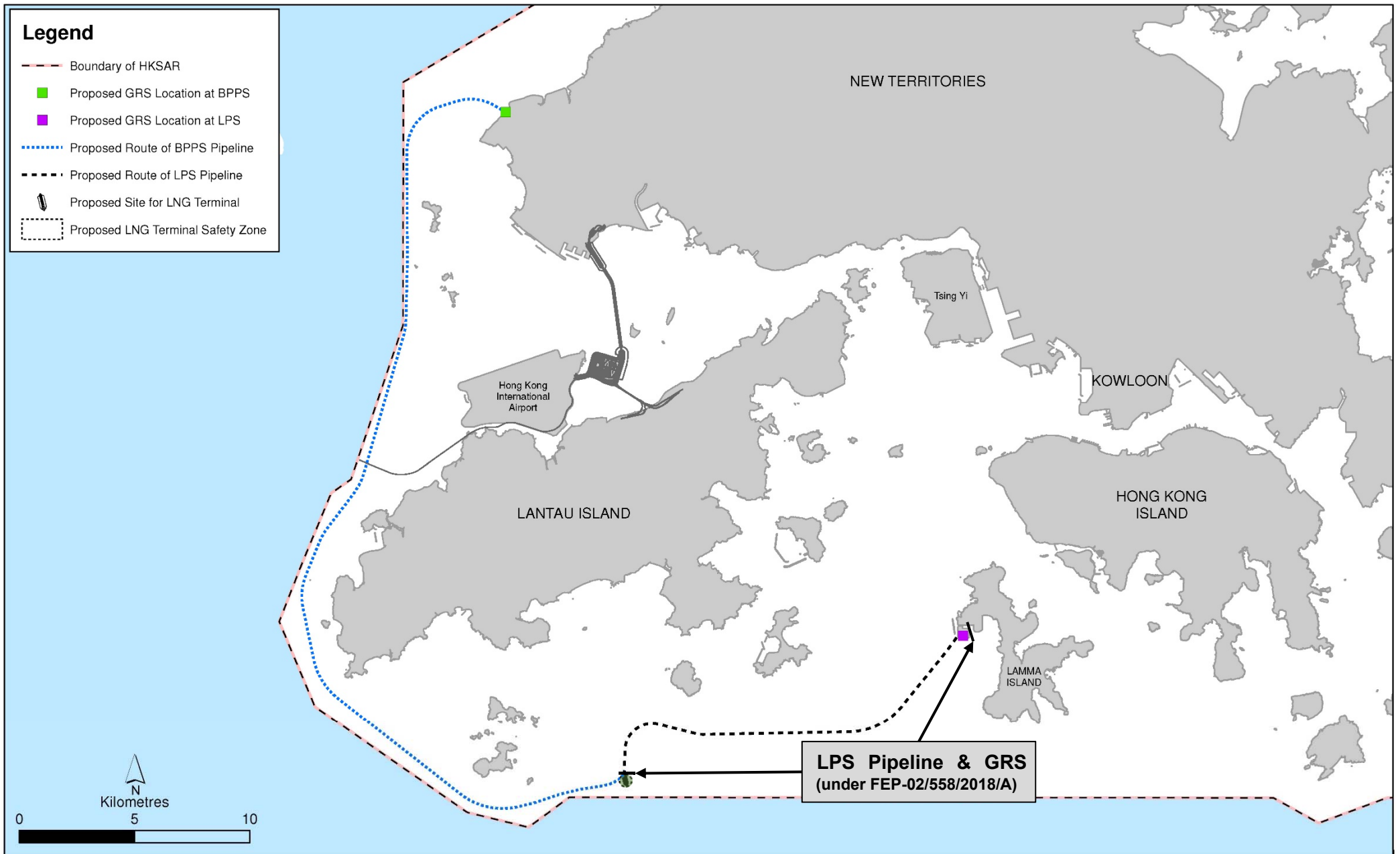


Figure 1.1

Indicative Location of Key Project Components

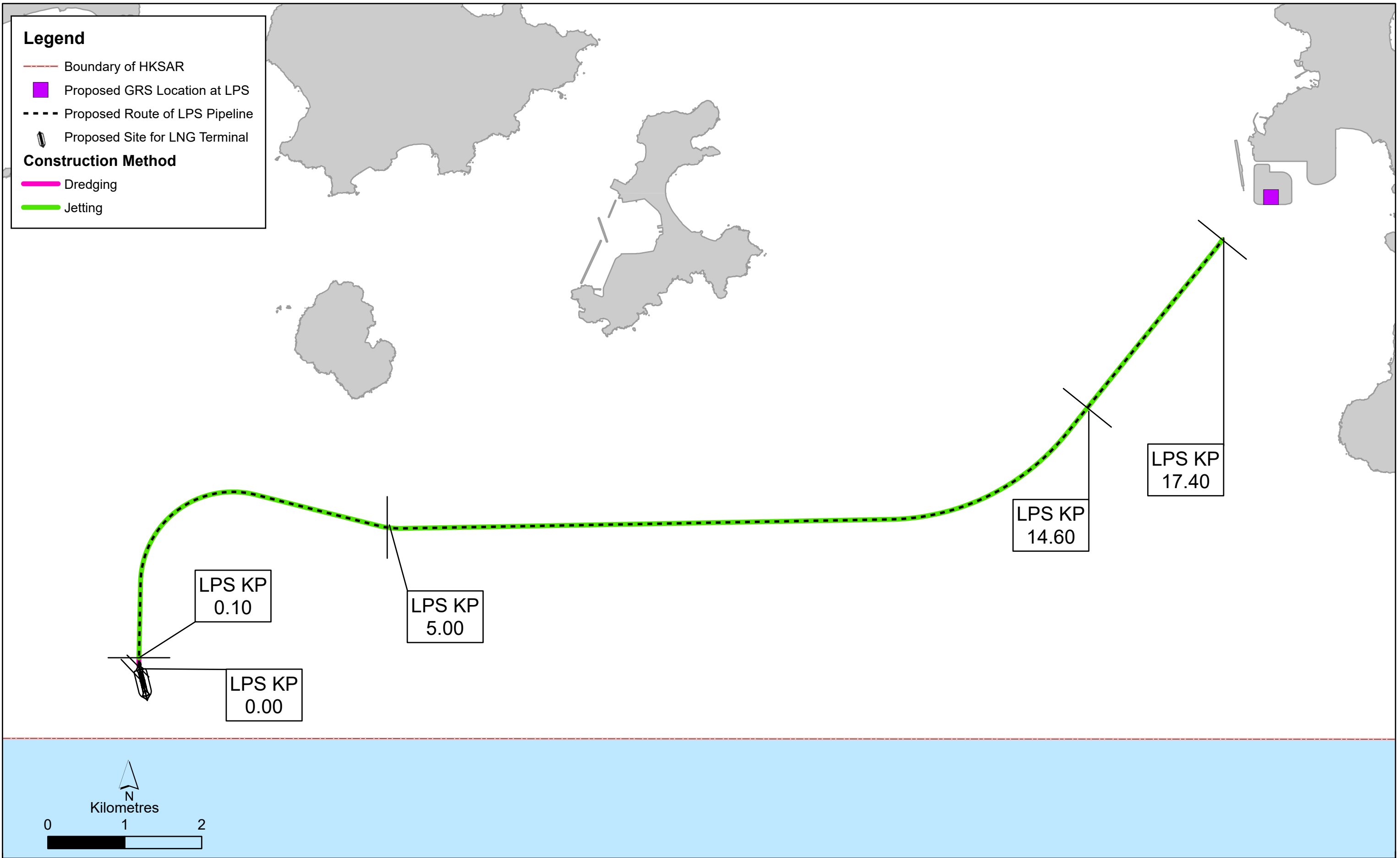


Figure 1.2

LPS Pipeline Route

2. SEQUENCE AND PROGRAMME AND DETAILED SCHEDULE FOR LPS PIPELINE

2.1 Overall Approach for Minimising Impact to Marine Ecology

In developing the sequence and programme for the dredging and jetting works of the LPS Pipeline as presented in *Figure 2.1*, EIA recommendations, conditions of the FEP, the peak calving season of Chinese White Dolphin (CWD) and peak occurrence season of Finless Porpoise (FP) have been taken into account, with a view to minimizing the impacts to marine ecology, in particular marine mammals, as far as practicable. It is also important to take into account the overall construction programme of the other components of the Project, including the construction of the BPPS Pipeline, GRSs at the BPPS and the LPS and the LNG Terminal, such that the connections between each component could be made at the required time for operation of the Project in 2022 to support the HKSAR Government's 2020 emission initiatives and contribute to achieving Hong Kong's commitment to improving air quality and reducing carbon emissions. The following paragraphs present the considerations made in developing the detailed schedule for the LPS Pipeline to minimise impact to marine ecology, in particular CWD and FP.

2.1.1 Work Front Management and Sequence of Work Programme

Generally for marine construction activities, it is important to reduce the number and size of works areas and total duration of marine works to limit potential short-term behavioural disturbance and / or displacement of marine mammals. The construction of the LPS Pipeline will involve pre-trenching, pipe-laying, post-trenching and rock armour placement. Each activity is scheduled to take place within a period of about less than two months as presented in *Figure 2.1*. In order to minimise potential short-term behavioural disturbance and / or displacement of marine mammals, the construction works for the LPS Pipeline is planned to work 24 hours a day in some areas of the pipeline routes to shorten the total duration of marine works, such that marine mammals that have avoided the vicinity of the works areas can return to the area sooner. Also, although some locations to be impacted may have moderate ecological importance (e.g. the waters between Soko Islands and Shek Kwu Chau), the pipeline construction works for the LPS Pipeline are planned to be undertaken at discrete work fronts, e.g. the pre-trenching works will be conducted at Jetty Approach (KP0.0 to 0.1) and at West Lamma Channel (KP17.3 to 17.4) in January to early February 2021 while the pipeline laying works will be conducted at other sections of the LPS Pipeline (KP0.1 to 16.0) in January to early February 2021 (see *Figure 2.1* for the detailed schedule). The work activities will also be carried out in sequence, i.e. phased. The pre-trenching works will be conducted in January to early February 2021, followed by pipeline laying works in January to February 2021, then post-trenching works in March to June 2021 and finally rock armour placement activities in May to June 2021 (see *Figure 2.1* for the detailed schedule). These activities will generally be conducted along the direction from the double berth jetty to West Lamma Channel (i.e. KP 0 to 17.4) such that discrete work fronts will be maintained throughout the construction period. Therefore, not the entire lengths of the pipeline route would be disturbed at any one time because pipeline pre-trenching, pipe-laying, post-trenching and rock armour placement activities would be undertaken in sequence. Considering the temporary nature of the disturbance and with management of work fronts/sequence and the optimised works programme, impacts on marine mammals are expected to be of minor significance, except for section of the LPS Pipeline between LNG Terminal and South of Shek Kwu Chau where impact of minor to moderate significance is expected hence requiring mitigation. Upon cessation of the disturbance, no significant long-term change in marine mammal distribution, abundance and usage pattern in the wider Hong Kong waters is expected.

2.1.2 Mitigation Measures and Precautionary Measures for Marine Mammals

Findings from the EIA and the Review Report on Finless Porpoise Peak Occurrence Season ⁽³⁾ showed that FP exhibited the tendency for greater activity in late hours at night and very early hours at surveyed locations compared to daylight hours. Consequently to mitigate potential disturbance to FP especially in waters of moderate ecological importance between LNG Terminal and South of Shek Kwu Chau along the LPS Pipeline (KP0.0-KP5.0), pipeline dredging/ jetting works are scheduled to take place for 12 hours during daytime period (0700-1900) with marine mammal exclusion zone monitoring. Pipeline dredging/ jetting works for the remainder of the LPS Pipeline would proceed with marine mammal exclusion zone monitoring for 24 hours a day to minimize the total works duration. With the implementation of such work arrangement during daytime period in waters of moderate ecological importance between LNG Terminal and South of Shek Kwu Chau along the LPS Pipeline (KP0.0-KP5.0) and the effective implementation of marine mammal exclusion zone monitoring as precautionary measure over the duration of dredging / jetting works, no unacceptable impact to FP is expected.

The following mitigation measures have been considered in the development of sequence and programme for the LPS Pipeline and will be implemented during the construction of the LPS Pipeline to minimise impacts to marine ecology, in particular marine mammals.

- Pipeline dredging/ jetting from LNG Terminal to South of Shek Kwu Chau (KP0.0 – 5.0) will be restricted to a daily maximum of 12 hours with daytime (0700 – 1900) operations;
- The vessel operators of this Project will be required to use predefined and regular routes (that do not encroach into existing and proposed marine parks), make use of designated fairways to access the works areas, and would avoid traversing sensitive habitats such as existing and proposed marine parks. Predefined and regular routes will become known to FP and CWD using these waters. This measure will further serve to minimise disturbance to marine mammals due to vessel movements;
- Any anchoring/ anchor spread requirements during Project construction will avoid encroachment into the existing and proposed marine parks, unless agreed by EPD;
- Silt curtain deployment during Project construction will avoid encroachment into the existing and proposed marine park;
- No stopping over or anchoring activity of vessels related to the Project should be conducted within existing and proposed marine parks even before, during and after typhoon, unless agreed by EPD;
- Use of appropriate dredging and jetting rates with the use of silt curtain where needed as recommended in the Pipeline Laying Method Plan ⁽⁴⁾ to reduce potential water quality impacts from elevated SS due to the proposed marine works; and
- Silt curtain will be checked and maintained to ensure its effectiveness in mitigating water quality impacts on existing, planned and potential marine parks.

Apart from the mitigation measures above, the following precautionary measures have been considered in the development of sequence and programme for the LPS Pipeline and will be implemented during the construction of the LPS Pipeline to further reduce potential impacts on marine mammals:

- All vessel operators working on the Project will be given a briefing, alerting them to the possible presence of dolphins and porpoises in the marine works areas, and the guidelines for safe vessel operation in the presence of these animals. The vessels will avoid using high speed as far as

(3) ERM (2020) Review Report on Finless Porpoise Peak Occurrence Season. Submitted under FEP-01/558/2018/A.

(4) ERM (2020) Pipeline Laying Method Plan. Submitted under FEP-02/558/2018/A

possible. By observing the guidelines, vessels will be operated in an appropriate manner so that marine mammals will not be subject to undue disturbance or harassment;

- All vessels used in this Project will be required to slow down to 10 knots around the Project's marine works areas and areas with high dolphin and porpoise usage, including existing and proposed marine parks. With implementation of this measure, the chance of vessel strike resulting in physical injury or mortality of marine mammals will be extremely unlikely; and
- During marine dredging or jetting operations, a marine mammal exclusion zone within a radius of 250m from dredger or jetting machine will be implemented. Qualified observer(s) will scan an exclusion zone of 250m radius around the work area for at least 30 minutes prior to the start of dredging or jetting. If cetaceans or other megafauna are observed in the exclusion zone, dredging or jetting will be delayed until they have left the area. This measure will ensure the area in the vicinity of the dredging or jetting work is clear of marine mammals prior to the commencement of works and will serve to reduce any disturbance to marine mammals. When a marine mammal is spotted by qualified personnel within the exclusion zone, dredging or jetting works will cease and will not resume until the observer confirms that the zone has been continuously clear of the marine mammal for a period of 30 minutes. This measure will ensure the area in the vicinity of the works is clear of the marine mammal during works and will serve to reduce any disturbance to marine mammals. If necessary, for night-time works, exclusion zone monitoring for FP by underwater acoustic means would be explored to supplement the exclusion zone monitoring by trained observers. A site trial will be conducted to demonstrate its practicability/ effectiveness before actual implementation during the night-time works.

Marine mammal exclusion zone monitoring has been demonstrated to be effective in reducing disturbance to marine mammals and has been adopted in marine construction activities in Hong Kong. It is considered that the implementation of marine mammal exclusion zone monitoring will be effective in further reducing the disturbance of marine mammals during construction works at both daytime and night-time. Marine mammal exclusion zone monitoring has been adopted in marine construction activities in Hong Kong during both daytime and night-time, in particular the north Lantau waters where CWD is more abundant ^{(5) (6) (7) (8)}. Marine mammal exclusion zone monitoring has been demonstrated to be technically feasible, and also effective in reducing disturbance to marine mammals and there is no reported case of marine mammal injury / behavioural change due to marine construction works with the implementation of marine mammal exclusion zone monitoring.

It is important to note that in Hong Kong, many similar subsea pipelines and cables have been installed or permitted in marine mammal habitats. There is no evidence of significant residual impacts on marine mammals due to pipeline installation activities. This Project has adopted similar construction methodology and mitigation measures and with appropriate mitigation, potential impacts to marine mammals are deemed environmentally acceptable.

2.1.3 Considerations to Minimise Impact to Chinese White Dolphins (CWD)

CWD generally sighted in West Lantau waters, especially the waters between Tai O and Fan Lau ⁽⁹⁾⁽¹⁰⁾ and the peak calving season of CWD is found to be in May and June. It should be noted

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- (5) Arup (2009) EIA Report for the Hong Kong - Zhuhai - Macao Bridge Hong Kong Boundary Crossing Facilities (Register No.: AEIAR-145/2009)
 - (6) AECOM (2009) EIA Report for the Tuen Mun - Chek Lap Kok Link (Register No.: AEIAR-146/2009)
 - (7) AECOM (2012) EIA Report for the Tung Chung New Town Extension (Register No.: AEIAR-196/2016)
 - (8) Mott MacDonald (2014) EIA Report for the Expansion of Hong Kong International Airport into a Three-Runway System (Register No.: AEIAR-185/2014).
 - (9) AFCD (2020) Monitoring of Marine Mammals in Hong Kong Waters (2019-2020). Prepared by Hong Kong Cetacean Research Project.
 - (10) ERM (2018) EIA Report for the Hong Kong Offshore LNG Terminal (Register No.: AEIAR-218/2018).

that the work activities for the LPS Pipeline are situated away from the major CWD habitats. In developing the detailed schedule for the LPS Pipeline, the consideration on reducing overall duration of exposure to marine construction works by marine mammals has been applied to effectively minimize impacts on marine mammals. As presented in the detailed schedule (*Figure 2.1*), the construction works will be conducted in January 2021 for completion by July 2021 to limit potential short-term behavioural disturbance and / or displacement of marine mammals. The construction works for the LPS Pipeline is planned to work 24 hours a day in some areas of the pipeline routes to shorten the total duration of marine works, such that marine mammals that have avoided the vicinity of the works areas can return to the area sooner. In addition, marine mammal exclusion zone monitoring will be implemented over the duration of dredging / jetting works to further reduce the disturbance of CWD, including the period of CWD peak calving season in May and June, during construction works at both daytime and night-time. Given these work activities are situated away from the major CWD habitats and they will be conducted in discrete work fronts and in sequence as discussed in *Section 2.1.1* with the implementation of the mitigation measures and precautionary measures as discussed in *Section 2.1.2*, including marine mammal exclusion zone monitoring, unacceptable impacts to CWD, including the period of CWD peak calving season in May and June, are not anticipated. Thus, potential impacts to CWD are deemed environmentally acceptable.

2.1.4 Considerations to Minimise Impact to Finless Porpoises (FP)

FP generally sighted in South Lantau and western Lamma waters around the Project area ⁽¹¹⁾⁽¹²⁾ and the peak occurrence season of FP has been reviewed and the period between January and June appears to be the peak months of porpoise occurrences for the waters in the vicinity of the LNG Terminal site ⁽¹³⁾. In order to match with the overall construction programme with all the other components of the Project, it is unavoidable to carry out pipeline construction activities at the areas frequented by FP between the proposed Jetty and the South of Shek Kwu Chau (i.e. KP0.0 to KP5.0) during the FP peak occurrence season. In developing the detailed schedule for the LPS Pipeline, the consideration reducing overall duration of exposure to marine construction works by marine mammals have been applied to effectively minimize impacts on marine mammals. As presented in the detailed schedule (*Figure 2.1*), the construction works will be conducted in January 2021 for completion by July 2021 to limit potential short-term behavioural disturbance and / or displacement of marine mammals. In addition, the construction programme for the LPS Pipeline has been carefully considered to reduce the number and size of works areas by having discrete work fronts and phased work activities, optimised works programme by working 24 hours a day in some areas of the pipeline routes, as well as limiting pipeline dredging/ jetting works to take place for 12 hours during daytime period (0700-1900) at areas frequented by FP between the proposed Jetty and the South of Shek Kwu Chau (i.e. KP0.0 to KP5.0) and the implementation of marine mammal exclusion zone monitoring as explained in *Section 2.1.1* and *Section 2.1.2*. Thus, potential impacts to FP are deemed environmentally acceptable.

2.1.5 Summary

Overall, reducing the overall duration of exposure to marine construction works by marine mammals is an effective approach to minimize impacts on these animals. Scheduling construction programme to minimise overlapping with the peak calving season of CWD in May and June or peak season of FP, restricting the daily maximum working hours, and implementation of a marine mammal exclusion zone by which marine works would cease temporarily whenever a marine mammal is sighted inside the zone are measures that have been considered as appropriate for the LPS Pipeline to achieve the

(11) AFCD (2020) *Op cit.*

(12) ERM (2018) *Op cit.*

(13) ERM (2020) *Op cit.*

purpose of impact avoidance and minimization. The detailed schedule for the construction of the LPS Pipeline has been developed based on the above considerations, as well as the overall construction programme of the other components of the Project to support the HKSAR Government's 2020 emission initiatives and contribute to achieving Hong Kong's commitment to improving air quality and reducing carbon emissions.

2.2 Detailed Schedule

Taking into account the considerations as discussed in *Section 2.1*, the LPS Pipeline will be constructed based on the sequences and procedures below for both preparation and construction phases. The detailed schedule is outlined in **Figure 2.1**.

2.2.1 Preparation Phase

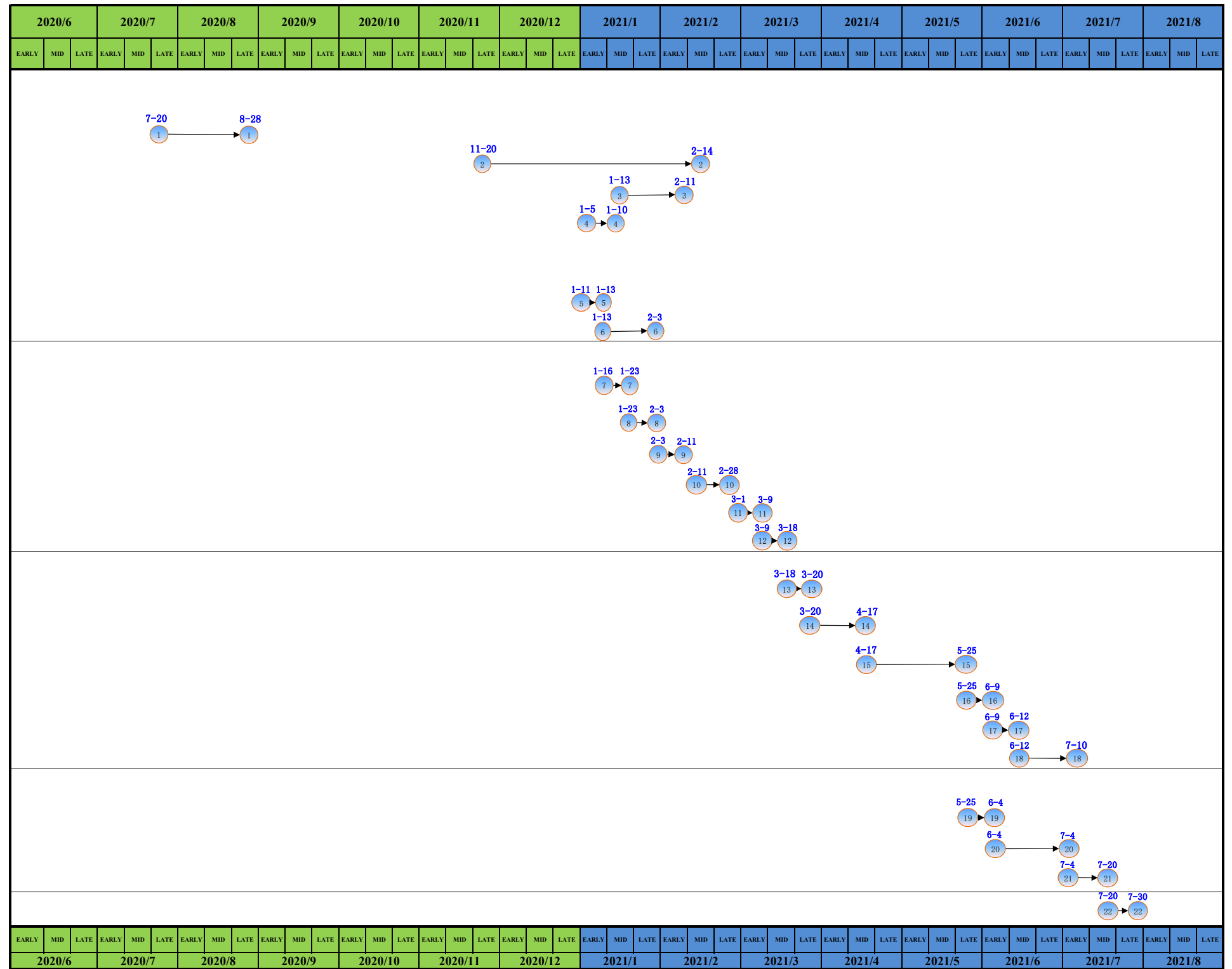
- Pre-construction survey;
- Pre-installed pipeline inspection;
- Removal of covered armour rock for existing pipeline; and
- Removal of obstructions on pipeline route.

2.2.2 Construction Phase

- Silt curtain installation and pilot test for pre-trenching work;
- De-burial (pre-trenching) of pre-installed pipeline at KP 17.3 to 17.4 by Mass Flow Excavator (MFE);
- Pre-trenching (Grab Dredging) at Jetty Approach (KP0.0 to 0.1);
- Pipeline laying (from KP 0.0 to KP 17.4);
- Riser Installation (Stalk-on) at KP 0;
- Intermediate hydrostatic testing (pressurizing from LPS);
- Silt curtain installation and pilot test for post-trenching (Jetting) work;
- Post-trenching (Jetting) (from KP 0.1 to KP17.4);
- Rock armour placement (from KP 0.1 to KP17.4); and
- Final hydrostatic testing (pressurizing from LPS).

Hong Kong Offshore LNG Terminal Project LPS Pipeline Construction Schedule

Node	PROGRAMME	START	FINISH
Preparation Phase			
1	Pre-construction survey	20/07/2020	28/08/2020
2	Pre-installation pipeline inspection	20/11/2020	14/02/2021
3	Removal of covered armour rock for existing pipeline	13/01/2021	11/02/2021
4	Removal of obstructions	05/01/2021	10/01/2021
Construction Phase			
Pre-Trenching			
5	Deployment of silt curtain and pilot test for pre-trenching	11/01/2021	13/01/2021
6	Pre-trenching	13/01/2021	03/02/2021
Pipeline Laying			
7	Pipeline laying - Double berth jetty to South of Shek Kwu Chau (KP 0.1-5.0)	16/01/2021	23/01/2021
8	Pipeline laying - South of Shek Kwu Chau to West Lamma Channel (KP5.0-16.0)	23/01/2021	03/02/2021
9	Riser installation (Stalk on)	03/02/2021	11/02/2021
10	Pipeline laying - West Lamma Channel (KP 16.0-17.4)	11/02/2021	28/02/2021
11	Contingency	01/03/2021	09/03/2021
12	Intermediate hydrostatic testing	09/03/2021	18/03/2021
Post-Trenching (Jetting)			
13	Deployment of silt curtain and pilot test for post-trenching	18/03/2021	20/03/2021
14	Post-trenching - Double berth jetty to South of Shek Kwu Chau (KP 0.1-5.0)	20/03/2021	17/04/2021
15	Post-trenching - South of Shek Kwu Chau to West Lamma Channel (KP5.0 - 14.5)	17/04/2021	25/05/2021
16	Post-trenching - West Lamma Channel (KP 14.5-17.4)	25/05/2021	09/06/2021
17	Post survey	09/06/2021	12/06/2021
18	Contingency	12/06/2021	10/07/2021
Rock Armour			
19	Rock Armour - Double berth jetty to South of Shek Kwu Chau (KP 0.1-5.0)	25/05/2021	04/06/2021
20	Rock Armour - South of Shek Kwu Chau to West Lamma Channel (KP5.0 - 17.4)	04/06/2021	04/07/2021
21	Contingency	04/07/2021	20/07/2021
22	Final hydrostatic testing	20/07/2021	30/07/2021



Remark:
 1. No construction works for the section of subsea gas pipeline between South of Shek Kwu Chau Islands and the jetty shall be carried out from 1900 hours to 0700 hours of the following day.
 2. A marine mammal exclusion zone of not less than 250m radius from the dredging and jetting works shall be implemented during the construction work for the subsea gas pipeline. No dredging or jetting works shall be carried until the marine mammal exclusion zone is confirmed by an experienced marine mammal observer as clear of marine mammals for 30 minutes continuously.

Figure 2.1 Detailed Schedule for LPS Pipeline