EnviroSolutions & Consulting Ltd
16/F & 17/F, 700 Nathan Road, Mong Kok, Kowloon Hong Kong
Tel: No. +852 3960 7000 | Fax: +852 3960 7111 | enquiries@envirosc.com
www.envirosc.com | www.simplyehs.com

Project Profile
Asia Link Cable – Hong Kong Bundle (ALC-HK Cable Bundle) – Chung Hom Kok

Prepared for:
China Telecom Global Limited

6 January 2025

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1 BASIC INFORMATION

1.1 Project Title

1.1.1 The title of the Project is "Asia Link Cable – Hong Kong Bundle (ALC-HK Cable Bundle) – Chung Hom Kok".

1.2 Purpose and Nature of the Project

1.2.1 The Asia Link Cable ("ALC") System is a proposed submarine optical fibre telecommunications cable providing additional hyper-capacity within Asia and boosting resiliency for international traffic. ALC will connect Hong Kong and Singapore as its trunk, with branches into the Philippines, Malaysia, Vietnam, Brunei and Hainan in China. It will bring greater connection capacity to transform industries, unlock more opportunities for innovation, further enhance the digital experience of Southeast Asian consumers, and support the growth ambitions of the region. Without this Project, these benefits may not be realised.

1.2.2 The ALC has a diameter of about 40mm and is about 6,021km in total length, of which 36.8km will be located within HKSAR. The indicative alignment of the entire ALC is illustrated in **Figure 1-1.** It is planned to bundle the ALC Hong Kong segment (ALC-HK) with up to two other 44.2mm diameter cables to allow further capacity into Hong Kong in the future without laying additional cables, i.e. ALC-HK Trunk Cable, Stub Cable 1 and Stub Cable 2, all within Hong Kong Waters. These three cables collectively form the **ALC-HK Cable Bundle**.

1.2.3 The ALC-HK Cable Bundle will be buried below the seabed from the eastern waters of Hong Kong and will land at newly constructed submarine Cable Landing Ducts ("CLDs") below High Water Mark ("HWM") of about 64m in length with concrete surround, located at Chung Hom Kok ("CHK"). Not forming part of this Project are terrestrial CLDs above the HWM of about 7m in length with concrete surround and a new Beach Manhole ("BMH"), which will be constructed by others. The CLDs and BMH will ultimately connect the ALC-HK Cable Bundle to a new Cable Landing Station ("CLS") located on a hill above the CHK landing beach. This is the same landing area as two existing New T&T (Hong Kong) Limited - Domestic Cable Route ("New T&T Cables") installed in 2001 and the Asia Direct Cable System – Hong Kong Segment ("ADC-HK") installed in 2022.

1.3 Details of Project Proponent

1.3.1 As the landing party, China Telecom Global Limited is responsible for the landing issue within HKSAR and is therefore the Project Proponent. Contact details of project proponent are as follows:

China Telecom Global Limited

Name:	Mr YANG RUOQUN
Position:	Deputy General Manager of Cloud and Network Development Department
Email:	yangruoqun@chinatelecomglobal.com
Telephone:	+852 9183 6316

1.4 Location and Scale of Project

Location of Project

1.4.1 The installation and operation of ALC-HK Cable Bundle and the submarine CLDs will cover the area between the eastern boundary of Hong Kong Waters and the cable landing point at CHK. The alignment of ALC-HK Cable Bundle is shown in **Figure 1-2.**

1.4.2 The ALC-HK Cable Bundle enters Hong Kong Waters in the east from the South China Sea and follows the edge of the southern boundary of Hong Kong Waters to the south of Sung Kong Island and Po Toi Island, from which it heads north-west and then north to enter Stanley Bay, finally landing on the rocky beach at CHK.

1.4.3 Based on the Approved Stanley Outline Zoning Plan ("OZP") No. S/H19/16, the area surrounding the landing point is zoned "Other Specified Use" annotated "Composite Signals Organization Station Complex" ("OU(CSOSC)") and "Green Belt" ("GB").

1.4.4 The rocky beach where the cable bundle will land is around 30m wide and at either side of the beach are massive granite slabs and huge relict boulders and can only be accessed through a steep slope covered with dense vegetation, or from the sea. Furthermore, according to Schedule 1 of *Environmental Impact Assessment Ordinance* Cap 499 ("EIAO"), "bathing beach" means any bathing beach specified in the Fourth Schedule to the *Public Health and Municipal Services Ordinance* (Cap. 132). Under this Ordinance, the landing point is confirmed not to be a bathing beach.

1.4.5 For reference, the existing conditions of the area where the BMH (not part of this Project) will be located are shown in **Figure 2-1**.

Scale of Project

1.4.6 The ALC has a diameter of about 40mm and is about 36.8km in length within Hong Kong, details are shown in **Figure 1-2**. It is planned to bundle the ALC-HK with up to two other 44.2mm diameter cables to form the ALC-HK Cable Bundle with the diameter of 130mm. As part of this Project, submarine CLDs of about 64m in length and 1m in width will be installed for the landing of ALC-HK Cable Bundle at CHK. Also as part of this Project there will be an approx. 234m long, 40mm diameter electrical sea earthing cable for ALC-HK Cable Bundle, from the HWM to a point offshore.

1.4.7 The cable installation works could be divided into three sections:

1. Onshore Installation
    - Submarine CLDs of about 64m to be installed from CHK landing point to offshore by barge-mounted grab with the help of tug boat and assisted by divers
    - Once the terrestrial CLD of about 7m in length and a new BMH have been constructed (by others, not part of this Project), pulling the cable bundle through the CLDs to reach the BMH
2. Shore-end Cable Installation
    - Cable bundle section of approximately 234m from the end of CLDs in shallow waters to deeper waters to be installed by diver
3. Offshore Cable Installation
    - Cable route clearance (prior to the actual cable installation)
    - Cable burial using a cable-laying barge and cable burial tool (for the remaining 36.5km to the eastern boundary of Hong Kong waters)

- Shallow burial at crossings and provision of cable protection
- Post-lay inspection and burial

1.4.8 The indicative location shown in **Figure 1-2** and the details of installation method for each section of ALC-HK Cable Bundle are provided in **Section 2.2**.

1.5 Designated Projects to be Covered by the Project Profile

1.5.1 This Project covers the entire section of the ALC-HK Cable Bundle from entry into Hong Kong Waters to the submarine CLDs. As shown in **Figure 1-3**, the coastline along the CHK landing point is zones as a Coastal Protection Area ("CPA"), which is wholly or partly situated on or over any foreshore and sea-bed, so that 500m from the nearest boundary of the CHK CPA is adopted for determination of DP element under (b) of Schedule 2, Part I, Item C.12 in EIAO. As the installation works near the shore involve dredging and will be conducted within 500m from the nearest boundary of the CPA, the Project is therefore classified as Designated Project ("DP") under the EIAO:

- **Schedule 2, Part I, Item C.12**
  (1) (b): A dredging operation that is less than 500 m from the nearest boundary of an existing or planned specified area that is wholly or partly situated on or over any foreshore and sea-bed;
  (2): In this item –
  foreshore and sea-bed (前濱及海床) has the meaning given by section 2 of the Foreshore and Sea-bed (Reclamations) Ordinance (Cap. 127) ;
  specified area (指明地區) means—
  (a) site of special scientific interest;
  (b) site of cultural heritage;
  (c) bathing beach;
  (d) marine park;
  (e) marine reserve;
  (f) fish culture zone;
  (g) wild animal protection area;
  (h) coastal protection area; and
  (i) conservation area.

1.5.2 An Environmental Permit ("EP") for construction and operation of the designated project is required prior to commencement of installation works of a DP. This Project Profile for ALC-HK Cable Bundle has been prepared to support an application for permission to apply directly for the EP under Section 5(1)(b) and Section 5(11) of the EIAO – this is the approach taken by all other submarine cable projects in Hong Kong that are DPs.

1.6 Name and Telephone Number of Contact Person

1.6.1 EnviroSolutions & Consulting Limited ("ESC") has been appointed to prepare this Project Profile. All queries regarding the Project can be addressed to:

EnviroSolutions & Consulting Limited

Name:	Ms Cindy CHUNG
Position:	Associate Principal Consultant
Email:	cindy@envirosc.com
Telephone:	+852 3690 7212

Figure 1-1 Alignment of Entire Asia Link Cable System

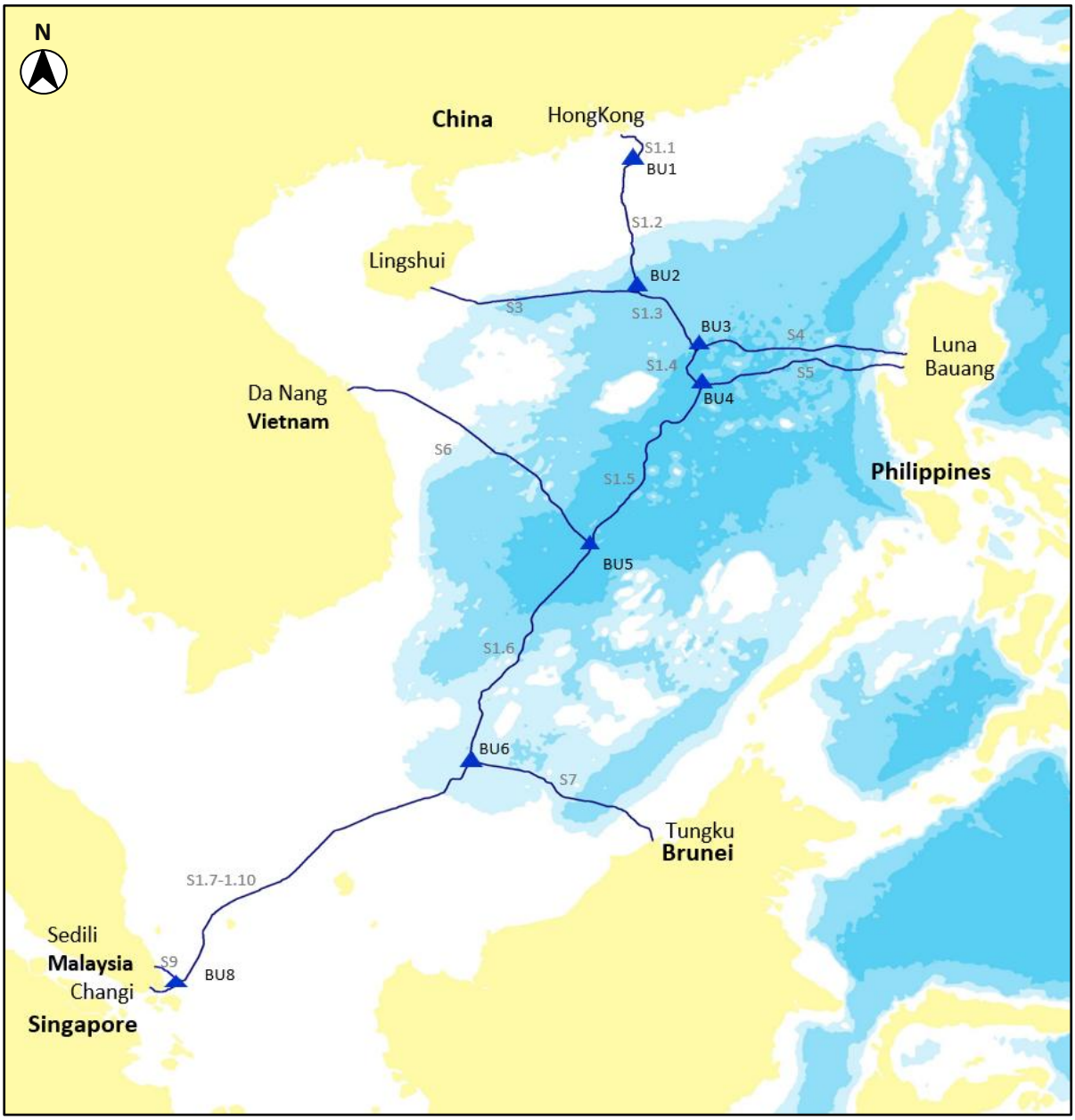
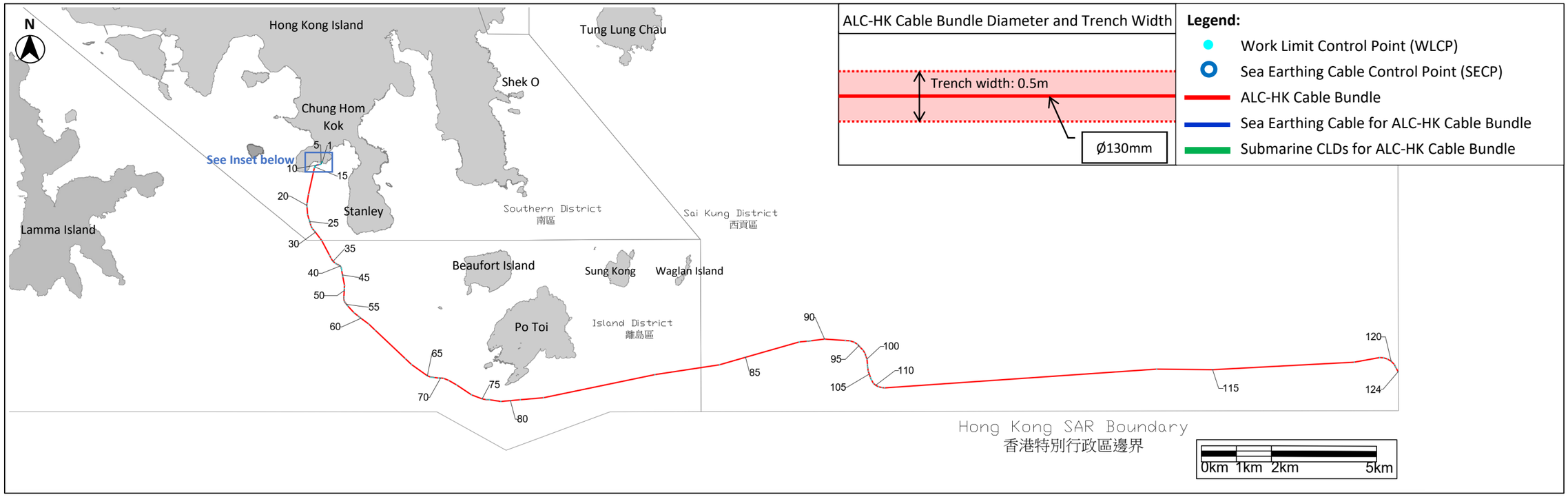


Figure 1-2 Proposed ALC-HK Cable Bundle Alignment with Co-ordinates of Control Points

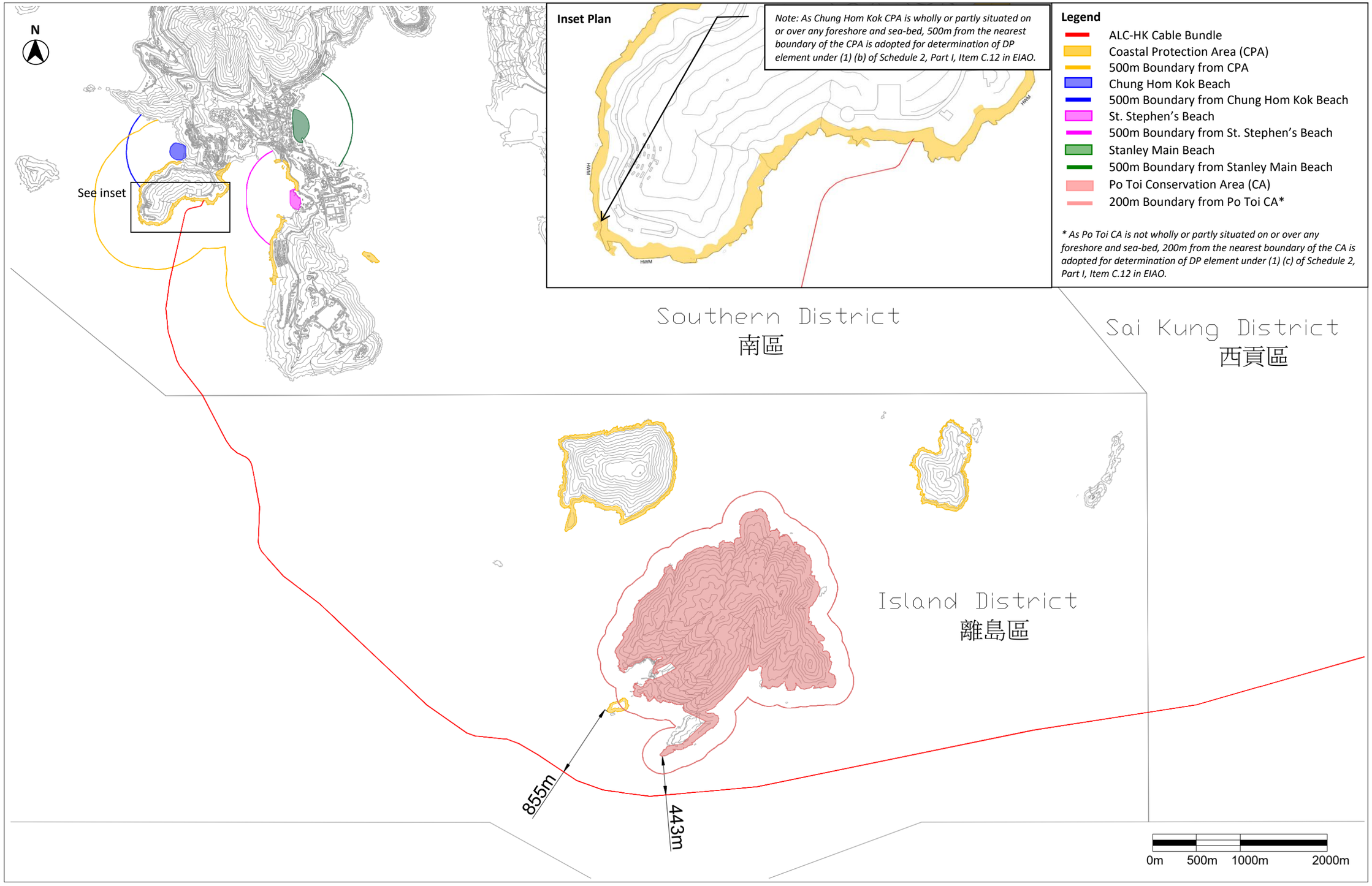


INSET PLAN	DESCRIPTION
Onshore Installation Chung Hom Kok 1 (BMH), E1 2, E2 3, E3 4, E4 5, E5 6, E6 Submarine CLDs	**Onshore Installation** • Submarine CLDs (64m long) to be installed by barge-mounted grab with the help of tug boat and assisted by divers • Once the terrestrial CLDs of about 7m in length and a new BMH have been constructed (by others, not part of this Project), a winch at the BMH will be employed to pull the cable bundle of 71m in length through the CLDs
Shore-end Cable Installation 11 12 13 14 15 16 17 10, E10 9, E9 8, E8 7, E7 E11	**Shore-end Cable Installation** • 234m (from End of CLDs) • Divers using hand tools with limited water/air-jetting power will install 234m of the cable bundle and AP protection is applied.
Offshore Cable Installation	**Offshore Cable Installation** • 36.5km (about 298m seaward from HWM to HKSAR Waters Boundary) • An "Injector Burial Tool" or "Sledge Tool" will install this section of cable bundle towed behind a cable-laying barge.

COORDINATES

WLCP 控制點	Easting 東經	Northing 北緯	WLCP 控制點	Easting 東經	Northing 北緯	WLCP 控制點	Easting 東經	Northing 北緯	WLCP 控制點	Easting 東經	Northing 北緯	WLCP 控制點	Easting 東經	Northing 北緯	SECP 控制點	Easting 東經	Northing 北緯
1	839095	808247	26	838753	806501	51	839717	804392	76	843780	801472	101	854681	802470	1	839095	808247
2	839091	808244	27	838778	806416	52	839715	804334	77	843830	801465	102	854686	802420	2	839091	808244
3	839090	808242	28	838810	806352	53	839728	804271	78	843881	801458	103	854691	802370	3	839090	808242
4	839085	808232	29	838865	806282	54	839754	804220	79	844204	801414	104	854700	802277	4	839085	808232
5	839064	808194	30	838897	806241	55	839792	804177	80	844473	801438	105	854731	802192	5	839064	808194
6	839060	808186	31	839028	806072	56	839825	804140	81	844752	801462	106	854766	802098	6	839060	808186
7	839050	808179	32	839080	806006	57	840000	803940	82	845424	801522	107	854784	802050	7	839050	808179
8	839046	808178	33	839301	805579	58	840118	803850	83	848603	802174	108	854796	802019	8	839046	808178
9	839009	808169	34	839343	805498	59	840159	803819	84	850456	802461	109	854851	801934	9	839009	808169
10	838934	808153	35	839401	805411	60	840200	803788	85	851192	802670	110	854913	801877	10	838934	808153
11	838912	808143	36	839465	805356	61	840425	803617	86	852724	803106	111	854999	801831	11	838908	808110
12	838898	808131	37	839473	805352	62	840606	803445	87	852956	803133	112	855091	801808			
13	838896	808130	38	839518	805329	63	841469	802629	88	853007	803138	113	855172	801802			
14	838884	808114	39	839576	805300	64	841643	802465	89	853057	803144	114	862947	802333			
15	838880	808105	40	839606	805274	65	842101	802143	90	853457	803191	115	864547	802320			
16	838876	808097	41	839630	805240	66	842201	802106	91	854047	803153	116	868596	802535			
17	838872	808078	42	839643	805202	67	842240	802102	92	854176	803145	117	869320	802663			
18	838699	807325	43	839646	805186	68	842292	802097	93	854302	803103	118	869437	802656			
19	838663	807059	44	839654	805146	69	842424	802083	94	854396	803043	119	869543	802623			
20	838655	807005	45	839676	805024	70	842475	802078	95	854433	803002	120	869650	802557			
21	838659	806970	46	839685	804974	71	842570	802068	96	854467	802964	121	869738	802465			
22	838680	806746	47	839730	804728	72	842711	802016	97	854547	802877	122	869766	802413			
23	838721	806608	48	839726	804636	73	842940	801879	98	854604	802792	123	869792	802365			
24	838735	806562	49	839726	804631	74	843363	801597	99	854634	802710	124	869850	802260			
25	838739	806550	50	839724	804579	75	843664	801488	100	854666	802621						

Figure 1-3 Designated Project Elements of ALC-HK Cable Bundle



2 OUTLINE OF PLANNING AND IMPLEMENTATION PROGRAMME

2.1 Cable Route Planning

Landing Point Selection

2.1.1 When determining the landing point, physical factors, commercial and technical factors have been considered, including minimisation of landside works, availability of area for construction of BMH and CLDs at the landing site and distance to the CLS.

2.1.2 CHK is one of the prime cable landing locations in Hong Kong and within CHK there are two landing points previously used for submarine cables:

1. Proposed Landing Point 1: Small, rocky beach at southern part of the CHK peninsula
   - Used by three cables:
     - Two New T&T Cables installed in 2001
     - ADC-HK installed in 2022
   - With an existing BMH (built when New T&T Cables were installed)
2. Alternative Landing Point 2: Sand beach at Sha Shek Tan ("SST")
   - Used by eight cables
     - SJC, C2C, two EAC-C2C cables, HKA, SJC2, BtoBE and H2HE cables
   - About 350m northeast of the proposed landing point

2.1.3 Considering the significant cable congestion at SST, the proposed landing point at the southern part of the CHK peninsula is selected with the following considerations:

- Only three other existing cables installed
  - No significant cable congestion
  - With space for new BMH and CLDs
- Available CLS nearby on the hilltop, or alternative space for new CLS on the hilltop
- Only minor land works are required for cable landing, thereby minimising terrestrial impacts

2.1.4 The location and photos of proposed landing beach area with viewpoints are shown in **Figure 2-1**.

Alignment

2.1.5 Environmental, engineering, planning and aspects have been considered in determining the cable route alignment and cable-laying process. The details are listed below and the ALC-HK Cable Bundle alignment and physical constraints are shown in **Figure 2-2.**

Environmental Aspects – Sensitive Receivers

- **Marine Environmentally Sensitive Areas.** To avoid or minimise adverse impact to Water Sensitive Receivers ("WSRs"), such as marine parks, coral communities of high ecological value, Fish Culture Zones ("FCZs"), Marine Reserves, Sites of Special Scientific Interest ("SSSIs"), gazetted bathing beaches, etc., the proposed alignment

maintains a distance of more than 500m from all WSRs, except for the Fish Spawning Grounds and the coral communities along coast of Po Toi Island. Similar to other submarine cables, ALC-HK Cable Bundle will unavoidably be laid within the Fish Spawning Grounds, which are extensive. The separation distance between the ALC-HK Cable Bundle alignment and coral communities along coast of Po Toi Island has been maximized as far as practicable to about 330m, which is almost double the 180m maximum predicted extent of sediment plumes from cable laying (see **Section 4.1.2**).

- **Terrestrial Environmentally Sensitive Areas.** The coastline of CHK is zoned as a CPA zone, as such the ALC-HK Cable Bundle will unavoidably land within the CPA area. Only small-scale of installation works such as pulling the cable bundle through the CLDs to reach the BMH will be conducted within CPA area, so adverse impact on the CPA is not anticipated.

Engineering Aspects – Seabed Characteristics

- **General Condition.** Various human activities from the past, such as trawling, installation of public utilities/other cables result in significantly disturbance on the seabed vicinity to the ALC-HK Cable Bundle alignment. Scattered trawl scars and numerous dumped materials on the seabed were identified in the Marine Geophysical Survey ("MGS"). The seabed comprises both soft marine sediment and rocky outcrops.
- **Marine Sediment.** According to the MGS, the seabed along the ALC-HK Cable Bundle alignment is primarily composed of fine sediment, predominantly clay or silt. In such areas, the cable bundle can be buried at target depth of 5m, which provides sufficient protection to reduce the risk of damage from activities such as anchoring and trawling.
- **Rock.** According to the MGS, rock outcrops are found at the southeast of the proposed landing point, which means laying the cable bundle southeast of the landing beach will be challenging. In such rocky areas, burial is not possible and so the cable bundle is laid on top of the seabed. Additional protection is provided, such as Articulated Pipes ("APs") or similar cable casing, but there is a higher risk of cable damage compared to burial in marine mud, and so such surface laying has been minimised as far as possible.

Engineering Aspects – Other Submarine Cables and Pipelines

- **Proximity of Other Cables.** To maintain the integrity of existing cables, the proposed cable bundle alignment maximises the offshore separation from existing cables. Given that three telecommunication cables already use the proposed landing point, the ALC-HK Cable Bundle will maintain an industry-standard minimum separation distance for the shore-end alignment in order to reduce the risk of damage.
- **Cable Crossings.** Given the large number of cables in Hong Kong, ALC-HK Cable Bundle will inevitably need to cross other cables: There will be 16 crossings with in-service cables and at each the ALC-HK Cable Bundle will be buried at a shallower depth of 1.5m (compared to the typical 5m depth) to keep a safe vertical separation with the cable below. The actual vertical separation achieved will be determined by the as-built depth of the cables below.
- **Gas Pipeline.** Similar to many other cables, ALC-HK Cable Bundle will need to cross over the Hong Kong Electric ("HKE") Gas Pipeline. The ALC-HK Cable Bundle will be laid by either the burial tool or divers at a depth agreed by HKE.
- **Seawater Intake.** The closest seawater intake is The University of Hong Kong Swire Institute of Marine Science at Cape D'Aguilar, however, at 5km distant it is far away from

the proposed landing site and proposed cable bundle alignment and so will not be affected.

Planning Aspects

- **Marine Traffic.** The cable bundle should avoid entering Traffic Separation Schemes ("TSS") for major marine vessel fairways and their vicinity to minimise marine impacts (i.e. marine safety and marine feasibility) and maximise the safety of cable-laying operations. The proposed ALC-HK Cable Bundle route does not cross the East Lamma Channel TSS or Tathong Channel TSS and as such will minimise disturbance to marine traffic.
- **Marine Sand Borrow Area.** There is an area of seabed gazetted seabed for sand dredging and sediment disposal located west of Po Toi Island and Beaufort Island and south and east of Tung Lung Chau. According to the MGS, the topography of seabed in these areas is variable and is unsuitable for cable laying. As such, the proposed route avoids these sand dredging and sediment disposal areas.
- **Existing or Planned Projects.** A planned project "Hong Kong Offshore Wind Farm in Southeastern Waters" is to be located in the southeastern, far from the ALC-HK Cable Bundle alignment. The ALC-HK Cable Bundle installation or construction programme will avoid overlapping with any other projects in the vicinity.
- **Known Marine Archaeological Resources.** The proposed alignment avoids impacts to all known marine archaeological resources.

2.2 Cable Installation

2.2.1 Cable installation works consist of three sections, named Onshore Installation, Shore-end Cable Installation and Offshore Cable Installation. The details are summarised in **Table 2-1**and the extent of each works section is shown in **Figure 1-2**.

Table 2-1 Summary of Cable Installation Sections

WORK STAGES	ONSHORE INSTALLATION		SHORE-END CABLE INSTALLATION	OFFSHORE CABLE INSTALLATION
Works Section	Submarine CLDs – from HWM to about 64m Seaward	Cable bundle pulling – From BMH to End of CLDs	About 234m from End of CLDs	About 298m Seaward from HWM to HKSAR Waters Boundary
Length	64m	71m (Submarine CLDs of 64m long and terrestrial CLDs of 7m long)	234m	36.5km
Target Burial Depth	the submarine CLDs will be buried 1-2m below the seabed	cable bundle will run through the CLDs, which is buried 1-2m below the ground/seabed	2m to 5m below the seabed on a "best endeavour" basis	5m below the seabed except when crossing existing pipelines or cables where the burial depth will be reduced
Installation Tools	The submarine CLDs will be installed by barge-mounted grab with the help of tug boat and assisted by divers	A winch at the BMH to pull the cable bundle through the CLDs	Divers using hand-held tools with limited water/air-jetting power	An "Injector Burial Tool" or "Sledge Tool" towed behind a cable-laying barge

Onshore Installation (from BMH to the End of CLDs)

2.2.2 For the installation of the submarine CLDs, a trench will be temporarily created in the seabed using a barge-mounted grab. A prefabricated steel frame will be lowered into the trench and then High Density Polyethylene ("HDPE") pipes will be lowered into the steel frame by barge-mounted grab with the help of a tug boat and assisted by divers. Concrete will then be poured into the steel frame in the trench, thereby encasing the HDPE pipes. The tremie method will be used for underwater concrete pouring to minimize sediment dispersion. Once the concrete has set, the trench in which the CLD has been constructed will be backfilled and the seabed will be reinstated to its original profile.

2.2.3 The BMH and the terrestrial CLDs do not form part of this Project and will be built well before the cable landing operation. The only works at the land that are part of this Project are to pull the cable bundle into the CLDs to reach the BMH: Upon securing the cable-end with a messenger rope by a diver, a buoy will be attached to the cable bundle. The cable bundle will then be pulled through the CLDs using a winch and will be fixed inside the BMH. The sea earthing cable for ALC-HK Cable Bundle will be installed by a similar method.

Shore-end Installation Works (about 234m from the End of CLDs)

2.2.4 Considering the proximity of three existing cables, the rocky nature and shallow water of the landing site, shore-end installation of the ALC-HK Cable Bundle (about 234m from the end of CLDs) will be performed by divers to a depth appropriate to the site conditions on a "best endeavour" basis. The depth of shore-end cable installation will be less than 5m. Thereafter, cable protection, such as Articulated Pipes ("APs") shown in **Figure 2-3**, will be installed by divers for about 234m of the cable section, if necessary. The sea earthing cable for ALC-HK Cable Bundle will be installed in a similar manner.

2.2.5 Soon after the cable bundle and earthing cable have been laid, the trench will naturally refill by disturbed sediment, and so the seabed will quickly be restored to its original profile.

Offshore Cable Installation (from about 298m seaward from the HWM to HKSAR Waters Boundary)

2.2.6 The offshore works comprise four stages:

1. Cable route clearance prior to the actual cable installation
2. Cable burial using a cable-laying barge and cable burial tool
3. Shallow burial at crossings and provision of cable protection
4. Post-lay inspection and burial

Cable Route Clearance

2.2.7 A Pre-Lay Grapnel Run ("PLGR") and Route Clearance ("RC") Operation/Injector Trail Run will be carried out prior to the actual cable installation. The main objective is to clear Out of Service ("OOS") cables and any seabed debris such as wires, hawsers, fishing equipment, etc. that may be present along the cable bundle alignment.

2.2.8 PLGR/RC is performed by a grapnel running along seabed of the cable bundle alignment, cutting and recovering OOS cables. The example of grapnels to be used are shown in **Figure 2-4**. The grapnel is not expected to penetrate deeper than the target depth of the actual cable burial during the route clearance. The width of seabed disturbed by grapnels during

RC/PLGR operation will not be wider than that of actual cable burial trench. Thus, the sediment disturbed from the grapnel run is minimal and the volume of sediment that may be disturbed is expected to be less than that from cable laying works. A trial-run along the cable bundle route with Dynamic Positioning System will be conducted when the vessel's injector setup has completed. The system will also record the surface navigation and burial data.

2.2.9 All other debris found on the seabed shall be removed as far as practicable and reasonable in order to ensure the corridor for cable installation work is safe. Towed equipment (e.g. grapnels) is prohibited to be used within 100m of any pipeline or in-use submarine cable system identified by the Tone/Magnet Detector survey. According to the industry standards, the recovery/re-launch of towed equipment shall be conducted 100m before/after any crossing point.

Burial Using a Cable-laying Barge and Cable Burial Tool

2.2.10 An "Injector Burial Tool" or "Sledge Tool" with jetting techniques towed on the seabed and behind a cable-laying barge will be adopted for cable burial. This covers the section starting from 298m seaward from HWM to the HKSAR boundary in the eastern waters. These burial tools are shown in **Figure 2-4.**

2.2.11 The Cable Lay and Burial Operation at the seabed will commence by feeding high pressure water into a burial tool and lowering the blade or injector to the target burial depth. The burial tool is connected to a barge, which slowly moves forward along the cable bundle alignment, and lays and buries the cable bundle simultaneously at a speed corresponding to the speed of the barge, which will be at maximum about 1km/hr, subject to sea and seabed conditions.

2.2.12 The estimated burial depth within Hong Kong waters is approx. 5m below the seabed, except the cable bundle section that crosses obstructions and in transient zones, such as between launch positions of burial tool, the end of APs, and on an incline. The cable barge master will monitor the cable engine on board during cable laying to ensure the cable pay out tension is within required parameters.

2.2.13 High-pressure water jetting will be directly employed along the cable bundle alignment by the burial tool to fluidise a narrow trench in the seabed to the desired depth into which the cable bundle is simultaneously laid and buried. The maximum width of the seabed fluidised by the burial tool is 0.5m and this is the maximum width of seabed being disturbed during the burial. After the cable bundle is laid, the sediment forming the trench naturally settles down around the cable bundle, burying it, and leaving a small depression in the seabed that quickly returns to the original profile due to natural settlement/sedimentation.

Shallow Burial at Crossings and Provision of Cable Protection

2.2.14 At about 50m before the ALC-HK Cable Bundle is due to cross over an existing cable (typically buried 5m below the seabed) the burial tool will be raised to a depth to keep a safe separation with the cable to be crossed. Generally, the ALC-HK Cable Bundle will be buried 1.5m below the seabed at the crossing point. Crossings and actual burial depth will be agreed with other cable owners in advance of installation. Once the cable has been crossed and at about 50m after this, the burial tool will be lowered back to achieve the target burial depth.

2.2.15 When crossing the HKE Gas Pipeline, which is buried about 3.7m below the seabed, a shallower burial depth is required. At about 100m prior to the pipeline crossing point, the burial tool will be raised to allow surface lay of the ALC-HK Cable Bundle crossing the pipeline, the ALC-HK Cable Bundle will be buried over the top of the Pipeline by divers at a depth possible/agreed with HKE. At about 100m after the crossing point, the burial tool will be lowered back to achieve the target burial depth. Since cable bundle buried at shallow depth may be susceptible to anchor damage, additional cable protection, i.e., Uraduct (shown in **Figure 2-3**), will be employed for a section of about 100m.

Post-Lay Inspection and Burial

2.2.16 For those locations where an injector burial tool or sledge tool cannot be used, such as crossing points, the cable bundle is temporarily left on the seabed instead of being buried. Thereafter, the barge will return to these certain locations to carry out the post-lay inspection and post-lay burial by diver using jetting tools or by Remotely Operated Vehicle ("ROV") as shown in **Figure 2-4**. The water jetting power of jetting tools or ROV is of either same or less than the injector burial tool/sledge tool used during cable installation. Thus, similar to that of the cable installation, the seabed can be expected to naturally reinstate to before-work level and conditions soon after completion of the post-lay inspection and burial works.

2.3 Operation Phase (including Maintenance)

Emergency Cable Repair Works

2.3.1 The are no maintenance activities after installation and during the cable operation unless the cable is damaged by anchors or dropped objects, in which case emergency cable repair works will be required. Cable repair works includes several stages: Route clearance prior to repair; identifying and exposing the damaged cable section; repairing the damaged cable section on board a cable-repair vessel; reconnecting the damaged cable; and reburial of the repaired section.

2.3.2 Signal detection will be employed for damaged cable section identification. A signal pulse will be sent from one end of the cable. The pulse will be bounced back to the signalling site once it reaches the damaged area. Fault location could be determined by calculating delay time from the reflected signal and then pinpoint the exact damaged area by divers with the use of tracking equipment or ROV. The sediment that covers damaged section will then be fluidized by divers using hand-held tools with limited water-jetting power, or else grapnels to hook the cable below the seabed. The fluidized sediment will naturally settle down onto the seabed along the original alignment. The cable will then be cut and one end of the cable will be taken up to the cable-repair vessel by diver or ROV. A surface buoy will be used to mark the location of the other end of cable which is left in the seabed.

2.3.3 On board the cable-repair vessel, the damaged cable section will be removed. Firstly, a length of replacement cable will be spliced to one end of the cable and electrical as well as optical testing will be conducted to ensure the integrity of the splice. Secondly, the other cable end (marked by the buoy under the sea) will be brought up to the cable-repair vessel and spliced to the end of the replacement cable section. Upon completion, cable integrity will be checked through end-to-end electrical and optical testing.

2.3.4 The repaired cable will then be lowered back down onto the seabed to the original alignment. Inspection of the repair will be conducted by diver or ROV. If it is necessary to

rebury the cable, cable laying work in the original trench to the original target depth will be carried out by diver, ROV or burial tool. If only shallow burial or surface laying is allowed, cable protection such as APs, Uraduct or other methods will be applied before replacement. Diver or ROV will be used to conduct final inspection and burial upon completion of repair works.

2.4 Project Programme

2.4.1 Contractor will be engaged to carried out the installation works. The installation works of the ALC-HK Cable Bundle is tentatively scheduled to be carried out from the second quarter to the third quarter of 2025 (up to six months), subject to receiving of necessary permits/approvals. Some of the work activities may be carried out concurrently. The planned installation programme within Hong Kong is summarised in **Table 2-2**.

Table 2-2 Provisional Installation Schedule

CABLE INSTALLATION WORKS	TENTATIVE TIME REQUIRED
PREPARATION FOR CABLE LAYING AND BURIAL	
Pre-Lay Grapnel Run and Route Clearance Operations /Injector Trial Run	Up to 45 working days
ONSHORE INSTALLATION	
Installation of the submarine CLDs (~64m)	Up to 35 working days
Pulling the cable bundle by the winch through the CLDs (~71m) and then securing at the BMH	Up to 4 working days
SHORE-END AND OFFSHORE CABLE INSTALLATION	
Shore-end installation by diver using hand-held tools (~234m)	Up to 10-14 working days
Remaining offshore installation to eastern boundary of Hong Kong waters (~36.5km)	Up to 60 working days
Post-lay Works, if necessary	Up to 45 working days

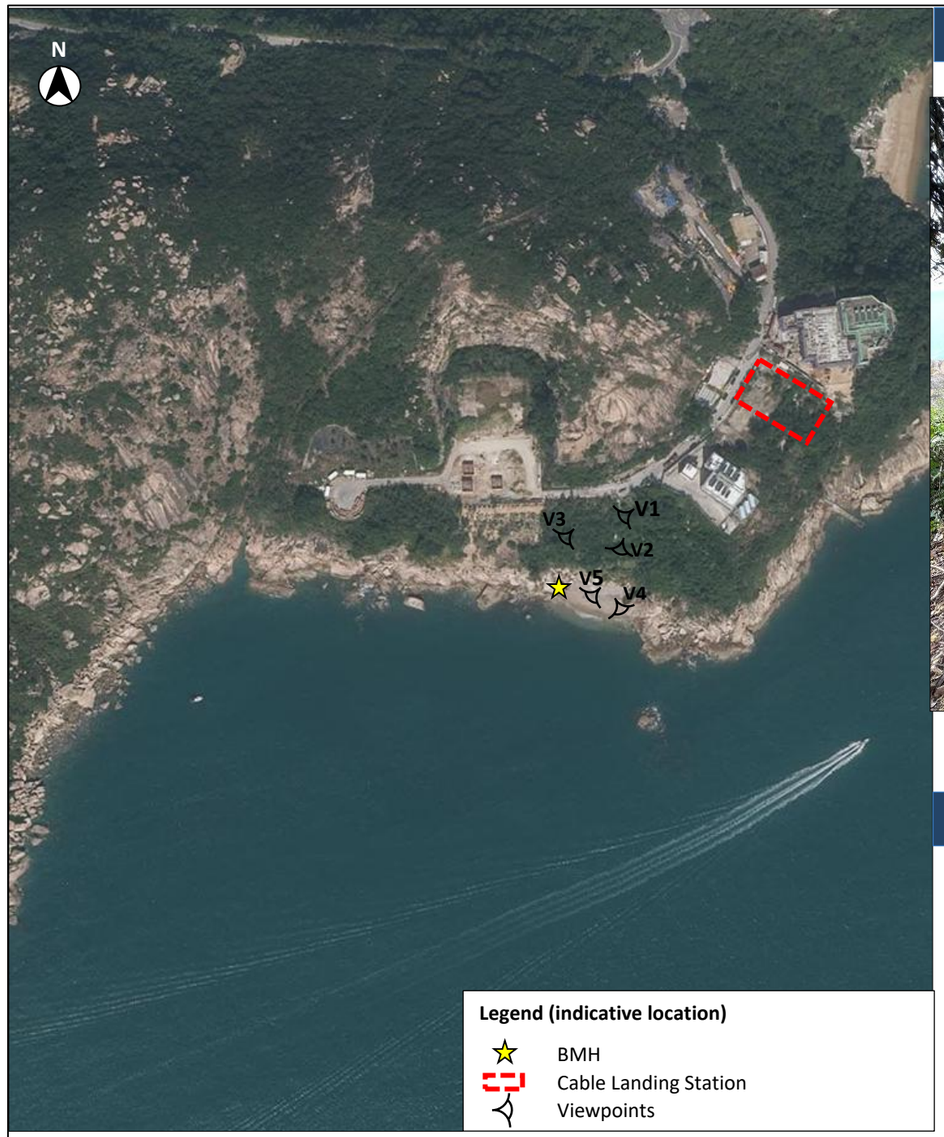
2.4.2 The cable bundle route is within Stanley Bay which is used for water sports activities, as shown on **Figure 2-5**. Mid-July to end-August and all days of Dragon Boat racing during the Tuen Ng Festival in June are the peak season for water sports activities. Marine works within Stanley Bay will be suspended throughout the period from 1 June to 31 August inclusive, in order to avoid disturbance to users of Stanley Bay, such as bathers at St. Stephen's Beach, participants of Dragon Boat races, users of St. Stephens's Beach Water Sports Centre ("SSBWSC"), etc. (Details are provided in **para. 3.3.5**).

2.5 Interactions with Other Projects

2.5.1 There is one planned project in the vicinity of the ALC-HK Cable Bundle:

- **Hong Kong Offshore Wind Farm in Southeastern Waters.** CLP has extended the feasibility study stage of the project by several years and postponed the construction stage. According to the minutes of the 10th Stakeholder Liaison Group Meeting of the project held on 26 September 2022, CLP is working on the feasibility and pre-engineering work studies and there is no confirmed date for the commencement of the project, but the project is shown in the 2024-2028 development plan. Since there is no confirmatory timeline given in the Wind Farm project, it is considered that the offshore works for that project are not likely to be concurrent with those for the ALC-HK Cable Bundle.

Figure 2-1 Location and Photos of the Proposed Landing Beach Area at Chung Hom Kok



PATHWAY TO THE BEACH

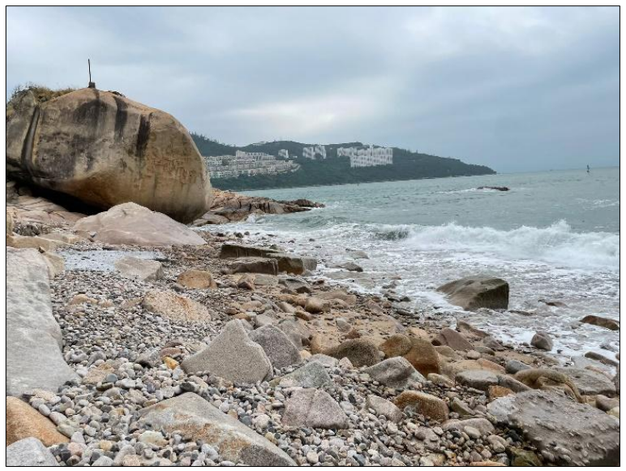
V1

V2

V3

THE PROPOSED LAND POINT- BEACH

V4



V5

Figure 2-2 Sensitive Receivers in the Vicinity of ALC-HK Cable Bundle

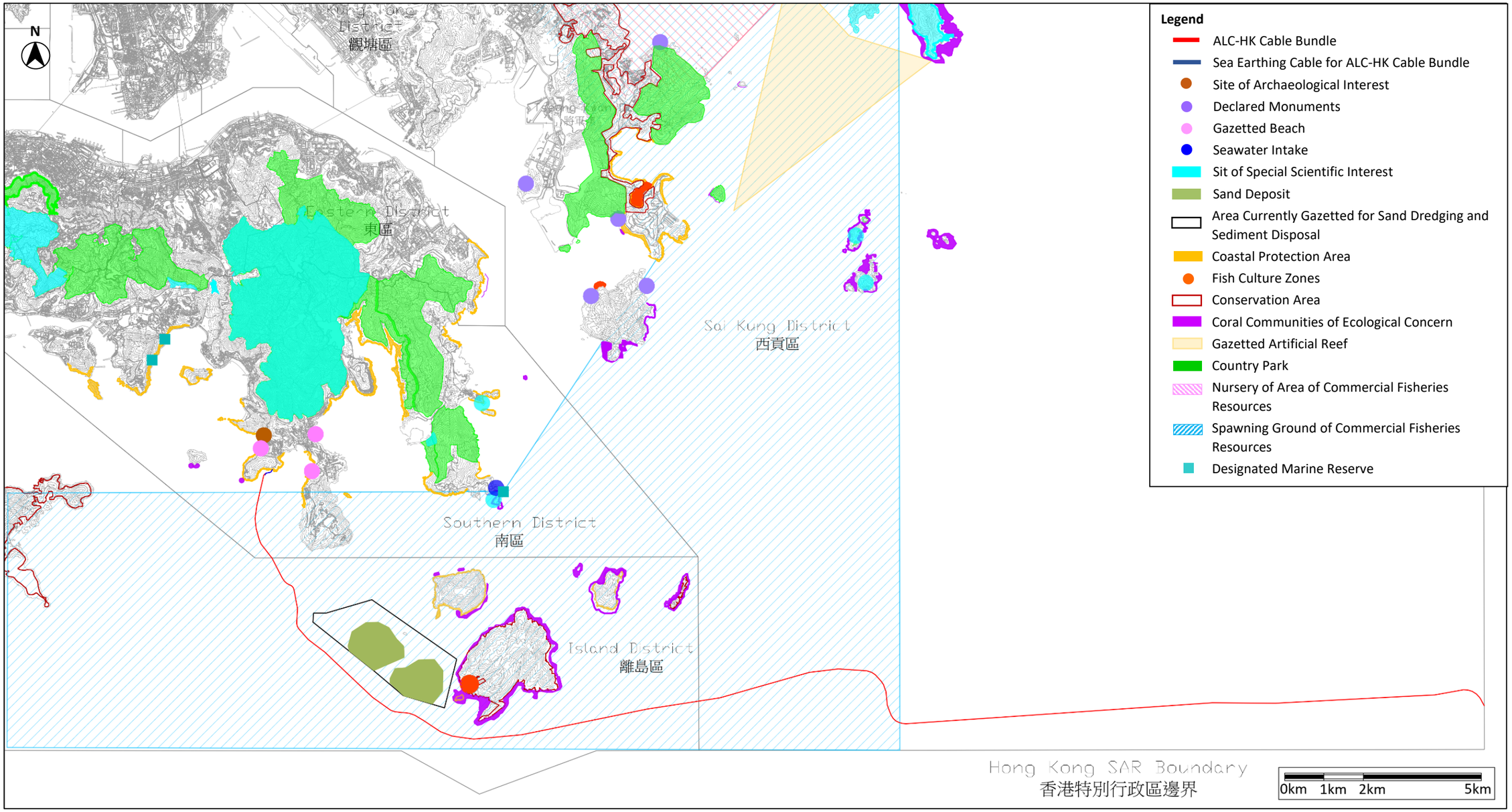
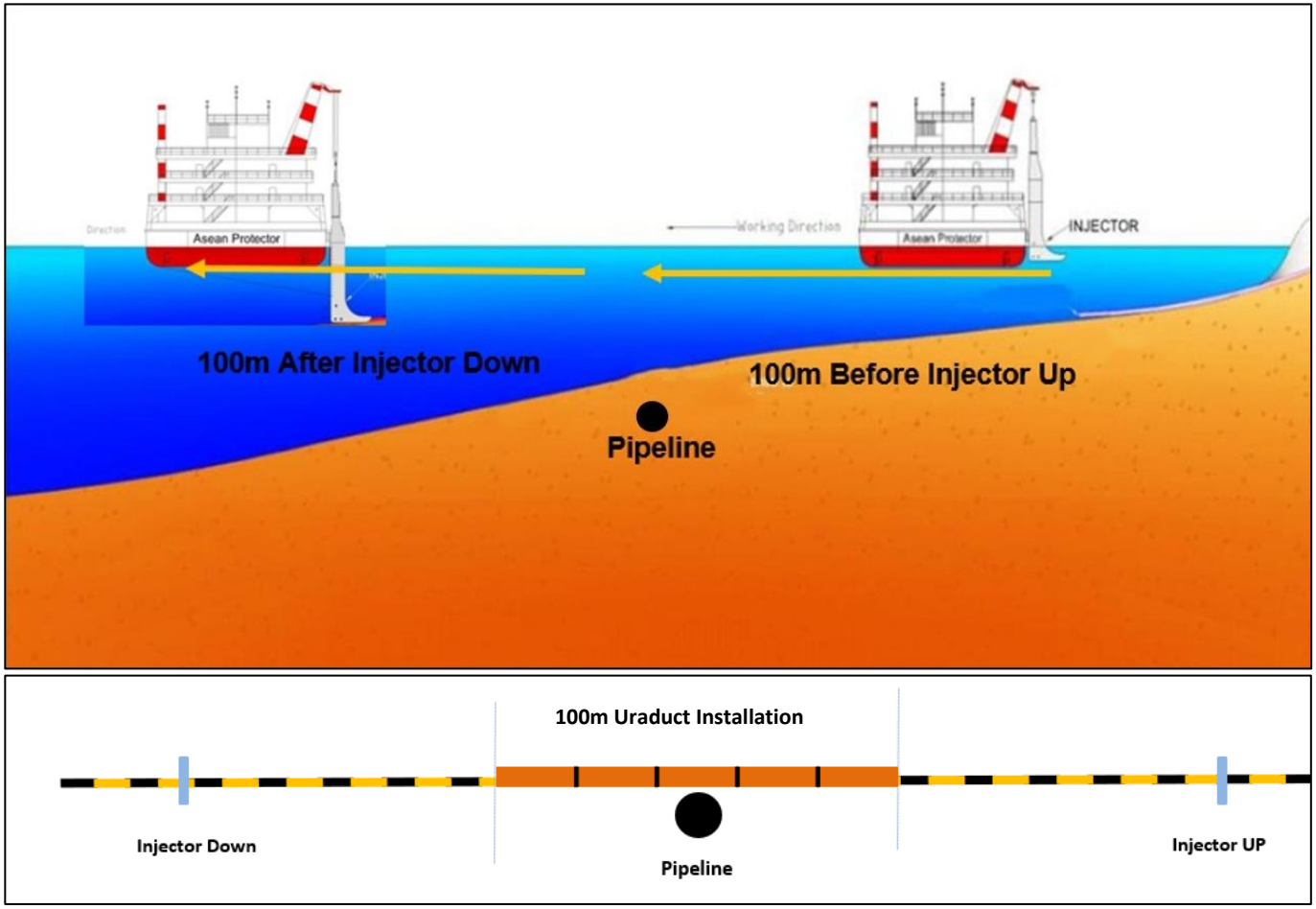


Figure 2-3 Possible Cable Protection Measures for ALC-HK Cable Bundle

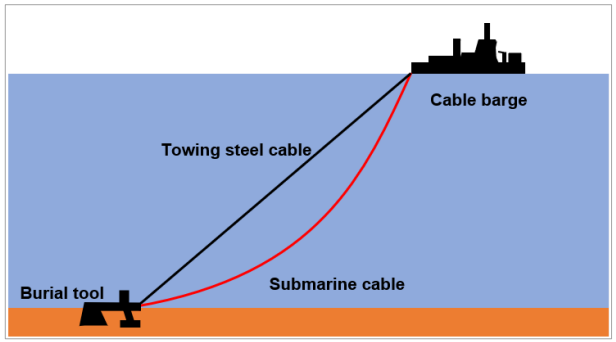
CABLE PROTECTION MEASURES AT CROSSING WITH PIPELINES



ARTICULATED PIPES (APs)

Figure 2-4 Examples of Cable-laying Barge and Cable Burial Tools

SIMULTANEOUS CABLE LAYING AND BURIAL OPERATION (SLEDGE TOOL)



BARGE-MOUNTED GRAB

INJECTOR BURIAL TOOL

SLEDGE TOOL

CABLE-LAYING BARGE

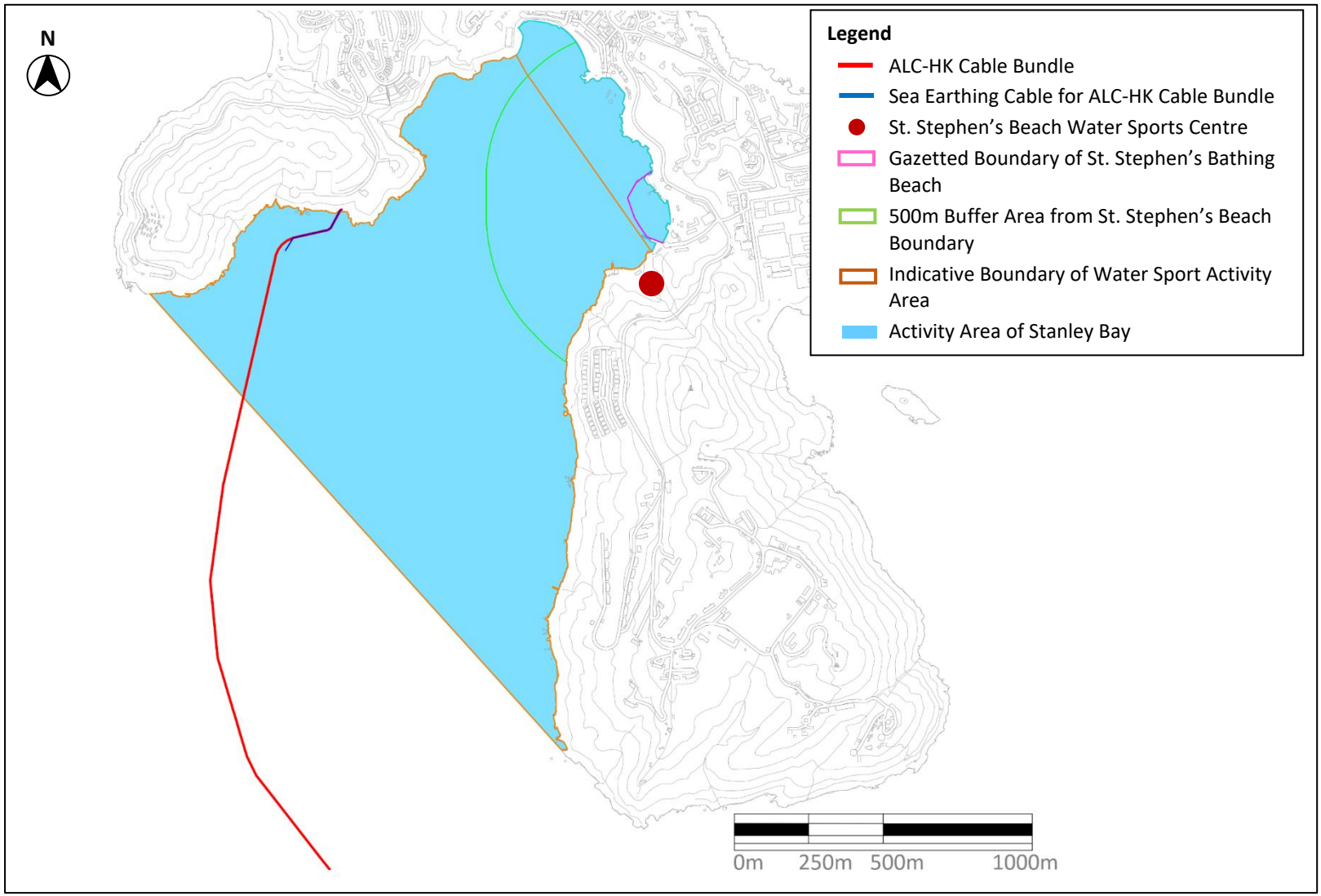
DIVER HAND-HELD TOOLS

GRAPNELS

ROV

TUG BOAT

Figure 2-5 Stanley Bay Area and Indicative Boundary of Water Sports Activity Area



3 MAJOR ELEMENTS OF THE SURROUNDING ENVIRONMENT

3.1 Cable and Pipelines Cable

3.1.1 There are several telecommunication cables and a pipeline in the surrounding area of the ALC-HK Cable Bundle landing point and alignment.

Telecommunication Cables

3.1.2 There are three in-service cables landed at the proposed landing point:

- New T&T Cables – two cables
- ADC-HK – one cable

Electrical Cables

3.1.3 There are no existing electrical cables located in the vicinity of the ALC-HK Cable Bundle alignment.

Pipelines

3.1.4 The ALC-HK Cable Bundle needs to cross the HKE Gas Pipeline, which is already crossed by many other existing cables.

3.2 Marine Fairways and Traffic Separation Scheme ("TSS")

3.2.1 The ALC-HK Cable Bundle will be laid outside the eastern edges of the East Lamma Channel TSS and avoids crossing all principal fairways and TSS in Hong Kong waters as well as Tathong Channel TSS. This will minimise the disturbance to marine traffic within major marine vessel fairways and their vicinity.

3.3 Designated Areas

3.3.1 There are areas with special planning designation in the vicinity of the ALC-HK Cable Bundle alignment, including CPA, Gazetted Bathing Beaches, Marine Reserve, SSSIs, coral communities, FCZs, Spawning Grounds of Commercial Fisheries Resources, and cultural heritage sites.

Coastal Protection Area

3.3.2 The BMH and terrestrial CLDs (which will be built prior to the cable installation and do not form part of this Project) are located within the CPA zone that stretches along the coastline of CHK. There will be no works conducted within the CPA except pulling the cable bundle into the CLDs and fixing it in the BMH.

3.3.3 Divers will secure the messenger rope at the end of cable bundle and a buoy will be attached to the cable bundle for location identification. The cable bundle will be pulled through the CLDs by a winch and be fixed in the BMH. Due to limited land-based work, the CPA at CHK will not be affected by this Project.

Gazetted Bathing Beaches

3.3.4 St. Stephen's Beach and Chung Hom Kok beach are the closest Gazetted Bathing Beaches to the cable bundle alignment at about 840m and 1,700m, respectively (the shortest distance measured through the marine environment). The installation work for the cable bundle will result in disturbance of sediment that could be carried by currents towards the beach. But as the distance to the beaches are significantly more that 180m maximum predicted extent of sediment plumes from cable laying (see **Section 4.1.2**), these beaches will not be affected by this Project and so mitigation measure is not required.

3.3.5 The cable bundle alignment passes through Stanley Bay, which is used for water sports. In order to minimise potential disturbance to the users of Stanley Bay, such as bathers at St. Stephen's Beach, participants of Dragon Boat races, users of SSBWSC and etc., no marine works within Stanley Bay will be carried out from 1 June to 31 August inclusive which cover the whole peak season for water sports (i.e. from mid-July to end-August and all days of Dragon Boat racing during the Tuen Ng Festival in June).

Site of Special Scientific interest

3.3.6 The closest SSSI to the Project is Tai Tam Reservoir SSSI (No.25), which is a terrestrial site about 1.4km from the landing point of the cable bundle. There are two more SSSI to the northeast of the cable bundle alignment, named Hok Tsui (Cape D'Aguilar) SSSI (No.49) and D'Aguilar Peninsula SSSI (No.6), both located over 4km from the Project. Due to the long distance, these SSSIs will not be affected by this Project.

Coral Communities

3.3.7 Coral surveys were conducted in 2000 for the New T&T Cables. Common and low ecological value soft coral species were recorded along Transect #4 (see **Figure B-2** of **Appendix B**); while rare in abundance but low ecological value hard coral species were recorded along Transect #5. Overall, the coral communities in the vicinity of the landing point are not considered to be of ecological importance. Since the landing point of the New T&T Cables is in the vicinity of the ALC-HK Cable Bundle, subtidal areas in the vicinity of the ALC-HK Cable Bundle landing site and route are of low to medium ecological value.

3.3.8 Another more recent subtidal dive survey was carried out in September 2020 for the ADC-HK. A total of two soft coral colonies and four hard coral colonies were found at Transects T1 and T2 (shown in **Figure B-3** of **Appendix B**), which are in the vicinity of the proposed landing point of ADC-HK. The coverage (< 5%) and species diversity (=3) of these coral communities are low, and these species are common or abundant in Hong Kong. At the location where coral colonies were identified, the installation of the submarine CLDs will be carried out using barge-mounted grab with the help of tug boat and assisted by divers. Suspended solids generated during the diver-assisted installation are expected to be localised and of very short-term duration. Moreover, the identified coral colonies are located more than 40m away from the submarine CLDs, so there will be no direct impacts and there are unlikely to be indirect impacts to these corals by this Project.

3.3.9 After that, the only cable installation works involved will be allowing the messenger rope and cable bundle to enter the CLDs. Cable bundle will be pulled through the CLDs using a winch, and then be fixed inside the BMH. The sea earthing cable for ALC-HK Cable Bundle

will be installed in a similar manner. There will be limited disturbance to the rocky beach area.

3.3.10 In the vicinity of the ALC-HK Cable Bundle alignment, there is no coral community within the 180m maximum predicted extent of sediment plumes from cable laying (see **Section 4.1.2**). The closest coral community is along the coast of south of Poi Toi Island and southwest of CHK with the distance of about 330m and 520m from the cable bundle alignment, while the other coral communities are more than 2km away, as shown in **Table A-5**. Given that separation distances between the separation distances between the coral communities and ALC-HK Cable Bundle alignment are more than 180m, no adverse impact is anticipated.

Fish Culture Zone

3.3.11 The nearest FCZ is the Po Toi FCZ located over 1.3km from the ALC-HK Cable Bundle alignment. Due to the long separation distance, the FCZ will not be affected by this Project.

Spawning Grounds of Commercial Fisheries Resources

3.3.12 The southern and eastern waters of Hong Kong serve as important spawning grounds of commercial fisheries resources. The Committee on Sustainable Fisheries also recommended designate the important spawning and nursery grounds as fisheries protection areas and step up the management measures in these areas to promote the rehabilitation and growth of fisheries resources in Hong Kong waters. Similar to most of the other existing cables, the ALC-HK Cable Bundle alignment intersects with spawning grounds of commercial fisheries resources.

Cultural Heritage Sites

3.3.13 According to the information provided in the website of Antiquities and Monuments Office ("AMO"), no declared monuments, proposed monuments, graded historic sites/buildings, or government historic sites identified by AMO are found within 500m of the cable landing site.

3.3.14 The closest, Chung Hom Wan Site of Archaeological Interest, is a terrestrial site located approx. 420m north of the proposed landing point. Since there are no major land-based construction works associated with the Project, terrestrial cultural heritage sites will not be affected by this Project.

3.3.15 The ALC-HK Cable Bundle will share the same landing beach as ADC-HK, while the remaining alignment of ALC-HK Cable Bundle will follow the similar route of SJC2-HK, SJC and VSNL. Reference has been made to the Project Profiles of ADC-HK in 2021, SJC2-HK in 2019, SJC in 2011 and VSNL in 2007 when evaluating the impact on marine archaeological resources from the proposed ALC-HK Cable Bundle.

3.3.16 To summarise, there are no features of archaeological value identified in the vicinity of the ALC-HK Cable Bundle alignment. This is also supported by the findings of the MGS that was completed for the ALC-HK Cable Bundle in 2023.

Marine Reserve

3.3.17 The closest Marine Reserve to the cable bundle alignment is Cape D'Aguilar Marine Reserve, which occupies about 20ha of sea area around Cape D'Aguilar. The Marine Reserve is

located over 5km to the north of the cable bundle alignment and the cable bundle does not enter the marine Reserve at any point. Therefore, the Marine Reserve will not be affected by this Project.

3.4 Outfalls and Seawater Intakes

3.4.1 The nearest seawater intake point to the cable bundle alignment is over 5km away, at the Swire Institute of Marine Science of the University of Hong Kong at Cape D'Aguilar. The seawater intake point will not be affected by the Project due to the long distance separation.

3.5 Cumulative Impacts from Other Projects

3.5.1 As discussed in **Section 2.5** the installation of the ALC-HK Cable Bundle will not be concurrent with any other projects in the vicinity and so no cumulative impact is expected.

4 POSSIBLE IMPACTS ON THE ENVIRONMENT

4.1 Summary of Potential Environmental Impacts

4.1.1 The potential environmental impacts arising from the installation works of the Project are summarised in **Table 4-1** and the potential impacts are reviewed below.

Table 4-1 Potential Sources of Environmental Impacts

POTENTIAL IMPACTS	CONSTR-UCTION	OPERATION		REMARKS
		NORMAL	REPAIR	
WATER QUALITY				
Liquid Effluents, Discharges, or Contaminated Runoff	×	×	×	• Not anticipated
Disruption of Water Movement or Bottom Sediment	✓	×	✓	• Cable laying and installation of the submarine CLDs will disturb the bottom sediment
ECOLOGY				
Terrestrial	×	×	×	• No trenching or excavation • No new construction on land • Flora and fauna not affected
Inter-tidal	✓	×	✓	• Habitat in the vicinity of the CLDs may be temporarily affected
Marine	✓	×	✓	• Corals and marine mammals in vicinity of the cable bundle alignment may be affected
FISHERIES				
Fisheries Impact	✓	×	✓	• Potential impacts during laying
CULTURAL HERITAGE				
Terrestrial	×	×	×	• Not anticipated
Marine	×	×	×	• No marine archaeological resources identified
OTHERS				
Air Quality				
- Gaseous & Particulate Emissions	✓	×	✓	• Emission will be limited or No significant emission
- Dust	✓	×	✓	• Emission will be limited or No significant emission
- Odour	×	×	×	• Not anticipated
Noise				
- Noisy Operation	✓	×	✓	• Limited use of Powered Mechanical Equipment (“PME”) • No nighttime works
Marine Traffic				
- Traffic Generation	✓	×	✓	• Limited marine traffic
Waste Management & Hazard to Life				
- Generation of Waste or By-products	×	×	×	• Not anticipated
- Manufacturing, Storage, Use, Handling, Transport, or Disposal of Dangerous Goods, Hazardous Materials or Wastes	×	×	×	• Not anticipated

POTENTIAL IMPACTS	CONSTR-UCTION	OPERATION		REMARKS
		NORMAL	REPAIR	
- Risk of Accidents Which Would Result in Pollution or Hazard	×	×	×	• Not anticipated
- Disposal of Spoil Material, Including Potentially Contaminated Material	×	×	×	• No contaminated mud and no disposal of spoil anticipated
Landscape and Visual Impact				
- Unsightly Visual Appearance	×	×	×	• Works are mainly underwater

Key: ✓ = Potential to result in adverse impacts
× = Not expected to result in adverse impacts

4.1.2 Environmental impacts are not expected during the normal operation of the cable. In the case of any signal fault is identified, cable repair/maintenance works are required. The cable repair works only focus on the damaged part of the cable, as such the time required is expected to be shorter than cable construction. During the cable repair works, grapnels will be adopted to penetrate the seabed to hook the cable and bring to the surface. Burial tool or divers using hand-held jetting tools will be used to uncover and recover the damaged/ repaired cables. The cable burying work will adopt the same techniques and either same or less powerful tools that used in cable installation. Thus, the seabed could reinstate to original condition naturally in a short period of time after the cable repair works.

4.1.3 Since the impact of cable repair works is considerably smaller than that of the cable construction works, the impact appraisal below will focus on the cable installation works during construction stage.

4.2 Water Quality Appraisal

4.2.1 The Project will not unload effluents, discharge or contaminated run-off into the marine environment. Potential impact of water quality has been reviewed in **Appendix A** and a summary is provided below.

Impact Review

4.2.2 Onshore cable installation will involve the limited use of machinery. As such, oil spillage could be a potential source of water quality impact. However, oil spillage could be prevented with the implementation of precautionary measures and good site practice.

4.2.3 The installation of the submarine CLDs will be conducted by barge-mounted grab with the help of tug boat and assisted by divers. Suspended solids generated during the diver-assisted installation are expected to be localised and of very short term in duration. With the recommended measures in place, water quality impact from installation of the submarine CLDs will be minimal. Submarine cable installation works could result in elevation of suspended solids, which will then disperse and sink back to the seabed within 180m, which is the maximum predicted extent of sediment plumes from cable laying within 3.5 minutes. Thus, the Project will may lead to small-scale and localised potential water quality impact.

4.2.4 There are 18 nos. identified WSRs. As shown in **Figure A-4**, the coral community along coast of Po Toi Island is the WSR nearest to the Project which is approximately 330m from the cable bundle alignment, which the maximum predicted extent of sediment plumes from cable laying is 180m only. Similar to other existing submarine cable, the ALC-HK Cable Bundle will pass through the Spawning Grounds of Commercial Fisheries Resources, so the

installation work could result in short-term impact. All other WSRs are located over 500m from the cable bundle alignment that they will unlikely be affected by the Project.

4.3 Ecology Appraisal

Terrestrial Ecology

4.3.1 At the landing point, the only works will be pulling the cable bundle through the CLDs to the BMH. No works will be carried out on the beach or the vegetated slope between the BMH and the CLS. Therefore, terrestrial ecology impact is not anticipated.

Marine Ecology Impact Review

4.3.2 Potential impact of marine ecological has been reviewed in **Appendix B** and the summary is provided below.

4.3.3 According to the existing available marine ecological resources information and previous surveys in the vicinity of the ALC-HK Cable Bundle landing point and cable bundle alignment within Hong Kong Waters, the ecological value is generally low level.

4.3.4 No coral communities of ecological importance were found in the vicinity of the natural rocky shore landing point. For the installation of the submarine CLDs from the HWM to seaward of about 64m, it would be conducted by a barge-mounted grab with the help of tug boat and assisted by divers. As the trenching works will only extend to 4.5m from the submarine CLDs and the identified coral colonies are more than 40m away from the submarine CLDs, no adverse impact from the installation works is therefore anticipated. After that, the cable bundle and its sea earthing cable will be pulled through the CLDs and secured in the BMH, which would not have any impact on the seabed. During the cable laying work, localised sediment plume will be generated only in a short duration and the disturbed sediment will sink to seabed soon after the cable installation work. As such, the associated impact is limited and localised and considered to be insignificant. During cable installation work, soft bottom assemblages will be disturbed. However, the habitat will be reinstated by similar communities in a short period of time and adverse impacts are not expected.

4.3.5 Coral communities of ecological concern are located more than 500m from the cable bundle alignment except the closest coral community of ecological concern along the coast of south of Po Toi Island, which is 330m from the cable bundle alignment and approximately 150m further than the 180m maximum predicted extent of sediment plumes from cable laying. The closest SSSI is Tai Tam Reservoir SSSI (No.25), which is a terrestrial site over 1.4km from the closest alignment while others SSSI and Marine Reserve locate more than 4km away. Since these coral communities, SSSIs and the Marine Reserve maintain a significant distance from the cable bundle alignment, they are not anticipated to be affected by the Project.

4.3.6 There is no record of Chinese White Dolphins being present in the south-eastern waters where the ALC-HK Cable Bundle will be laid and so will not be affected.

4.3.7 The installation of the submarine CLDs and cable section from the CHK landing point to south of the CHK landing point will cover the areas where finless porpoises has been observed in the dry season from December to May. The rest of the cable section from south-eastern to eastern waters will fall within an area that where finless porpoises have been observed in wet season from June to November. The cable installation work is planned to be

carried out during the second quarter to third quarter in 2025. Although the construction programme would across the dry and wet season, finless porpoises are highly mobile and can swim into open waters to avoid short-term and localized seabed disturbance. Also finless porpoises are air-breathing so that sediment plume will not affect their respiratory systems. In the view of temporal and spatial distribution of finless porpoises, the impact on finless porpoises is not anticipated. Nevertheless, as a precautionary measure, an exclusion zone with a radius of 250m from the cable installation barge will be set up to minimise potential indirect impacts on finless porpoises during the installation and landing works. Full details of Environmental Monitoring and Audit ("EM&A") requirements are given in **Appendix E**.

4.3.8 Amphioxus, *Branchiostoma belcheri*, may present in vicinity to the cable bundle alignment. Amphioxus, mostly a benthic species, is a species of high conservation value and is listed as a Category II protected species in Mainland China. They are agile and have the instinct to swim away from any disturbance it they are present in the close vicinity of the cable installation works and return afterwards. As such, potential adverse impact to Amphioxus is not anticipated.

4.4 Fisheries Appraisal

4.4.1 Potential impact of fisheries has been reviewed in **Appendix C** and a summary is provided below.

Impact Review

4.4.2 With reference to existing available material on the fisheries resources and fishing operations in the vicinity of the ALC-HK Cable Bundle, most of the area supports fisheries resources with low to moderate fisheries production.

4.4.3 The submarine CLDs will not encroach into the spawning ground of commercial fisheries resources, while the ALC-HK Cable Bundle alignment will pass through a recognised spawning ground of commercial fisheries resources at south-eastern waters. Therefore, the aforementioned spawning ground will be directly impacted by the Project. Fisheries production in this area traversed by ALC-HK Cable Bundle ranges from 0 to (>200 to 300kg/ha) in which the majority of the grids show less than 100kg/ha in terms of production weight.

4.4.4 Fisheries production (with sampan) was the highest (>50 to 100kg/ha) where the cable bundle is southwest to southeast of Po Toi Island, then the value decreases (0 to 50 kg/ha) where the cable bundle is west and east to Po Toi Island. Fisheries production (with other types of fishing vessels) was highest (>200 to 300kg/ha) where the cable bundle is south of Po Toi Island, and the value decreases (0 to 100kg/ha) where the cable bundle is west and east to Po Toi Island.

4.4.5 Given that cable-laying vessel only occupies a small area of the sea surface at any one time and for only a short duration (it moves at around 1km/h), no significant impacts on fisheries resources, fishing vessel channels and fishing activities along the cable bundle alignment are expected.

4.4.6 In terms of indirect impact, under the worst-case assumption, the calculated maximum dispersion distance of sediment plume due to cable laying works is 180m from the cable bundle alignment, and suspended solid will settle back onto the seabed within 3.5 minutes.

Then the benthic fauna will recolonise immediately to provide food for fish after the sediment resettlement.

4.4.7 Nursery areas of commercial fisheries resources, artificial reefs and the nearest FCZ (i.e. Poi Toi FCZ) are over 15km, 11km and 1.3km from the cable bundle alignment. The potential indirect impact decreases with greater distance. Nursery areas of commercial fisheries resources, artificial reefs and FCZ are far from the cable bundle alignment and the submarine CLDs, so they are unlikely to be impacted by the Project.

4.5 Cultural Heritage Appraisal

4.5.1 Potential impact of cultural heritage has been reviewed in **Appendix D**. A MAI conducted by a qualified marine archaeologist is also provided. A summary is provided below.

Impact Review

4.5.2 Declared monuments, proposed monuments, graded historic sites/buildings, or government historic sites identified by AMO are not found within 500m of the cable landing site. There will be no threat to terrestrial cultural heritage from marine works. The nearest, Chung Hom Wan Site of Archaeological Interest, is 420m away from the landing site. The installation of the submarine CLD will use barge-mounted grab with the help of tug boat and assisted by divers. After that, a small scale of cable installation work (i.e. using a winch to pull cable bundle through the CLDs to reach the BMH) will be conducted at the landing point. The impact on the Site of Archaeological Interest is not expected due to the small scale of work and far distance. Hence no further investigation or mitigation measures are required.

4.5.3 Based on the findings of the geophysical surveys for ALC-HK Cable Bundle in 2023 and pervious MAIs, the seabed sediments along the ALC-HK Cable Bundle alignment are very soft to soft clay and very soft to soft sandy gravelly clay as well as loose to medium dense sand. However, the seabed has been extensively disturbed. There were 14 sonar contacts within the 50m Study Area corridor in the survey for ALC-HK Cable Bundle. Three of them are classified as fishing gear while the others are either debris or linear debris. These items are of no marine archaeological potential and there is no need for any further investigation.

4.5.4 There were 47 magnetic contacts identified within the 50m corridor but all are either in-service cables/gas Pipeline, out-of-service cables or unknown objects. Other magnetic contacts and sub-bottom anomalies that were found during the geophysical surveys have been identified as related to existing or out-of-service cables and HKE Gas Pipeline, and though there are also some anomalies that are unknown in origin, they most likely represent buried or partially buried debris. Thus, the unknown magnetic contacts are not considered to have any archaeological value and further investigation or mitigation is not required.

4.5.5 The ALC-HK Cable Bundle route partially overlaps with four other cables, and for each of these a MAI was conducted, none of which identified any marine archaeological resources. A qualified marine archaeologist, Sarah HEAVER, reviewed the MGS and agreed with its conclusion that all of the 47 nos. magnetic contacts are associated with either previous or existing cables, or are modern debris, and that previous seabed disturbance would have significantly reduced the archaeological potential of the seabed in the vicinity of the submarine CLDs and the ALC-HK Cable Bundle.

4.5.6 The UKHO wrecks database identifies no shipwreck sites within the 50m Study Area corridor. The nearest such site is located more than 464m from the ALC-HK Cable Bundle alignment.

4.6 Others

4.6.1 The following impacts are not anticipated from the installation of the cable bundle:

Air Quality

- **Gaseous and Particulate Emissions.** The nearest Air Sensitive Receiver ("ASR") is the office of HKIS-1 CLS, which is about 70m from the Cable Bundle alignment, as shown in **Figure 4-1**. During construction phase, around three vessels (including cable-laying barge, tug boat and barge-mounted grab) and three pieces of construction equipment (including winch, generator and remotely-operated vehicles) are anticipated to be used for installation works.

  The cable laying barge would be situated 360m away from the nearest ASR and the shore-end cable installation works would mainly be carried out by divers. Besides, a barge-mounted grab will be operated about 120m away from the nearest ASR for installation of the submarine CLDs for a relatively short period of time. Given the limited use of construction equipment and small scale of works, adverse air quality impact from their use is not expected.

  To minimize any adverse impact, exempted NRMMs shall not be used and electric machinery shall be used as far as practicable during construction and maintenance. As the following regulations will be also complied with, the gaseous and particulate emission is not expected to cause adverse air quality impact.

  - *Air Pollution Control (Non-Road Mobile Machinery) (Emission) Regulation:* NRMM Label shall be applied for all relevant on-site plant.
  - *Air Pollution Control (Fuel Restriction) Regulation*: Liquid fuel with a sulphur content of less than 0.005% by weight shall be used for on-site plant.

  During operation, cable repair works may be required. The scale of the cable repair works will be much smaller and the power of plant used will be either similar or smaller scale than cable installation works. Thus, no adverse air quality impact is expected from the cable repair works.

- **Dust.** For this Project, only pulling the cable bundle through landing duct from the BMH will be required for the cable landing. As such, dust generation will be negligible. Nevertheless, to further minimise any potential dust emission during installation (and operation phase if cable repair works are required), relevant control measures listed in the *Air Pollution Control (Construction Dust) Regulation* will be followed.

- **Odour.** No marine sediments will be dredged or brought to the surface, so there will be no odour impacts.

Noise

- **Noisy Operations During Non-Restricted Hours** (i.e. between 0700 and 1900 hours on any day not being a Sunday or a general holiday). The CLS on the hill above the landing site are for office use and not considered to be Noise Sensitive Receivers ("NSRs"). There are no NSRs within 300m of the cable installation works, as shown in **Figure 4-2**. As the installation works will use limited numbers of marine vessels and construction equipment and there are no NSR is identified within 300m study area, adverse noise impact from the installation works is not anticipated. Also, construction works associated with the onshore and offshore submarine cable installation are not

anticipated during restricted hours. But if works during restricted hours are found required later, a Construction Noise Permit ("CNP") will be applied for under the *Noise Control Ordinance ("NCO")*. Therefore, adverse noise impact on noise sensitive receivers is thus not expected.

Marine Traffic

- **Traffic Generation.** The shore-end and offshore cable installation would only involve minimal or short-term marine traffic movement, which will not generate significant traffic impact.

Waste Management & Hazard to Life

- **Generation of Waste or By-products.** During the RC and PLGR stage, old cables and debris recovered will be retained on board the barge. The old cables and debris will be sorted and recycled as far as practicable. The recyclable materials would be collected by the recycling collectors, while the non-recyclable will be disposed of at the landfill.

  During construction and repair (if needed), sediment will be fluidized by divers using hand-held tools with limited water-jetting power, or else use grapnels to hook the cable from below the seabed. The fluidized sediment will naturally settle down onto the seabed along the original alignment. No dredged sediment will be generated.

  All waste will be handled properly and disposed of in accordance with the *Waste Disposal Ordinance ("WDO")*, therefore, no adverse impact on waste management is anticipated.

- **Manufacturing, Storage, Use, Handling, Transport or Disposal of Dangerous Goods, Hazardous Materials or Wastes.** The Project will not generate dangerous goods or hazardous materials.
- **Risk of Accidents Which Would Result in Pollution or Hazard.** Cable installation work is an established process in Hong Kong and the risk of accident is minimal. Since no dangerous goods or hazardous materials will be used or generated by the Project, the risk of accidents resulting in pollution or hazard is not anticipated.
- **Disposal of Spoil Material, Including Potentially Contaminated Material.** The Project will not generate spoil or dredged material, so disposal of concerned material is not required. There are no contaminated mud pits near to the cable bundle alignment and thus, it is not expected to have contact with any contaminated materials.

Landscape and Visual Impact

- **Landscape and Visual Impact.** For the shore-end and marine sections, the cable bundle and submarine CLDs will be buried below the seabed and so will not cause any visual obstruction or inconvenience to the public. Therefore, the Project will not cause any long-term adverse impact on existing landscape, visual appearance during either construction or operation.

Figure 4-1 500m Study Area of the Project and Representative Air Sensitive Receivers (ASRs)

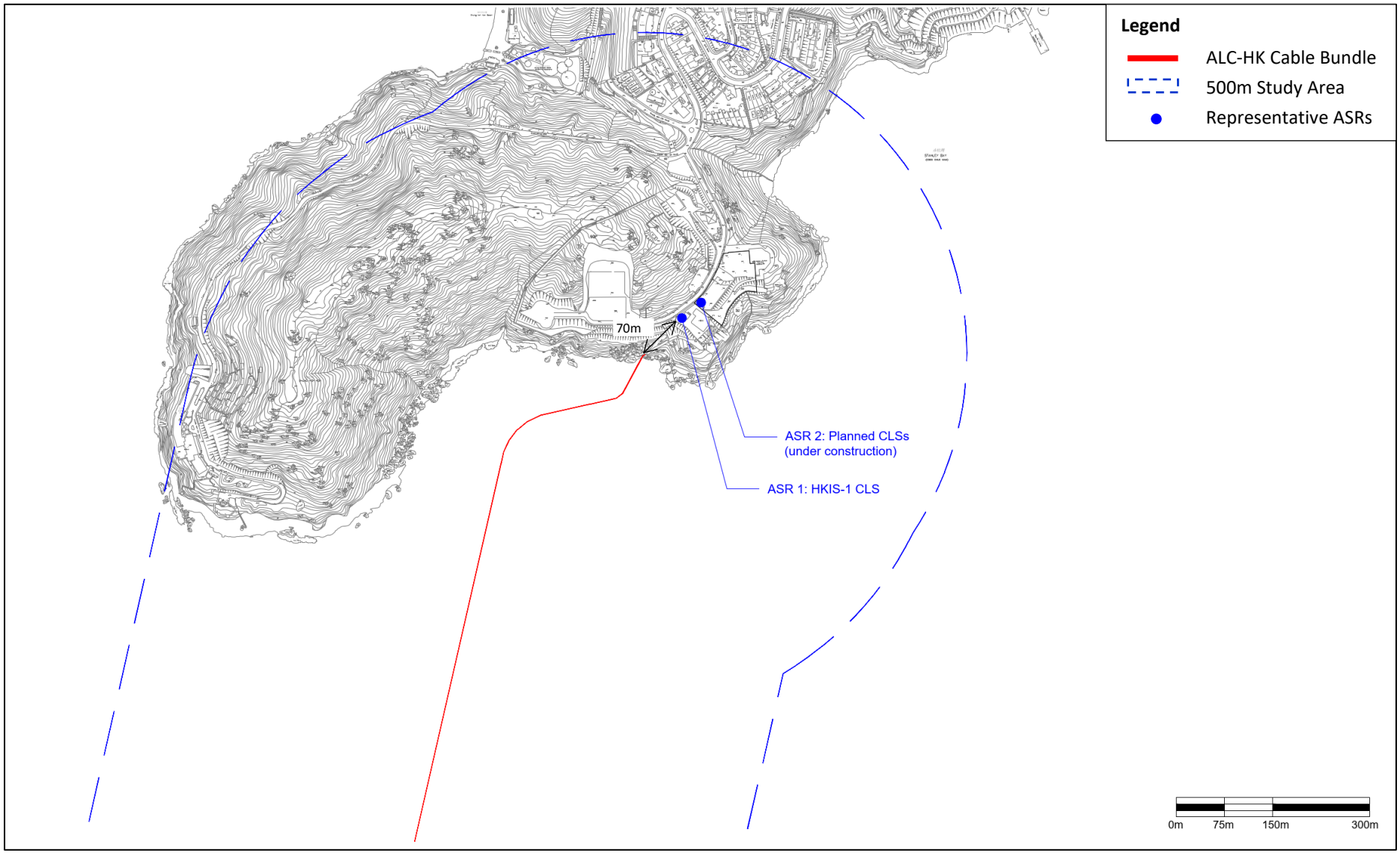
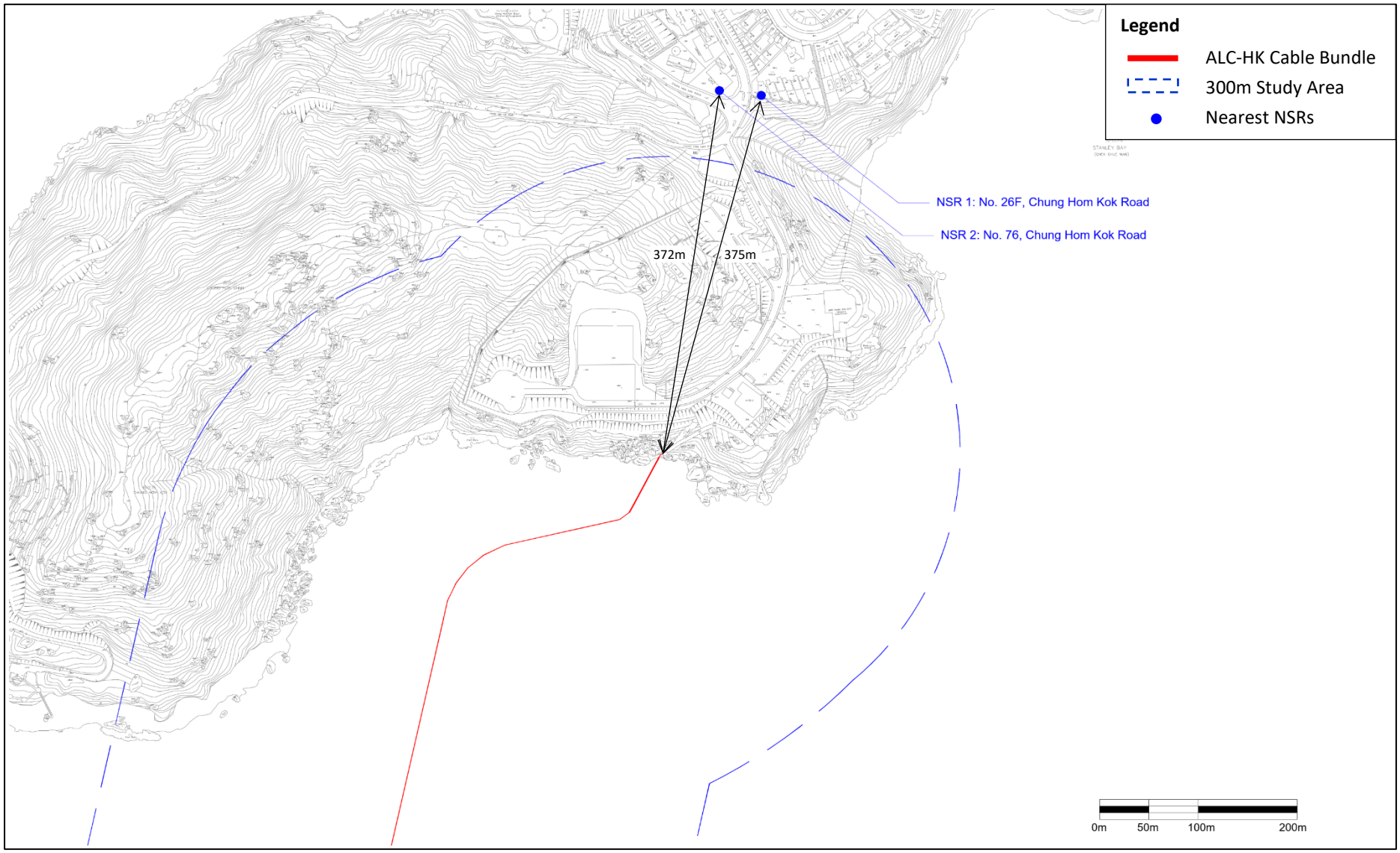


Figure 4-2 300m Study Area of the Project and Nearest Noise Sensitive Receivers (NSRs)



5 ENVIRONMENTAL PROTECTION MEASURES TO BE INCORPORATED INTO THE DESIGN AND ANY FURTHER IMPLICATIONS

5.1 Measures to Minimise Environmental Impacts

Construction Phase

5.1.1 During the installation of the submarine CLD and cable bundle, a localised but temporary increase of suspended solids is expected at the seabed. The maximum predicted dispersion extent of sediment plumes is 180m from the cable trench, and the sediment plumes will settle back to the seabed within about 3.5 minutes. This finding is alike to the previous conclusions of similar projects (listed in **Section 6**) for which the respective EM&A programmes found no water quality exceedances during installation.

5.1.2 As mentioned in **Section 4.1.2**, there are a total of 18 nos. identified WSRs. The cable installation might result in a temporary impact to the Fish Spawning Grounds similar to many other previous cables. Others WSRs are all located beyond the 180m maximum predicted dispersion extent of sediment plumes from cable laying. Nevertheless, the mitigation measures as listed in **Section A.6** in **Appendix A** shall be implemented to further minimize any potential impact due to the Project.

5.1.3 Installation of the submarine CLDs, from the HWM to 64m offshore, will use barge-mounted grab with the help of tug boat and assisted by divers. After that, the cable bundle and its sea earthing cable will be pulled through the CLDs and secured in the BMH, which would not have any impact on the seabed. For the shore-end cable installation by divers using hand-held tools with limited water-jetting power, sediment plume of a smaller scale will be generated during the laying of cable bundle and its sea earthing cable. The disturbed sediment is expected to settle back to seabed soon afterwards. Therefore, increase of suspended solid will be localised and temporary, so adverse indirect impacts on the hard bottom habitats and coral communities near the landing point are not anticipated.

5.1.4 The cable installation work is planned from the second quarter to third quarter of 2025. As discussed in **Section 4.3**, although the cable bundle alignment will encroach areas where the finless porpoises were observed in dry season and wet season, these finless porpoises are highly mobile and can avoid short term and localized seabed disturbance. Besides, sediment plume will have no effect on air-breathing finless porpoises' respiratory system. The potential adverse impact is insignificant. Nevertheless, as a precautionary measure, a marine mammal exclusion zone with a radius of 250m from the cable installation barge will be set up to mitigate potential indirect impacts on finless porpoises during the cable laying works.

5.1.5 Other than the above, details mitigation measures and precautionary measures have been provided in **Appendix A**, **Appendix B**, **Appendix C**, **Appendix D** and **Appendix E**.

Operation Phase (including Maintenance)

5.1.6 No environmental impact is expected during operation stage of ALC-HK Cable Bundle.

5.2 Possible Severity, Distribution and Duration of Environmental Effects

5.2.1 The installation of cable bundle and the submarine CLDs including preparation works and contingency will take approx. six months. The potential environmental impacts have been

reviewed and concluded that there would be minimal, temporary, and localised impacts on water quality.

5.2.2 During operation, in the case of cable damage, repair works at the specific damaged location will be required. The cable repair works will be carried out by either the burial tool or divers using jetting tools of limited water-jetting power, so the seabed can be expected to naturally restore to original conditions soon after the repair works, similar to that of the cable installation. The extend and duration of potential impact will be smaller and shorter than cable installation.

5.2.3 Therefore, residual environmental impacts due to installation and operation of the Project are not anticipated.

5.2.4 The installation programme of the ALC-HK Cable Bundle will not overlap with other projects in the vicinity and thus cumulative impact is not expected. However, if other projects end up being planned to be carried out concurrently with ALC-HK Cable Bundle, a Liaison Officer engaged by the Project Proponent will be responsible for the liaison with the Project Proponent of other projects in order to come out with an agreed working schedule that avoids the overlapping of time period.

5.3 Further Implications

5.3.1 Overall, with the recommended mitigation measures in place, no adverse environmental impact on water quality, ecology, fisheries, cultural heritage and etc., is anticipated from the cable installation works nor from any emergency repair works in the future.

5.3.2 The Landing Beach in CHK has been used by three other cable systems and no records of adverse impacts to the environment have been identified from the installation or operations of these systems – see **Section 6** for details of other similar projects.

5.4 Environmental Monitoring and Auditing

5.4.1 There is no unacceptable impact on WSRs and marine ecology. However, a precautionary measure has been proposed for predication verification and unexpected impact detection:

- Water quality sampling stations located
  - Within spawning grounds of commercial fisheries resources
  - Near Po Toi FCZ
  - Near coral communities along the coast of Po Toi Island
- A marine mammal exclusion zone (for finless porpoises)
  - A radius of 250m from the cable installation barge
  - During day-time cable installation works

5.4.2 When cable repair works are required, the Project Proponent shall review the requirement of implementing mitigation and monitoring measures for cable repair works. The Environmental Team (“ET”) and Independent Environmental Checker (“IEC”) shall be re-engaged to determine the scope of the required EM&A works for EPD’s approval and to implement and audit the EM&A programme during the repair works.

5.4.3 Details of the EM&A requirements are presented in **Appendix E**.

6 USE OF PREVIOUSLY APPROVED EIA REPORTS

6.1.1 Submarine cable installation projects that are DPs have all secured EPs via obtaining permission to apply directly for the EP ("Direct Application") since enactment of the EIAO, and no EIA reports have been submitted for approval. After reviewing the pervious applications, the Project Proponent also intends to secure an EP via Direct Application, under Sections 5(1)(b) and 5(11) of the EIAO.

6.1.2 The Project Profiles of submarine cable installation projects used for the preparation of this Project Profile are listed in **Table 6-1**.

Table 6-1 Recent Approved Project Profiles of Submarine Cable Installation Projects

NAME OF PROJECT	EP NO.	EP ISSUE DATE	PP NO.	PP SUBMISSION DATE	LANDING POINT, CABLE LENGTH	ANY ADVERSE IMPACTS
Cheung Chau Submarine Cable System, (Hong Kong Telecommunications (HKT) Limited)	EP-612/2022	28 June 2022	PP-644/2022	5 May 2022	Tai Long Wan, 4.4km	No
Peng Chau Cable System, (Hong Kong Telecommunications (HKT) Limited)	EP-610/2022	6 May 2022	PP-640/2022	7 March 2022	Nim Shue Wan, 1.5km	No
Lamma Island Cable System, (Hong Kong Telecommunications (HKT) Limited)	EP-609/2022	6 May 2022	PP-639/2022	7 March 2022	Telegraph Bay, 2.3km	No
Asia Direct Cable System – Hong Kong Segment (ADC-HK) - Chung Hom Kok, (China Telecom Global Ltd)	EP-595/2021	23 August 2021	PP-626/2021	21 June 2021	Chung Hom Kok, 34km	No
H2H Express Submarine Cable (H2HE), (China Mobile International Ltd).	EP-575/2020	21 May 2020	PP-599/2020	18 March 2020	Chung Hom Kok, 38km	No
Bay to Bay Express Cable System – Hong Kong Segment (BtoBE-HK) - Chung Hom Kok, (China Mobile International Ltd)	EP-573/2020	5 May 2020	PP-598/2020	2 March 2020	Chung Hom Kok, 36.6 km	No
South East Asia - Japan 2 Cable System – Hong Kong Segment (SJC2-HK) - Chung Hom Kok, (China Mobile International Ltd)	EP-572/2020	4 March 2020	PP-595/2020	19 December 2019	Chung Hom Kok, 37.9 km	No
TKO Connect Cable System, (Hong Kong Broadband Network Limited)	EP-570/2020	22 July 2019	PP-584/2020	3 June 2019	Siu Sai Wan, 2.83km	No
Hong Kong – Guam Submarine Cable Project (HK-G), (NTT Com Asia Limited)	EP-568/2019	18 June 2019	PP-579/2019	2 April 2019	Tseung Kwan O Industrial Estate, 33.6km	No
Hong Kong-America Cable (HKA) - Chung Hom Kok, (China Telecom Global Ltd)	EP-567/2019	20 February 2019	PP-573/2018	26 November 2018	Chung Hom Kok, 4km	No
Ultra Express Link, (Hong Kong Telecommunications (HKT) Limited)	EP-543/2017	14 September 2017	PP-553/2017	29 June 2017	Tseung Kwan O Industrial Estate, 2.76km	No
Pacific Light Cable Network (PLCN) – Deep Water Bay, (PCCW Global (HK) Limited)	EP-539/2017	10 July 2017	PP-550/2017	27 April 2017	Deep Water Bay, 40km	No
Tseung Kwan O Express – Cable System, (Superloop (Hong Kong) Limited)	EP-509/2016	20 May 2016	PP-532/2016	16 December 2015	Tseung Kwan O Industrial Estate. 2.7km	No

NAME OF PROJECT	EP NO.	EP ISSUE DATE	PP NO.	PP SUBMISSION DATE	LANDING POINT, CABLE LENGTH	ANY ADVERSE IMPACTS
Asia-Africa-Europe-1 (AAE-1) Cable System, (PCCW Global (HK) Limited)	EP-508/2016	20 April 2016	PP-533/2016	1 February 2016	Lap Sap Wan, Cape D'Aguilar, 27.65km	No
Asia Pacific Gateway (APG) – Tseung Kwan O, (NTT Com Asia Limited)	EP-485/2014	18 February 2014	PP-496/2014	24 January 2014	Tseung Kwan O Industrial Estate, 35km	No
Replacement of the Existing 11KV Submarine Cable Circuit Connecting Liu Ko Ngam and Pak Sha Tau Tsui at Kat O, (CLP Hong Kong Limited)	EP-461/2013	27 August 2013	PP-489/2013	30 May 2013	Liu Ko Ngam and Pak Sha Tau Tsui, 880m	No
Asia Submarine-cable Express (ASE) – Tseung Kwan O (NTT Com Asia Limited)	EP-433/2011	14 November 2011	PP-452/2011	7 October 2011	Tseung Kwan O Industrial Estate, 33.5km	No
South-East Asia Japan Cable System (SJC) Hong Kong Segment, Chung Hom Kok (China Telecom (Hong Kong) International Limited)	EP-423/2011	24 October 2011	PP-444/2011	22 June 2011	Chung Hom Kok, 37 km	No
Asia-America Gateway (AAG) Cable Network, South Lantau, (Reach Networks Hong Kong Ltd)	EP-298/2007	20 December 2007	PP-331/2007	5 October 2007	Tong Fuk, South Lantau Coast, 10km	No
VSNL Intra Asia Asia Submarine Cable System – Deep Water Bay (Videsh Sanchar Nigam Ltd)	EP-294/2007	23 November 2007	PP-324/2007	31 August 2007	Deep Water Bay, 40km	No
Proposed 132 kV Submarine Cable Route for Airport "A" to Castle Peak Power Station Cable Circuit, (CLP Power Hong Kong Limited)	EP-267/2007	29 March 2007	PP-295/2006	18 July 2006	West of Butterfly Beach, Tuen Mun and northern part of the platform of the Airport, 6.2km	No
132 kV Submarine Cable Installation for Wong Chuk Hang – Chung Hom Kok 132kV Circuits, (The Hong Kong Electric Co., Ltd)	EP-132/2002	16 April 2002	PP-159/2002	21 January 2002	Deep Water Bay and South Bay, 2.9km	No
Submarine Cable Landing Installation at Tuen Mun for HGC Optical Fibre Submarine Cable System between Tuen Mun and Chek Lap Kok, (Hutchison Global Crossing Limited)	EP-106/2001	24 October 2001	PP-127/2001	19 April 2001	Tuen Mun and Chek Lap Kok, 500m	No
FLAG North Asian Loop (FLAG Telecom Asia Limited)	EP-099/2001	18 June 2001	PP-121/2001	28 March 2001	Tong Fuk, South Lantau Island, 10km	No

NAME OF PROJECT	EP NO.	EP ISSUE DATE	PP NO.	PP SUBMISSION DATE	LANDING POINT, CABLE LENGTH	ANY ADVERSE IMPACTS
C2C Cable Network – Hong Kong Section: Chung Hom Kok (GB 21 (Hong Kong) Limited)	EP-087/2001	11 January 2001	PP-109/2000	5 December 2000	Chung Hom Kok, 30km (each of the three cables)	No
New T&T Hong Kong Limited Domestic Cable Route (New T&T (Hong Kong) Limited)	EP-086/2001	16 February 2001	PP-108/2000	5 December 2000	Chung Hom Kok to Cheung Sha: 37km Chung Hom Kok to Sandy Bay: 32km	No
East Asian Crossing (EAC) Cable System (TKO), (Asia Global Crossing Limited (AGC))	EP-081/2000	4 October 2000	PP-101/2000	11 August 2000	Tseung Kwan O Industrial Estate, 25km	No
East Asian Crossing (EAC) Cable System, (Asia Global Crossing Limited (AGC))	EP-079/2000	6 September 2000	PP-094/2000	30 June 2000	Tseung Kwan O Industrial Estate, 25km	No
Cable Landing Work in Tong Fuk Lantau for APCN 2 Fibre Optic Submarine Cable System, (Cable & Wireless HKT International Limited)	EP-069/2000	26 July 2000	PP-089/2000	12 May 2000	Tong Fuk, Lantau Island, 9km	No
Telecommunication Installation at Lot 591SA in DD328, Tong Fuk, South Lantau Coast and the Associated Cable Landing Work in Tong Fuk, South Lantau for the North Asia Cable (NAC) Fibre Optic Submarine Cable System, (Level 3 Communications Limited)	EP-064/2000	5 June 2000	PP-079/2000	29 March 2000	Tong Fuk, Lantau Island, 8.5km	No
Cable Landing Work in Deep Water Bay for SEA-ME-WE 3 Fibre Optic Submarine Cable System, (Hong Kong Telecom International Limited)	EP-001/1998	27 July 1998	PP-006/1998	26 May 1998	Deep Water Bay	No

Appendix A Water Quality Appraisal

CONTENTS

FIGURES

TABLES

A WATER QUALITY APPRAISAL

A.1 Introduction

A.1.1 Potential water quality impacts arising from the installation of the ALC-HK Cable Bundle will be reviewed in this appendix and necessary mitigation measures will be recommended. The appendix could be read together with the marine ecology appraisal in **Appendix B**.

A.2 Relevant Legislation and Appraisal Criteria

A.2.1 Legislation and associated guidance or non-statuary guidelines listed below are referred to in the review of water quality impacts:

- Water Pollution Control Ordinance ("WPCO")
- Environmental Impact Assessment Ordinance (Cap. 499. S.16) and the Technical Memorandum on EIA Process ("EIAO-TM"), Annexes 6 and 14
- Technical Memorandum for Effluents Discharge into Drainage and Sewerage Systems, Inland and Coastal Waters ("TM-ICW")
- Professional Persons Environmental Consultative Committee Practice Notes, Construction Site Drainage (ProPECC PN2/24)
- Practice Note for Authorized Persons and Registered Structural Engineers - Management Framework for Disposal of Dredged/Excavated Sediment (ADV-21)

WPCO

A.2.2 As the main piece of legislation for controlling water pollution and water quality in Hong Kong, WPCO sets up a total of ten Water Control Zones ("WCZs") and four supplementary WCZs in Hong Kong. Each WCZ has its own set of Water Quality Objectives ("WQOs").

A.2.3 The alignment of the ALC-HK Cable Bundle traverses the Southern and Mirs Bay WCZs, as shown on **Figure A-1**. The WQOs for the two WCZs are summarised in **Table A-1**. These WQOs serve as evaluation criteria for determining the compliance of any discharge during the installation of the submarine cable system.

Table A-1 Summary of WQOs for Marine Waters of Southern and Mirs Bay WCZs

PARAMETERS	SOUTHERN AND MIRS BAY WCZs
Aesthetic Appearance	- There should be no objectionable odours or discolouration of the water - Tarry residues, floating wood, articles made of glass, plastic, rubber or of any other substances should be absent - Mineral oil should not be visible on the surface - Surfactants should not give rise to a lasting foam - There should be no recognisable sewage-derived debris - Floating, submerged and semi-submerged objects of a size likely to interfere with the free movement of vessels or cause damage to vessels should be absent - The waters should not contain substances which settle to form objectionable deposits
Dissolved Oxygen ("DO")	- Bottom: Not less than 2mg/L for 90% samples - Depth-averaged: Not less than 4mg/L for 90% samples
Nutrients (measured	- Southern WCZ: Annual mean depth-averaged total inorganic nitrogen

PARAMETERS	SOUTHERN AND MIRS BAY WCZs
as total inorganic nitrogen)	not to exceed 0.1 mg/L - Mirs Bay WCZ: Annual mean depth-averaged total inorganic nitrogen not to exceed 0.3 mg/L
Unionised Ammonia	- Not to exceed 0.021mg/L (annual mean)
E. coli	- Annual geometric mean not to exceed 610cfu/100mL (for secondary contact recreation subzones in Southern and Mirs Bay WCZs and fish culture subzones in Southern and Mirs Bay WCZs)
pH	- To be in the range 6.5 to 8.5, change due to waste discharge not to exceed 0.2
Salinity	- Change due to waste discharge not to exceed 10% of natural ambient level
Temperature	- Change due to waste discharge not to exceed 2°C
Suspended Solids (SS)	- Waste discharge not to raise the natural ambient level by 30% nor cause the accumulation of suspended solids which may adversely affect aquatic communities
Toxicants	- Not to be present at levels producing significant toxic effect
Chlorophyll-a	- No criteria established for Southern and Mirs Bay WCZs

Seawater Intakes

A.2.4 Seawater quality at intake points should comply with relevant WQOs shown in **Table A-2**.

Table A-2 WQOs for Seawater for Flushing Supply at Intake Point

PARAMETER (UNIT)	WATER QUALITY CRITERIA
Colour (HU)	<20
Turbidity (NTU)	<10
Threshold Odour No. (TON)	<100
Ammoniacal Nitrogen (mg/L)	<1
Suspended Solids (mg/L)	<10
Dissolved Oxygen (mg/L)	>2
5-day Biochemical Oxygen Demand (mg/L)	<10
Synthetic Detergents (mg/L)	<5
E. coli (cfu/100mL)	<20,000

EIAO-TM

A.2.5 General guidelines and criteria for reviewing the water quality impact are illustrated in Annexes 6 and 14 of the EIAO-TM. According to the EIAO-TM, it recognizes that achieving all WQOs at the discharge point may not always be feasible due to higher impacts in certain areas. These certain areas known as "mixing zones" as defined by the Environmental Protection Department (“EPD”), are where the initial dilution of input discharge occurs. The acceptance criteria for the initial dilution area are generally based on the principle that it should not compromise the overall integrity of the water body and should not harm the ecosystem, including areas with sensitive beneficial uses and aquatic organisms. The specific characteristics of these areas are determined on a case-by-case basis.

TM-ICW

A.2.6 Throughout the installation and operation of the submarine cable, all discharges are required to comply with the TM-ICW issued under Section 21 of WPCO. Effluents discharged into the drainage and sewerage systems, inshore and coastal waters of the WCZs should meet the pollutant concentration criteria based on the specific discharge volumes. These requirements are specified in the Discharge License issued by EPD and specified in license conditions for any new discharge within a WCZ.

ProPECC PN2/24

A.2.7 In addition to the abovementioned statutory requirements, the *Professional Persons Environmental Consultative Committee Practice Note on Construction Site Drainage (ProPECC PN2/24)*, issued by EPD in 2024, also offers useful guidelines on water pollution control associated with construction activities.

A.3 Description of the Baseline Environment

Hydrodynamics

A.3.1 The shore-end section of the ALC-HK Cable Bundle and the submarine CLDs located at CHK is situated within the Southern WCZ starting from the landing site. Moving southwards from the landing point at CHK, the cable bundle travels south-eastward and then eastward, running along the southern edge of the Southern WCZ. Subsequently, the remaining portion of the cable bundle enters the Mirs Bay WCZ and continues towards the eastern boundary of Hong Kong. Once it exits the waters of Hong Kong, the major impact of the cable bundle will be within the oceanic waters of the South China Sea.

Marine Water Quality Monitoring Result

A.3.2 In the vicinity of the cable bundle alignment, there are four EPD marine water quality monitoring stations (SM1, SM19, MM8 and MM13). Water quality data from these stations between 2019 and 2023 have been reviewed and summarised in **Table A-3**, location of these stations are presented on **Figure A-2**.

A.3.3 The monitoring data show that the annual means for both depth-averaged and bottom dissolved oxygen comply with WQO during 2019 to 2023. Except total inorganic nitrogen at SM1 and SM19, all stations meet the water quality standards of total inorganic nitrogen and unionised ammonia as outlined in the WQOs. For SM1 and SM19, the maximum value recorded for total inorganic nitrogen was 0.14 mg/L and 0.16 mg/L, respectively, while the WQO for the Southern WCZ is set at 0.1 mg/L. The suspended solid concentrations ranged from 2.4 to 7.7mg/L at all monitoring stations. *E. coli* levels are much lower than the WQOs and comply with the WQOs at all stations between 2019 and 2023.

Marine Sediment Quality Monitoring Result

A.3.4 In the vicinity of the cable bundle alignment, there are three EPD marine sediment quality monitoring stations (SS1, MS8 and MS13). Sediment quality data from these stations between 2019 and 2023 have been reviewed and summarised in **Table A-4**, location of these stations are shown **in Figure A-3**.

A.3.5 Sediment quality, management and classification specified under *Practice Note for Authorized Persons and Registered Structural Engineers - Management Framework for Disposal of Dredged/Excavated Sediment (ADV-21)* comprise two criteria for a broad range of Contaminants of Concern, the Lower Chemical Exceedance Limit ("LCEL") and the Upper Chemical Exceedance Limit ("UCEL").The sediment quality data (mean values) indicates that all parameters measured are not greater than both the LCEL and the UCEL at all stations except for the maximum copper value recorded at SS1, which exceeded the LCEL. However, considering that the mean value of copper at SS1 is significantly lower than the LCEL, this exceedance is considered an exceptional case. Therefore, it can be concluded that the sediment in the vicinity of the cable bundle alignment is generally not contaminated in accordance with the existing sediment classification guidelines.

Water Sensitive Receivers

A.3.6 Based on the desktop study, there are 18 nos. identified Water Sensitive Receivers ("WSRs") in the vicinity of the cable bundle alignment:

- Seawater Intake:
  - Seawater intake for the Swire Institute of Marine Science of the University of Hong Kong
- Gazetted Bathing Beaches:
  - St. Stephen's Beach
  - Chung Hom Kok Beach
  - Stanley Main Beach
- Fisheries:
  - Po Toi FCZ
  - Spawning Grounds of Commercial Fisheries Resources.
- SSSIs:
  - Tai Tam Reservoir SSSI (No.25)
  - Hok Tsui (Cape D'Aguilar) SSSI (No.49)
  - D'Aguilar Peninsula SSSI (No.6).
- Marine Reserve:
  - Cape D'Aguilar Marine Reserve.
- Coral Communities of Ecological Concern:
  - Along coastline of Round Island
  - southwest of Chung Hom Kok
  - Beaufort Island
  - Po Toi Island
  - Sung Kong
  - Waglan Island
  - Sung Kong Islet
  - Cape D'Aguilar.

A.3.7 WSRs are shown on **Figure A-4** and summarised in **Table A-5**, which also indicates the closest distance between the WSRs and the cable bundle.

Table A-3 Summary of Marine Water Quality Monitoring Statistics from 2019 to 2023 (SM1, SM19, MM8 and MM13)

WATER QUALITY PARAMETER	HONG KONG ISLAND (SOUTH)						WAGLAN ISLAND			MIRS BAY (SOUTH)		
	SM1			SM19			MM8			MM13		
	MEAN	MIN	MAX	MEAN	MIN	MAX	MEAN	MIN	MAX	MEAN	MIN	MAX
Temperature (°C)	24.2	23.8	24.7	24.1	23.3	24.8	23.7	23.2	24.4	23.9	23.6	24.4
Salinity	32.4	31.6	33.0	32.5	31.8	33.0	32.9	32.6	33.3	33.1	32.8	33.4
Dissolved Oxygen – Depth averaged (mg/L)	6.0	5.1	6.6	5.8	5.0	6.3	6.0	5.2	6.2	6.0	5.1	6.3
Dissolved Oxygen – Bottom (mg/L)	5.6	4.9	6.1	5.5	4.5	5.8	5.7	4.7	6.1	5.8	4.7	6.1
Dissolved Oxygen – Depth-averaged (% Saturation)	86.0	73.0	94.0	83.4	73.0	90.0	84.4	74.0	89.0	85.6	74.0	89.0
Dissolved Oxygen – Bottom (% Saturation)	79.6	71.0	87.0	77.0	65.0	82.0	80.4	68.0	86.0	81.2	67.0	87.0
pH	7.8	7.6	8.0	7.8	7.7	8.0	7.9	7.7	8.1	7.9	7.7	8.0
Suspended Solid (mg/L)	4.4	2.4	6.7	4.9	3.0	7.7	5.0	3.3	6.5	5.1	3.3	6.2
5-day Biochemical Oxygen Demand (mg/L)	0.7	0.6	0.7	0.6	0.5	0.7	0.6	0.5	0.7	0.5	0.4	0.6
Unionised Ammonia (mg/L)	<0.001	<0.001	0.002	<0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.001
Total Inorganic Nitrogen (mg/L)	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Total Nitrogen (mg/L)	0.5	0.4	0.5	0.5	0.4	0.6	0.4	0.4	0.5	0.5	0.4	0.6
Chlorophyll-a (µg/L)	2.8	2.5	3.3	2.6	1.9	3.1	2.3	1.7	3.1	1.9	1.5	2.1
Escherichia coli (cfu/100mL)	1.6	1.0	2.0	1.2	1.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0

Notes:

1. Data presented is the depth-averaged value averaged over 5 years, unless stated otherwise.
2. Total Inorganic Nitrogen and Unionised Ammonia is presented as the depth averaged annual mean over 5 years and the depth averaged annual range.
3. *E. coli* is presented as depth averaged annual geometric mean.

Source: Compiled from *Appendix B of Marine Water Quality in Hong Kong in 2019 to 2023*, EPD.

Table A-4 Summary of Marine Sediment Quality Monitoring Statistics between 2019 and 2023 (SS1, MS8 and MS13)

SEDIMENT QUALITY PARAMETER	LCEL	UCEL	HONG KONG ISLAND (SOUTH)			WAGLAN ISLAND			MIRS BAY (SOUTH)		
			SS1			MS8			MS13		
			MEAN	MIN	MAX	MEAN	MIN	MAX	MEAN	MIN	MAX
Chemical Oxygen Demand (mg/kg)	-	-	10650	7800	15000	10430	8500	13000	10020	7200	14000
Total Kjeldahl Nitrogen (mg/kg)	-	-	550	390	1200	470	340	560	430	340	500
Arsenic (mg/kg)	12	42	8.2	5.2	9.8	8.9	5.2	11.0	9.4	6.9	12.0
Cadmium (mg/kg)	1.5	4	<0.1	<0.1	0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.1
Chromium (mg/kg)	80	160	26	16	36	32	16	49	35	21	51
Copper (mg/kg)	65	110	22	8	82	15	11	21	15	10	24
Lead (mg/kg)	75	110	32	22	42	35	21	41	34	28	43
Mercury (mg/kg)	0.5	1	0.07	0.05	0.18	0.06	0.05	0.13	0.06	0.05	0.10
Nickel (mg/kg)	40	40	17	11	21	22	11	30	23	16	31
Silver (mg/kg)	1	2	0.2	0.2	0.3	<0.2	<0.2	0.2	<0.2	<0.2	0.2
Zinc (mg/kg)	200	270	90	53	140	91	51	120	95	69	130

Notes:

1. Data presented are arithmetic mean (except if specified differently)
2. Data is based on Government laboratory analysis of bulk samples collected twice per year.
3. LCEL – Lower Chemical Exceedance Level, UCEL – Upper Chemical Exceedance Level.
4. If concentrations are below the limit of detection, results are taken as half of the reporting limit.

Source: *Compiled from Appendix E of Marine Water Quality in Hong Kong in 2023*, EPD.

Table A-5 Closest Distances of WSRs to the Cable bundle alignment

USES	ID	SENSITIVE RECEIVERS	CLOSEST DISTANCE TO CABLE BUNDLE
Seawater Intake	I1	Seawater Intake for the Swire Institute of Marine Science of the University of Hong Kong	>5km
Gazetted Bathing Beach	B1	Chung Hom Kok Beach (other side of peninsula)	1,700m*
	B2	St. Stephen's Beach	840m
	B3	Stanley Main Beach (other side of peninsula)	>1km
FCZ	F1	Po Toi FCZ	>1.3km
Spawning Grounds of Commercial Fisheries Resources	F2	The southern and eastern waters through which the cable bundle alignment traverses	0
SSSI	S1	Tai Tam Reservoir Catchment SSSI (No.25)	>1.4km
	S2	Hok Tsui (Cape D'Aguilar) SSSI (No.49)	>4km
	S3	D'Aguilar Peninsula SSSI (No.6)	>4km
Marine Reserve	M1	Cape D'Aguilar Marine Reserve	>5km
Coral Communities of Ecological Concern	C1	Coral communities along coast of Round Island	>1.7km
	C2	Coral communities along coast of southwest of Chung Hom Kok	520m
	C3	Coral communities along coast of Beaufort Island	>2.7km
	C4	Coral communities along coast of Po Toi Island	330m
	C5	Coral communities along coast of Sung Kong	>2.5km
	C6	Coral communities along coast of Waglan Island	>2.3km
	C7	Coral communities along coast of Sung Kong Islet	>3.6km
	C8	Coral communities along coast of Cape D'Aguilar	>5.5km

Note: * Shortest distance sediment could travel through the sea between the cable bundle alignment and the beaches

A.4 Potential Sources of Impact

A.4.1 During cable installation and operation, the activities that may generate potential suspended solids are summarized in **Table A-6**.

Table A-6 Summary of Potential Sources of Impact

WORKS	DESCRIPTIONS
Onshore Installation	Submarine CLDs of about 64m to be installed from CHK landing point to offshore by barge-mounted grab with the help of tug boat and assisted by divers. Pulling the cable and the electrical earthing cable through the CLDs and securing in the BMH.
Shore-end Cable Installation	ALC-HK Cable Bundle burial of about 234m from the end of the CLDs and installation of associated earthing cable by diver using jetting tools.
Offshore Cable Installation	Cable route clearance (prior to the actual cable installation). Cable burial by barge and cable burial tool, or shallow burial by divers at cable and pipeline crossings. Post-lay inspection and burial if needed.

WORKS	DESCRIPTIONS
Emergency Cable Repair Works	Raising and replacing certain cable section damaged by accident events, such as anchoring operations.

A.4.2 The following paragraphs discussed the potential for any direct and indirect adverse water quality impacts arising from the installation works. During normal cable operation, there will be no disturbance on the seabed and no adverse water quality impact is anticipated . Nevertheless, the potential water quality impact due to the emergency cable repair works has been also discussed in the following section.

Construction Phase

Onshore Installation

A.4.3 The BMH and the terrestrial CLDs will be in place before the cable landing installation, so no new construction at the terrestrial area is required for this Project. For the installation of the submarine CLDs, a trench will be temporarily created on the seabed by barge-mounted grab for placing the fabricated steel frame. HDPE pipes will then be placed in the steel frame, followed by concrete pouring using tremie method to minimize the sediment dispersion. Suspended solids generated during the diver-assisted installation are expected to be localised and of very short term in duration. Once the installation of submarine CLDs is completed, the trench will be backfilled and the seabed will be reinstated to original profile.

A.4.4 After that, cable bundle will be pulled through the landing duct using a winch, and then be fixed inside the BMH. The earthing system will be installed in a similar manner. Adverse water quality impact from onshore cable installation on the WSRs is therefore not expected.

Shore-end Cable Installation

A.4.5 Due to the shallow water and rocky seabed in the immediate vicinity of the coastline at the landing point, special care will be taken during the installation of the ALC-HK Cable Bundle.

A.4.6 For the shore-end cable installation, in view of the rocky nature of the landing site, shore-end cable installation (about 234m from the end of CLDs) and associated earthing cable will be performed by divers to a depth suitable for the site conditions on a “best endeavour” basis. The shore-end cable installation will be less than 5m deep, and cable protection such as APs will be installed for approximately 234m of the cable section. The earthing system will also be installed using a similar method.

A.4.7 Considering the shore-end cable installation will only involve a relatively short section to be conducted by divers using hand-held tools with limited water-jetting power within a few hours, it is expected that sediment release will be minimal. The seabed is anticipated to naturally restore to its pre-installation levels and conditions shortly after the completion of the installation.

A.4.8 As such, no adverse water quality impact on the WSRs is anticipated during shore-end installation works.

Off-shore Cable Installation

Route Clearance

A.4.9 PLGR and RC operations will be carried out prior to the actual cable installation. PLGR/RC operations involve running a grapnel along the seabed of the cable bundle alignment to cut and recover OOS cables. The major purpose is to clear OOS cables and any seabed debris, such as wires, hawsers, fishing equipment, etc., that may have accumulated along the cable bundle alignment. It is anticipated that the grapnel will not penetrate deeper than the intended depth of the actual cable burial during the route clearance. The width of the seabed disturbed by the grapnels during the RC/PLGR operation will be no wider than that of the actual cable burial trench. As a result, the sediment disturbance caused by the grapnel running is expected to be minimal, and the volume of sediment generated is anticipated to be lower than that produced during the cable laying works.

A.4.10 PLGR/RC operations are conducted for all cable laying projects as necessary preparation. According to previous approved Project Profiles of these cable projects in Hong Kong, PLGR/RC operations would not cause unacceptable adverse water quality impacts. As the same methods are applied for this Project, the impacts arising from the PLGR/RC operations would be similar. Therefore, no adverse water quality impact arising from the PLGR/RC operations on the representative WSRs would be anticipated. There is no expectation that unacceptable adverse water quality impacts will arise at WSRs from the PLGR/RC operations.

Burial Using a Cable-laying Barge and Cable Burial Tool

A.4.11 Starting from about 298m from HWM to the eastern boundary of Hong Kong Waters, the cable bundle will be buried on the seabed using jetting techniques by an “Injector Burial Tool” or “Sledge Tool” which is towed by a cable-laying barge.

A.4.12 The Cable-laying and burial operation will commence by feeding high pressure water into a burial tool and lowering the blade or injector to the desired burial depth. The burial tool is attached to a barge that will slowly advance along the planned cable bundle route, simultaneously laying and burying the cable bundle at a pace that matches the barge's speed, which will typically be not higher than 1km/hr but may vary depending on seabed conditions. Within Hong Kong Waters, the target burial depth is approximately 5 meters below the seabed, with exceptions for cable sections that must cross obstacles or are located in transient zones, such as between launch positions of burial tool, the end of APs, and on slopes.

A.4.13 A high-pressure water jet emitted from the burial tool will be used to create a narrow trench in the seabed along the planned cable bundle alignment. The cable bundle will be laid and buried simultaneously within this trench, which will be no wider than 0.5m. Once the cable is in place, the sediment that was displaced to form the trench will naturally settle back around the cable bundle, burying it and leaving a small indentation in the seabed. Over time, this indentation will be filled in by natural sedimentation, restoring the seabed to its original profiles.

A.4.14 When an "Injector Burial Tool" or "Sledge Tool" is used during the cable-laying process, some of the disturbed seabed sediment will not settle directly back down but will instead disperse into the surrounding area. The potential water quality impacts of this sediment dispersion have been quantitatively studied in **Section A.5**.

Shallow Burial at Crossings and Provision of Cable Protection

A.4.15 When crossing other existing cables that are typically buried 5m below the seabed, the burial tool will be raised to a depth that maintain enough separate distance with the existing cables. Generally, the ALC-HK Cable Bundle will be buried 1.5m below the seabed at the crossing points. The specific crossing points and burial depths will be coordinated with the owners of the existing cables prior to installation. After 50m past the cable crossing points, the burial tool will be lowered back to achieve the target burial depth.

A.4.16 To cross the HKE Gas Pipeline, which is buried approximately 3.7m below the seabed, a shallower burial depth is necessary. About 100m before the pipeline crossing, the burial tool will be raised to allow the ALC-HK Cable Bundle to be laid on the surface of the seabed. Divers will then bury the cable bundle over the pipeline at a depth that is feasible and agreed upon with HKE. Approximately 100m after the pipeline crossing, the burial tool will be lowered back down to achieve the target burial depth. Because the cable bundle buried at a shallow depth is more vulnerable to damage from anchors, additional cable protection, i.e., Uraduct will be employed for a section of about 100m.

A.4.17 Considering the cable installation will only involve a relatively short section to be conducted by divers using hand-held tools with limited water-jetting power within a few hours, it is expected that sediment release will be minimal. The seabed is anticipated to naturally restore to its pre-installation levels and conditions shortly after the completion of the installation.

A.4.18 As such, no adverse water quality impact on the WSRs is anticipated for shallow burial at crossings carried out by divers.

Operation Phase (including Maintenance)

Emergency Cable Repair Works

A.4.19 If the cable is damaged by anchors or dropped objects, cable repair works will be required. These comprise:

- Clearing the area around the damaged section
- Locating and exposing the damaged section of the cable
- Repairing the damaged section on a cable-repair vessel
- Reconnecting the repaired cable
- Reburying the repaired section

A.4.20 To identify the fault location, a signal pulse will be sent through the cable from the cable end. The pulse will bounce back to the starting point once it reaches the damaged area. The rebounding time of the signal can be used to determine the location of the damage. Divers with tracking equipment or a ROV will then be deployed to pinpoint the exact location of the damage.

A.4.21 Divers will use hand-held tools with limited water-jetting power to remove the sediment covering the damaged cable section. Alternatively, grapnels will be used to penetrate the seabed and hook the cable. The cable will then be cut, and one end will be brought to the surface and onto the cable-repair vessel by a diver or ROV, while the other end will be left on the seabed. A surface buoy will be attached to mark the location of the damaged section.

A.4.22 On the cable-repair vessel, the damaged section of the cable will be removed. First, a new cable segment will be spliced to one end of the damaged cable, and electrical and optical tests will be performed to ensure the integrity of the splice. Then, the other end of the damaged cable (marked by the surface buoy) will be brought to the ship and spliced to the other end of the new cable segment. Once the repair is complete, the integrity of the cable will be verified with end-to-end electrical and optical tests.

A.4.23 The repaired cable will then be lowered back to the seabed and placed along its original alignment. A diver or ROV will inspect the affected cable section. If the cable needs to be reburied, a diver, ROV, or burial tool will be used to place it in the original trench at the original target depth. If only shallow burial or surface laying is feasible, cable protection such as APs, Uraduct, or other protection methods will be used before the cable replacement. A diver or ROV will conduct a final inspection and bury the cable after the completion of cable repair works.

A.4.24 Cable repair works are rare, and many cables never need to be repaired. Potential water quality impacts could result from lifting the damaged cable section from the trench to the seabed surface and then rebuying it after repair works. Raising and re-burying the cable will be conducted by divers or ROVs using jetting tools with similar or less water jetting power than those used during the initial cable installation. Additionally, cable repair works would be only performed on a small portion of the cable in a specific location and are finished within a short period of time compared to the initial cable installation. The seabed is anticipated to naturally return to its pre-work state and conditions shortly after the repair works. It means that water quality impact from cable repair works is anticipated to be lower than that of the initial cable laying works. Therefore, no adverse water quality impact is expected from cable repair works.

A.5 Impact Appraisal

Construction Phase

Installation of Submarine CLDs

A.5.1 As mentioned in **A.4.3**, the installation of the submarine CLDs will be carried out by barge-mounted grab with the help of tug boat and assisted by divers, followed by concrete pouring using tremie method to minimize the sediment dispersion. The trench will be backfilled and the seabed will be reinstated to original profile. Any water quality impact from installation of the submarine CLDs will be localised and of short duration.

Calculations of Sediment Dispersion

A.5.2 For the cable laying operations, the values used in the following calculations to review the impact of the ALC-HK Cable Bundle are within the range of values used in other recently approved Project Profiles for similar cable laying projects. The formula used for the ALC-HK Cable Bundle is consistent with those used in other recently approved Project Profiles for similar cable laying projects. The method for calculating settling velocity and settling time is identical to that used in other recently approved Project Profiles for similar cable laying projects, including ADC-HK and SJC2-HK. A list of the values used in these calculations is provided in the **Annex 1** attached to this Appendix for reference.

Calculation of Sediment Release Rate

A.5.3 The calculation of sediment dispersion is based on the following approach, with appropriate references to EAC, ASE, APG, TKOE, UEL, PLCN, SJC2-HK, and ADC-HK. To account for a worst-case scenario, the upper limits for the parameters have been used in these studies to calculate the release rate, settling velocity, settling time, and traveling distance of suspended sediments.

Release rate	= cross sectional area of disturbed sediment x speed of burial tool x sediment dry density x percentage loss
Depth of Disturbance	= 5m (burial depth of cable bundle)
Width of Disturbance	= 0.5m (width of seabed disturbance as cable bundle buried)
Max. Cross-sectional Area.	= 2.5m^2
Loss Rate	= 20% (majority of sediment not disturbed)
Maximum Speed of Burial Tool	= 0.278m/s (1km per hour)
In-situ Dry Sediment Density	= 600kg/m (typical of Hong Kong sediment)
Release Rate	**= 83.4kg/s**

A.5.4 The temporary disturbance during cable installation will be approximately 0.25m on either side of the cable bundle alignment's centreline, for a total width of 0.5m. Based on recently completed cable projects and the method statements for those projects, the maximum speed of the cable-laying barge (and therefore the burial tool) will be 1 km/hr, as mentioned in **para. A.4.12** above.

Initial Concentration of Suspended Sediments

A.5.5 During cable laying works, sediment from the seabed will be disturbed, resulting in high concentrations of suspended sediment and high settling velocities in a localized area. The suspended sediment will quickly form large clumps (flocculation) due to the high concentration and localized nature of the disturbance. These clumps of sediment have a higher settling velocity than individual sediment particles.

A.5.6 The suspended sediment is expected to remain within 1m above the seabed, regardless of the water depth. Near the seabed, current velocities are slower than those near water surface due to factors like bottom friction. The current velocity adopted in these calculations is made reference to the cable projects with similar alignment to the ALC-HK Cable Bundle.

A.5.7 For this appraisal, the current velocity of 0.9m/s has been adopted. This is a conservative estimate and represents an upper bound for bottom current velocities near the cable bundle alignment.

A.5.8 It is expected that the sediment will initially spread to a maximum of 6m along the centreline of the trench, which represents the longitudinal dimension of the cable burial tool. Although the suspended solids are expected to form around the cable laying works, a conservative assumption has been used to allow for a cross-current to carry sediment towards WSRs.

A.5.9 Based on the above, the worst-case scenario assumes that the sediment initially mixes evenly throughout the lower 1m of the water column and over the initial length of sediment spread.

Initial concentration	= release rate ÷ (current velocity x height of sediment x width of sediment)
Release Rate	= 83.4kg/s
Current Velocity	= 0.9 m/s
Height of Sediment	= 1m
Width of Sediment	= 6m
Initial Concentration	**= 15.44 kg/m^3**

Settling Velocity and Settling Time

A.5.10 The settling velocity of suspended solids is typically determined by the relationship between the initial suspended solids concentrations and the cohesive nature of the disturbed sediment. Generally, higher sediment concentrations lead to higher settling velocities due to flocculation, which increases the mass and promotes faster settling. However, this relationship does not hold true when initial concentrations exceed 1kg/m^3 (1). Since calculations indicate that the initial concentrations for this Project are expected to exceed 1kg/m^3, a conservative settling velocity of 10mm/s has been adopted.

A.5.11 As the sediment gradually settles onto the seabed, the suspended sediment concentrations will gradually decrease. To account for this gradual reduction in concentrations, the adopted settling velocity is halved, resulting in an average settling velocity of 5mm/s. This approach is the same as that used in other cable laying projects, including EAC, ASE, APG, TKOE, UEL, PLCN, ADC-HK and others.

A.5.12 The required time for the sediment to settle onto the seabed will thus be the maximum height of the sediment divided by the average settling velocity.

Settling Time	= maximum height of sediment ÷ settling velocity
	= 1m ÷ (0.005m/s)
Settling Time	**= 200s ≈ 3.5 minutes**

Dispersion Distance

A.5.13 By combining this settling time with the speed of the tidal currents, we can estimate how far the sediment will spread during the cable laying process. As mentioned before, a tidal current velocity of 0.9m/s was adopted for a worst-case scenario.

Distance Travelled	= Settling Time x Speed of Tidal Current
	= 200s x 0.9m/s
Distance Travelled	**= 180m**

A.5.14 The calculations above indicate that the sediment disturbed during cable laying will settle back to the seabed within approximately 180m of the cable bundle alignment in about 3.5 minutes.

(1) Delo, E.A. & Ockenden, M.C., (1992). Estuarine muds manual. Report SR 309. Hydraulic Research Wallingford.

Potential Impacts to WSRs

A.5.15 ***Table A-7*** below lists the 18 nos. WSRs in the vicinity of the ALC-HK Cable Bundle and reviews their potential impacts based on their distance from the cable laying activities. According to the sediment plume distance calculated above, WSRs within 180m of the cable trench are likely to be affected by the project, while WSRs beyond 180m are unlikely to be affected (see **Figure A-4**).

A.5.16 The cable bundle (and many other existing cables) passes through the Spawning Grounds of Commercial Fisheries Resources, so short-term impacts may occur during installation.

A.5.17 The closest coral communities are along the coast of Po Toi Island, approximately 330m away from the cable bundle alignment. Besides, the other WSRs are more than 700 meters from the cable bundle alignment.

A.5.18 Given that these WSRs (except Spawning Grounds of Commercial Fisheries Resources) are out of the 180m maximum sediment plume settlement distance, the sediment disturbed by the cable installation should be expected to settle before reaching them. Therefore, adverse impacts on these WSRs are not anticipated.

A.5.19 Nevertheless, considering the potential short-term impact to the Spawning Grounds of Commercial Fisheries Resources through which the cable bundle (and many other existing cables) passes through, and to avoid any unpredicted impact arising from the cable laying works on the nearest FCZ (i.e., Po Toi FCZ, which is located >1.3km away from the cable trench) and nearest coral communities at the coast of Po Toi Island (which is located 330m away from the cable trench), water quality monitoring works along the cable bundle alignment near these WSRs (including Spawning Grounds of Commercial Fisheries Resources, Po Toi FCZ and the coral communities along the coast of Po Toi Island) is recommend as a precautionary measure.

A.5.20 Regarding the installation of the submarine CLDs, it will be conducted by barge-mounted grab with the help of tug boat and assisted by divers, followed by concrete pouring using tremie method to minimize the sediment dispersion. To further minimize the disturbance to the seabed, the placement of steel frame will be carefully controlled so that there will not be any sudden, rapid drop that could re-suspend seabed material within the trench. Moreover, backfilling rate will be carefully controlled to avoid dropping large quantities of material and the grab will only release the material at the trench. With the above measures in place, water quality impact from installation of the submarine CLDs will be minimal.

A.5.21 For the shore-end installation works of cable bundle and earthing cable, it would be conducted by divers using jetting techniques. Given that the section of shore-end cable installation is short, the installation will only take a few hours, and the equipment used has limited water jetting power, the amount of sediment disturbed is expected to be minimal. Therefore, no adverse water quality impact on the WSRs is anticipated during the shore-end installation works.

Operation Phase (including Maintenance)

Emergency Cable Repair Works

A.5.22 Under normal condition, the operation of the cable bundle would not result in change in water quality. It should be noted that in case cable repair work is required during operation

phase, cable repair works would be only performed on a small portion of the cable in a specific location and are finished within a short period of time compared to the initial cable installation. The seabed is anticipated to naturally return to its pre-work state and conditions shortly after the repair works. It means that water quality impact from cable repair works is anticipated to be lower than that of the initial cable laying works. Therefore, no adverse water quality impact is expected from cable repair works.

Cumulative Impacts

A.5.23 The installation of the ALC-HK Cable Bundle will not be carried out concurrently with other projects in the surroundings and thus no cumulative impact is expected. However, if other projects, such as, Hong Kong Wind Farm Project, are scheduled within a time period that overlaps with that for the ALC-HK Cable Bundle, the Project Proponent of ALC-HK Cable Bundle will engage a Liaison Officer who will be responsible for liaising with the Project Proponents of other planned projects in the vicinity to agree on a working schedule that avoids concurrent construction works.

Table A-7 Water Quality Impact at WSRs During Cable Installation

USES	ID	SENSITIVE RECEIVERS	CLOSEST DISTANCE TO CABLE BUNDLE	POTENTIAL FOR ADVERSE IMPACT
Seawater Intake	I1	Seawater Intake for the Swire Institute of Marine Science of the University of Hong Kong	>5km	None due to >>180m distance between WSR and cable trench
Gazetted Bathing Beach	B1	Chung Hom Kok Beach (other side of peninsula)	1700m*	None due to >>180m distance between WSR and cable trench
	B2	St. Stephen's Beach	840m	None due to >>180m distance between WSR and cable trench
	B3	Stanley Main Beach (other side of peninsula)	>1km	None due to >>180m distance between WSR and cable trench
FCZ	F1	Po Toi FCZ	>1.3km	None due to >>180m distance between WSR and cable trench
Spawning Grounds of Commercial Fisheries Resources	**F2**	**The southern and eastern wates through which the cable bundle passes**	**0**	**Possible due to <180m distance between WSR and cable trench**
SSSI	S1	Tai Tam Reservoir Catchment SSSI (No.25)	>1.4km	None due to >>180m distance between WSR and cable trench
	S2	Hok Tsui (Cape d'Aguilar) SSSI (No.49)	>4km	None due to >>180m distance between WSR and cable trench
	S3	D'Aguilar Peninsula SSSI (No.6)	>4km	None due to >>180m distance between WSR and cable trench
Marine Reserve	M1	Cape d'Aguilar Marine Reserve	>5km	None due to >>180m distance between WSR and cable trench
Coral Communities of Ecological Concern	C1	Coral communities along coast of Round Island	>1.7km	None due to >>180m distance between WSR and cable trench
	C2	Coral communities along coast of southwest of CHK	520m	None due to >>180m distance between WSR and cable trench
	C3	Coral communities along coast of Beaufort Island	>2.7km	None due to >>180m distance between WSR and cable trench
	C4	Coral communities along coast of Po Toi Island	330m	Unlikely due to >180m distance between WSR and cable trench
	C5	Coral communities along coast of Sung Kong	>2.5km	None due to >>180m distance between WSR and cable trench
	C6	Coral communities along coast of Waglan Island	>2.3km	None due to >>180m distance between WSR and cable trench
	C7	Coral communities along coast of Sung Kong Islet	>3.6km	None due to >>180m distance between WSR and cable trench
	C8	Coral communities along coast of Cape D'Aguilar	>5.5km	None due to >>180m distance between WSR and cable trench

Note: * This is the shortest distance sediment could travel through the sea between the cable bundle alignment and the beaches

Bold text means the WSR is located <180m from the cable trench and might be affected by the cable installation works

A.6 Mitigation Measures

Construction Phase

Onshore Installation Works

A.6.1 Although no adverse water quality impact on the WSRs is anticipated during onshore cable installation at CHK, the following precautionary measures will be implemented:

- For the installation of the submarine CLDs, the trenching and backfilling process of the sediment would be in low speed to minimize the disturbance to the seabed.
- The steel frame will be slowly lowered into the trench to avoid any sudden, rapid drop that could re-suspend seabed material within the trench. Tremie method will be adopted for subsequent concrete pouring to confine the sediment dispersion.
- Stockpiles of materials will be covered with tarpaulin sheeting or similar fabric to minimise runoff during the rainy season.
- Care will be taken during the cable landing to avoid any spillage of materials to the adjacent marine waters and to ensure that any spoil materials are not discharged into these waters.
- Machinery will be inspected before use to ensure that it is not leaking oil or fuel. Maintenance and repair of machinery will be carried out off-site to prevent chemical spillage. If on-site maintenance or repair is unavoidable, secondary containment will be provided to avoid any chemical spillage.
- All construction waste and drainage will be handled and disposed of in accordance with the *Waste Disposal Ordinance* and *Practice Note for Professional Persons, Construction Site Drainage (ProPECC PN2/24).*
- Best Management Practices (BMPs) will be implemented to prevent and minimize contaminated runoff from work sites, marine plant, and vessel.
- Provision of chemical toilet for workforce.

Shore-end Cable Installation and Offshore Cable Installation

A.6.2 As discussed in **para. A.5.15** to **A.5.18** above, no adverse impacts to the WSRs are anticipated during cable laying work with the cable burial tool, diver or ROV. Nevertheless, the following general mitigation measures will be followed:

- The crane barge used to transport debris recovered from the seabed during route clearance will be equipped with tight bottom seals to prevent leakage of material during loading and transport to the disposal site.
- The crane barge will be filled to a level that prevents falling material during loading and transport and maintains adequate freeboard to ensure that the decks are not washed by wave action.
- The speed of the cable-laying barge will be limited to a maximum of 1km/hr.

A.6.3 The peak season for water sports activities in Stanley Bay is from mid-July to end-August, and there are Dragon Boat races during the Tuen Ng Festival in June. To minimize potential disruptions to users of the Stanley Bay, including bathers at St. Stephen's Beach, participants

in Dragon Boat races, and St. Stephen's Beach Water Sports Centre ("SSBWSC"), the following mitigation measures will be implemented:

- Marine works within the area of Stanley Bay designated for water sports activities, as shown on **Figure 2-6**, will NOT be carried out during the peak bathing/water sports activities season, including Tuen Ng Festival, from 1 June to 31 August.
- The Project Proponent shall appoint a liaison officer for the Project to ensure effective communication during marine works within Stanley Bay. Prior to the commencement of the works the Project Proponent will consult with LCSD and other relevant parties regarding Stanley Dragon Boat Race schedule, and SSBWSC regarding their races/competitions, to establish an appropriate notification system prior to and during installation works.

A.6.4 EM&A will be conducted for the project in the areas near the major WSRs such as Po Toi FCZ, Spawning Grounds of Commercial Fisheries Resources and the coral communities as a precautionary measure. The specific monitoring locations are provided in **Appendix E**. In case any exceedance of Limit Level due to cable installation works is observed, the works shall be suspended until the exceedance is rectified. Appropriate mitigation measures, including slowing down the speed of the cable-laying barge, reducing the water jetting pressure and etc., should be considered and implemented, if practicable.

Operation Phase (including Maintenance)

Emergency Cable Repair Works

A.6.5 As discussed in **para. A.4.24**, water quality impact from cable repair works is anticipated to be minimal and lower than that of the initial cable laying works. The need of implementing mitigation and monitoring measures during cable repair should be reviewed by the Project Proponent if cable repair works are required. The Environmental Team ("ET") and Independent Environmental Checker ("IEC") shall be re-engaged to advise on the scope of any EM&A works needed and to implement and audit the required EM&A programme during the repair works – see **Appendix E** on EM&A requirements.

A.7 Conclusion

A.7.1 This appendix reviews the potential water quality impact arising from the proposed ALC-HK Cable Bundle and the submarine CLDs during the installation and operation stage. Appropriate mitigation measures are also recommended as necessary.

Impacts

A.7.2 Localized and small-scale water quality impacts may be arisen from the installation of the submarine CLDs, submarine cable installation works and cable repair works. Calculations show that sediments disturbed by the cable burial tool will settle back to the seabed within 3.5 minutes, with a maximum dispersion distance of 180m from the cable bundle alignment.

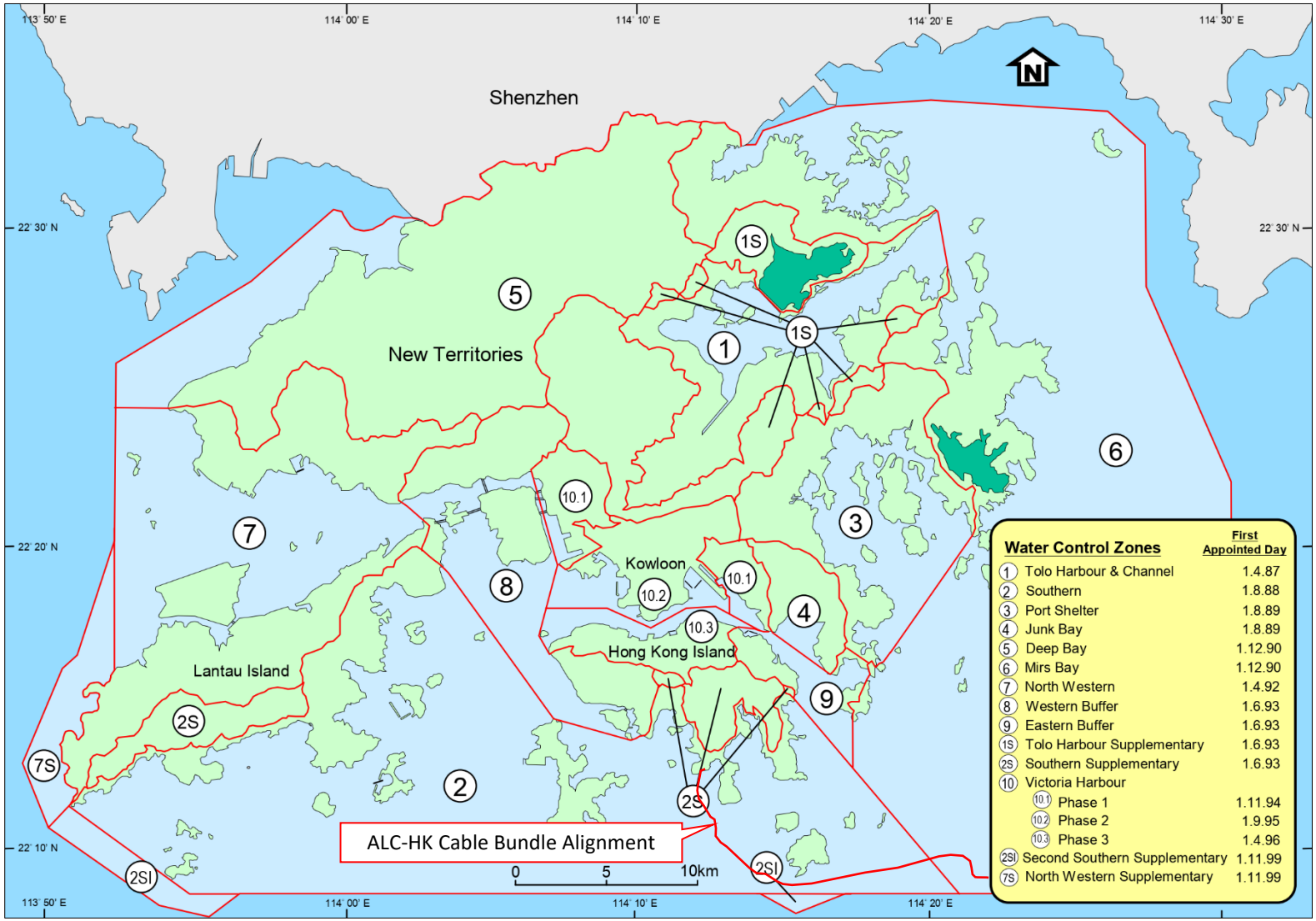
A.7.3 A total of 18 nos. WSRs near the proposed cable bundle alignment have been identified in this water quality impact appraisal. Except the Spawning Grounds of Commercial Fisheries Resources, all the identified WSRs are located more than 180m away from the cable bundle alignment. The sediment disturbed by the cable installation should is expected to settle before reaching the WSRs. Therefore, adverse impact on these WSRs is not anticipated. The cable bundle (and many other existing cables) passes through the Spawning Grounds of Commercial Fisheries Resources, so short-term impacts may occur during installation.

Mitigation Measures

A.7.4 Water quality monitoring works along the cable bundle alignment near the WSRs (including Spawning Grounds of Commercial Fisheries Resources, Po Toi FCZ and the coral communities along the coast of Po Toi Island) is recommended as a precautionary measure.

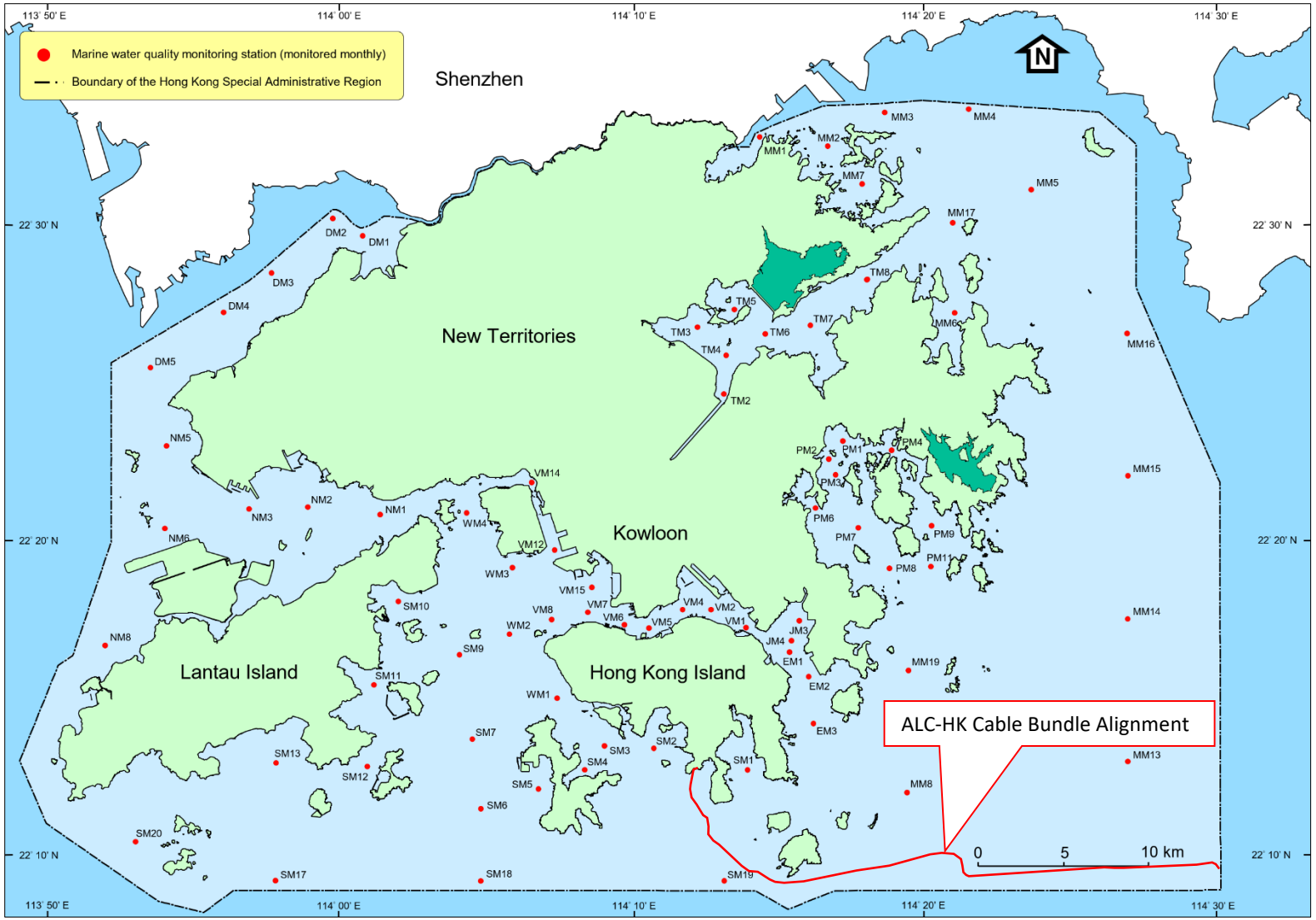
A.7.5 Overall, with the recommended mitigation measures in place, no adverse water quality impacts are anticipated from the cable installation works or from any future emergency repair works.

Figure A-1 Water Control Zones in Hong Kong



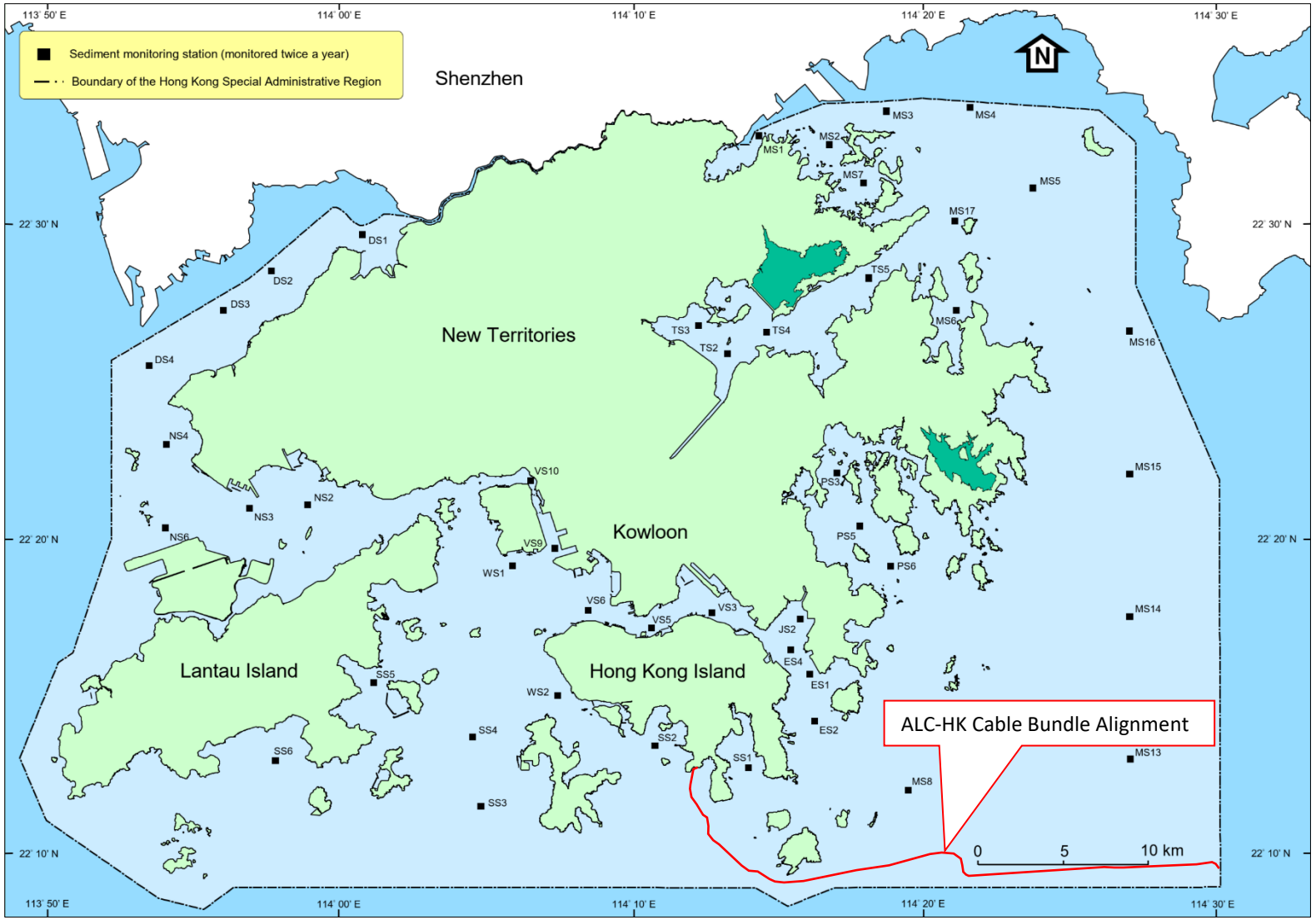
Source: Environment Bureau– Plan No. WP/WP4/75, Nov 1999

Figure A-2 EPD's Marine Water Quality Monitoring Stations



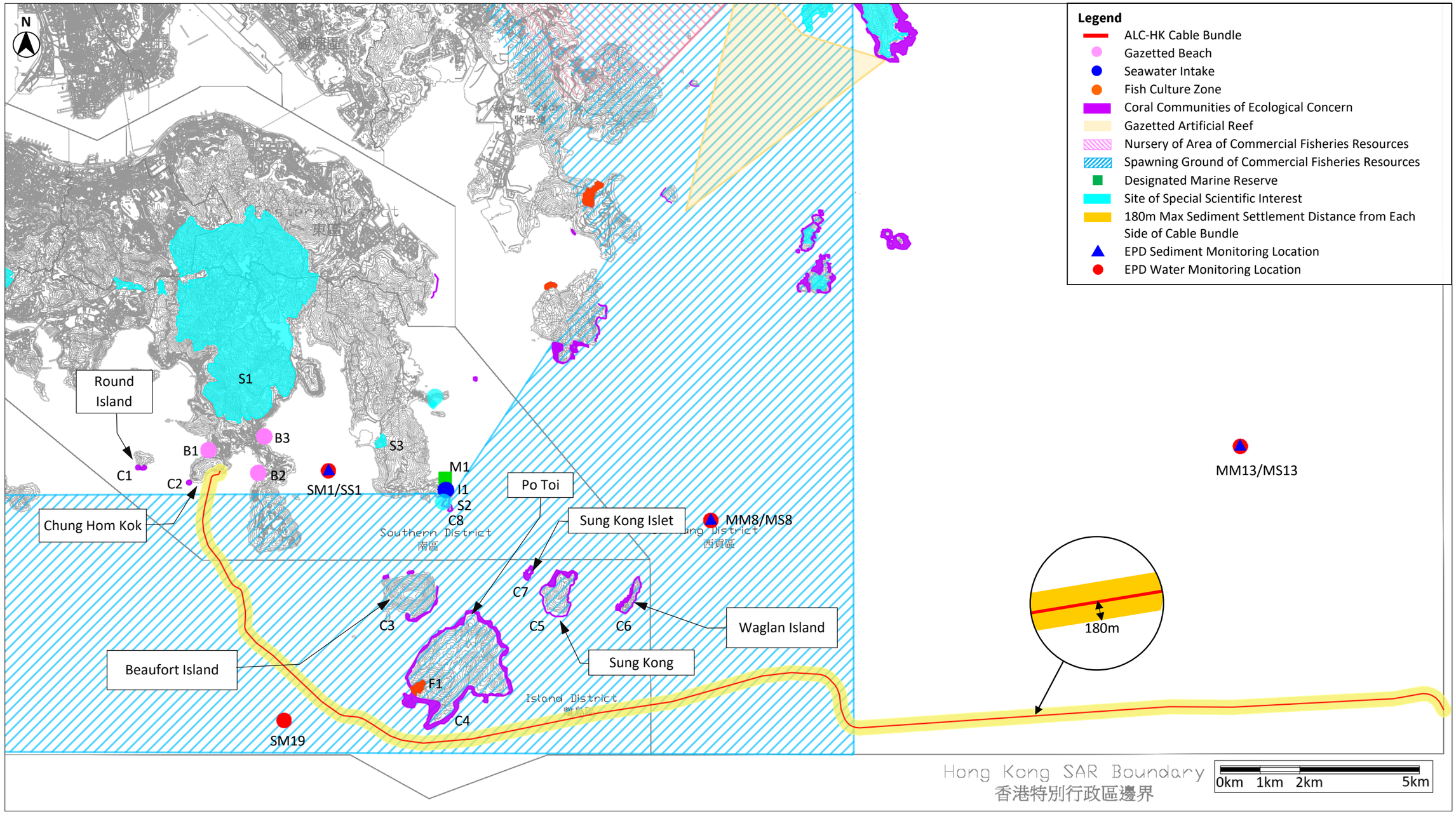
Source: *Marine Water Quality in Hong Kong in 2023*, published by EPD.

Figure A-3 EPD's Marine Sediment Monitoring Stations



Source: *Marine Water Quality in Hong Kong in 2023*, published by EPD.

Figure A-4 WSRs and EPD Monitoring Stations in the Vicinity of the ALC-HK Cable Bundle Alignment



Annex 1 Summary of Parameters Used in Sediment Plume Calculations for Other Selected Cable Projects

PROJECT	SEDIMENT RELEASE RATE (kg/s)	INITIAL CONCENTRATION (kg/m^3)	DEPTH OF DISTURBANCE (m)	WIDTH OF DISTURBANCE (m)	MAXIMUM CROSS-SECTIONAL AREA (m^2)	LOSS RATE (%)	SPEED OF BURIAL TOOL (m/s)	IN-SITU DRY DENSITY (kg/m^3)	CURRENT VELOCITY (m/s)	HEIGHT OF SEDIMENT PLUME (m)	WIDTH OF SEDIMENT PLUME (m)
PARAMETERS USE IN SEDIMENT PLUME CALCULATIONS FOR THIS PROJECT											
ALC-HK Cable Bundle (this Project)	**83.4**	**15.44**	**5**	**0.5**	**2.5**	**20**	**0.278**	**600**	**0.9**	**1**	**6**
Justification for Value Adopted	*Standard formula*	*Standard formula*	*As required by project*	*As required by project*	*Standard formula*	*Worst case among PPs*	*Adopted in most other PPs*	*Adopted in all other PPs*	*Adopted in most other PPs*	*Adopted in most other PPs*	*Adopted in all other PPs*
PARAMETERS USE IN SEDIMENT PLUME CALCULATIONS FOR OTHER SELECTED CABLE PROJECTS											
Asia Direct Cable (ADC) – Hong Kong Segment (AEP-595/2021)	83.4	15.44	5	0.5	2.5	20	0.278	600	0.9	1	6
South-East Asia Japan2 Cable System (SJC2) – Hong Kong Segment (AEP-572/2020)	83.4	15.44	5	0.5	2.5	20	0.278	600	0.9	1	6
Ultra Express Link (UEL) – Tseung Kwan O/Chai Wan (AEP-543/2017)	83.4	15.44	5	0.5	2.5	20	0.278	600	0.9	1	6
Pacific Light Cable Network (PLCN) Deep Water Bay (AEP-539/2017)	83.4	15.44	5	0.5	2.5	20	0.278	600	0.9	1	6
AAE-1 Cable – Cape D'Aguilar (AEP-508/2016)	(i) 500m to 2.5km = 24.9 (ii) 2.5km to 27.65km = 83.4	(i) 500m to 2.5km = 14.88 (ii) 2.5km to 27.65km = 15.44	5	0.5	2.5	20	(i) 500m to 2.5km = 0.083m/s (ii) 2.5km to 27.65km = 0.278m/s	600	(i) In vicinity of Cape D'Aguilar = 0.28 m/s (ii) In existing cable corridor = 0.90 m/s	1	6
Tseung Kwan O Express Cable System (TKO-E) – Tseung Kwan O/Chai Wan (AEP-509/2016)	83.4	15.44	5	0.5	2.5	20	0.278	600	0.9	1	6
Asia Pacific Gateway (APG) – Tseung Kwan O (AEP-485/2014)	83.4	15.44	5	0.5	2.5	20	0.278	600	0.9	1	6
Asia Submarine-cable Express (ASE) – Tseung Kwan O (AEP-433/2011)	83.4	15.44	5	0.5	2.5	20	0.278	600	0.9	1	6
South-East Asia Japan Cable System (SJC) Hong Kong Segment (AEP-423/2011)	33.0	6.11	5	0.5	2.5	10	0.220	600	0.9	1	6
VSNL Intra Asia Submarine Cable System – Deep Water Bay (AEP-294/2007)	41.7	7.72	5	0.5	2.5	10	0.278	600	0.9	1	6
Proposed 132kV Submarine Cable Route for Airport "A" to Castle Peak Power Station Cable Circuit (AEP267/2007)	13.2	1.47	5	2.0	5.0	20	0.022	600	1.5	1	6
132 kV Submarine Cable Installation for Wong Chuk Hang – Chung Hom Kok 132 kV Circuits (AEP132/2002)	3.33	1.39	5	1.0	2.5	20	0.011	600	0.4	1	6
Flag North Asian Loop (AEP099/2001)	41.7	4.63	5	0.25	1.25	20	0.278	600	0.5	3	6
New T&T Hong Kong Limited: Domestic Cable Route (AEP-086/2001)	37.53	3.48	9	0.25	2.25	10	0.278	600	0.9	2	6
C2C Cable Network – Hong Kong Section: Chung Hom Kok (AEP-087/2001)	20.85	2.90	5	0.25	1.25	10	0.278	600	0.6	2	6

Appendix B Marine Ecology Appraisal

CONTENTS

FIGURES

TABLES

B MARINE ECOLOGY APPRAISAL

B.1 Introduction

B.1.1 This appendix reviews marine ecology impacts arising from the installation of the ALC-HK Cable Bundle, and may be read in conjunction with the water quality appraisal in **Appendix A**.

B.2 Relevant Legislation and Appraisal Criteria

B.2.1 Legislation and associated guidance or non-statuary guidelines listed below are referred to in the review of ecological impacts:

- Environmental Impact Assessment Ordinance (Cap. 499. S.16) and the Technical Memorandum on EIA Process ("EIAO-TM"), Annexes 8 and 16
- Water Pollution Control Ordinance ("WPCO")

EIAO-TM

B.2.2 Annexes 8 and 16 of the EIAO-TM provide general guidelines and criteria for assessing ecological impacts. In addition to the magnitude and scale of the impact, the EIAO-TM recognizes that the significance of an ecological impact is also linked to the perceived importance of the affected habitat or species. Generally, impacts on important habitats or species are considered more significant than impacts on less important ones.

WPCO

B.2.3 WPCO is the primary legislation for controlling water pollution and water quality in Hong Kong. It designates ten WCZs and four supplementary WCZs, each with its own set of Water Quality Objectives ("WQOs").

B.2.4 The WQOs recognize the importance of protecting marine waters to ensure they are suitable for marine life growth and various human uses in a sustainable manner. Waters designated for more sensitive uses, such as sanctuaries for important species like the Chinese White Dolphin, require a higher level of protection and therefore have more stringent WQOs than water bodies with less sensitive functions, such as navigation. Sensitive water bodies are primarily located in the eastern and southern waters of Hong Kong.

B.3 Description of the Marine Environment

B.3.1 Calculations in **Appendix A** indicate that the sediments disturbed arising from cable laying works will settle back onto the seabed within a maximum travelling distance of 180m from the cable trench and will settle within about 3.5 minutes.

B.3.2 As shown in **Table A-5**, the closest ecologically sensitive receiver is a coral community of ecological concern, located approximately 330m from the cable bundle alignment. The second closest ecologically sensitive receiver, also a coral community of ecological concern, is over 500m from the cable bundle alignment. The Cape D'Aguilar Marine Reserve is over 5km from the cable bundle alignment.

Coastal Protection Area

B.3.3 The landing area where the BMH and the territorial CLDs are located is zoned as CPA, which stretches along the coastline of CHK and is discussed in **para. 3.3.2**.

Coral Communities

B.3.4 The coral communities of ecological concern identified along the ALC-HK Cable Bundle alignment are shown in **Figure B-1**. The closest coral community to the cable bundle alignment is along coast of Po Toi Island, about 330m away. Other coral communities are located more than 500m away from the cable bundle route and are not expected to be impact by the Project.

B.3.5 The following description is based on a review of previous marine ecological studies conducted for similar projects in the same area. In particular, the New T&T Cable and ADC-HK Cable, which have landing sites identical to that of the ALC-HK Cable Bundle, are considered to be highly relevant to the ALC-HK Cable Bundle.

Intertidal Soft Bottom Assemblages

B.3.6 For New T&T cable, a quantitative Sandy Shore Survey of Intertidal soft bottom assemblages was carried out at the landing site in 2000[1]. The survey area, designated as *Natural Sandy/Pebble Shore (Site S1)*, was located to the west of the landing point of the ALC-HK Cable Bundle, as shown in **Figure B-2.**The survey area consisted of a natural, semi-exposed sandy or pebble shore that exhibited minimal or no signs of human disturbance.

B.3.7 The substratum of the shore was primarily composed of small to medium-sized pebbles in the high and low-shore regions. In contrast, the mid and low shore were predominantly characterized by fine sand. No macrofauna were identified in any of the core samples surveyed, and the beach was virtually devoid of life.

B.3.8 Based on the surveys conducted in 2000, it can be concluded that the intertidal soft bottom assemblages at the landing site exhibit low abundance and biodiversity. Consequently, the ecological importance of the landing site is considered to be low.

Intertidal Hard Bottom Assemblages

B.3.9 A quantitative rocky shore survey of intertidal hard bottom assemblages were also carried out at the landing point at Chung Hom Kok in 2000[1]. The Survey Area *Exposed Rocky Shore (Site R1)*, as shown in **Figure B-2,** is on the eastern side of ALC-HK Cable Bundle landing point and route. The studied shore was a natural and exposed rocky shore, which appeared to be little or no human disturbance.

B.3.10 According to the survey, there were comparatively high densities of mobile organisms on the shore, including limpets (61.6m^{-2}) and chitons (33.1m^{-2}), while snails (26.7m^{-2}) were relatively moderate abundances. The percentages coverage of barnacles (21.1%), macroalgae (3.6%) and bivalves (2.4%) were also recorded during the study, respectively.

1. ERM (2000). Project Profile for the New T&T Hong Kong Limited Domestic Cable Route. Report for New T&T (Hong Kong) Limited, (DIR-045/2000)

B.3.11 The survey concluded that no species of conservation importance was recorded. The assemblages recorded in the study were typical of exposed rocky shores in Hong Kong[1]. As a result, the intertidal hard surface assemblages were considered to be of medium ecological value.

B.3.12 Overall, no rare and conservative species was recorded during the intertidal survey, and the landing point is considered to have low to medium ecological value.

Subtidal Soft Bottom Assemblages

B.3.13 The *Consultancy Study on Marine Benthic Communities in Hong Kong*[2] provided survey information for subtidal soft bottom assemblages in the vicinity of the ALC-HK Cable Bundle. 12 sampling stations were located in the vicinity of ALC-HK Cable Bundle alignment, of which the survey result may represent the ecological status of that area.

B.3.14 The study revealed that the substratum of the sampling stations was covered by very fine sand and/or silt/clay. The benthic assemblages observed at these stations were typical of those found in Hong Kong waters and comparable to benthic assemblages in many other subtidal habitats in Hong Kong. For the summer season, the average number of species was moderate (35 species/0.5m^2), while the average number of individuals (170 individuals/m^2) and average wet weight (41.7g/m^2) were low compared to the average values (33 species/ 0.5m^2, 540 individuals/m^2 and 71.2 g/m^2).

B.3.15 Regarding the winter season, the average number of species (29 species/0.5m^2) and average wet weight (32.0g /m^2) were moderate, while the average number of individuals (170 individuals/m^2) was low in comparison to average values of benthic assemblages in Hong Kong (34 species/0.5m^2, 450 individuals/m^2 and 28 g/m^2). For the summer season, five stations exhibited high diversity (>3) while seven showed only moderate diversity (2 to 3) compared toother survey areas. Species diversity was lower during the winter season, with only two stations showing high diversity while others were of moderate diversity. Overall, no species of conservation importance were identified in the vicinity of the ALC-HK Cable Bundle during either the summer or winter seasons.

B.3.16 In summary, the study identified a low level of benthic assemblages at the sampling stations located in the vicinity of the ALC-HK Cable Bundle alignment. However, no species of conservation importance were recorded. Therefore, it can be concluded that the area along the cable bundle has low ecological value in terms of subtidal soft bottom assemblages.

Subtidal Hard Bottom Assemblages

B.3.17 Dive surveys using Rapid Ecological Assessment ("REA") as adapted from Le Vantier et al. (1998)[3] were conducted at the CHK landing site for New T&T cable alignment in 2000[1], which has the same landing site of ALC-HK Cable Bundle. The locations of the five transects and their distances to the ALC-HK Cable Bundle alignment are presented in **Figure B-2**. Among the five transects studied in the dive surveys, four of them are located in close proximity to the ALC-HK Cable Bundle alignment: Transect #1 to Transect #4. Transect #2 and Transect #3 with the average depths of 5.2m and 8.4m respectively, are situated directly across the ALC-HK Cable Bundle alignment. And Transect #1, with a depth of 4.6m, is located

2. CityU Professional Services Limited (2002). Consultancy Study on Marine Benthic Communities in Hong Kong (Agreement No. CE 69/2000). Final Report submitted to AFCD.
3. DeVantier, L. M., G. De'Ath, Done, T. J., & Turak, E. (1998). Ecological Assessment of a Complex Natural System: A Case Study from the Great Barrier Reef. Ecological Applications, 8(2), 480–496.

about 26m to the west of the ALC-HK Cable Bundle. For Transect #4, with a depth of 4.2m, is located about 15m to the east of the ALC-HK Cable Bundle.

B.3.18 The majority of the transects had primarily a sand, or sand and gravel seabed composition. The seabed of all the four transects was predominantly composed of sand and gravel (76 to 100% coverage), with some rubble, bedrock, boulder and hard substrate (1 to 30% coverage).

B.3.19 Regarding benthic organisms, Simple Gorgonians were observed along all the four transects with uncommon to common abundance, while Sponges were recorded to be rare in abundance along Transects #1, #2, and #4.

B.3.20 Besides, Sea fans, *Dendronephthya spp* and Bryozoans were also recorded in Transect #1 and Transect #4 with rare to uncommon abundance. In terms of ecological attributes, only soft coral was recorded, with a coverage percentage of 1 to 10%. No hard coral was observed along all the four transects.

B.3.21 Another dive survey using REA was conducted more recently in 2020 for the ADC-HK Cable[4] to review the substrate type and ecological attributes at the CHK landing site along cable bundle route, which has the same landing area as the ALC-HK Cable Bundle. The conditions of six transects were studied in this diver survey. The locations of six transects and their distances from ALC-HK Cable Bundle alignment are shown in **Figure B-3**. A total of six 50m transects were surveyed, Transect 1 was located directly across the ALC-HK Cable Bundle alignment and Transect 2 was 5m away from the alignment. Transects 3, 4, 5, and 6 were situated at least 13m away from the ALC-HK Cable Bundle alignment. Among the six transects (T1 to T6), T1 and T2 were predominantly characterized by rocky substrates, while T3, T4, T5, and T6 were primarily composed of fine sand or sand with silt in deeper water. The survey results are summarized in **Table B-1** below.

Table B-1 Summary of REA for ADC-HK Cable

TRANSECT	FINDINGS
T1	- The substrates were mainly dominated by natural rocky substrates including boulders and rubbles, and also patches of sand with gravel - Most hard substrates were covered by sediments and had bare surface. The dominant sessile taxa on the hard substrates were sessile algae including crustose coralline and brown encrusting algae - Sessile animals including rock oysters, sponges, bryozoans, tunicates, hydroids, small mussels, barnacles and tube worms; only few coral colonies were observed at the end of this transect - A total of three hard coral colonies of two species Plesiastrea versipora and Oulastrea crispata were recorded - One soft coral colony Dendronephthya sp. was recorded. The coral colonies are either common or abundant species in Hong Kong - No other taxon of conservation interest was observed
T2	- The substrates were mainly dominated by natural rocky substrates including boulders and rubbles, and also patches of sand with gravel - Most hard substrates were covered by sediments and had bare surface. The dominant sessile taxa on the hard substrates were sessile algae including crustose coralline and brown encrusting algae

4. SMEC (2021). Project Profile for Asia Direct Cable System - Hong Kong Segment (ADC-HK) - Chung Hom Kok. Report for China Telecom Global Limited, (DIR-285/2021)

TRANSECT	FINDINGS
	- Sessile animals included rock oysters, sponges, bryozoans, tunicates, hydroids, small mussels, barnacles and tube worms - One hard coral colony Bernardpora stutchburyi and one soft coral colony Dendronephthya sp. Were recorded. The coral colonies are common species in Hong Kong - No other taxon of conservation interest was observed
T3	- Substrates were mainly dominated sand with gravel, with few patches of rubble only - Dominant sessile taxa on the hard substrates were sessile algae, including crustose coralline and brown encrusting algae - No hard coral, soft coral or other taxon of conservation interest was observed
T4, T5 & T6	- The substrates were mainly dominated fine sand (and silt at T5 and T6) - No hard coral, soft coral or other taxon of conservation interest was observed

B.3.22 A total of four hard coral colonies and two soft coral colonies were found at T1 and T2 at three locations in this diver survey. The area of the hard coral colonies ranged from 4 to 300cm^2 and the height of the soft coral colonies ranged from 4 to 10cm. All hard and soft coral colonies were generally healthy, with low (≤5%) or no levels of sedimentation, bleaching or partial mortality. All the colonies were mainly associated with boulders.

B.3.23 The coral community observed had low coverage (<5%) and species diversity. Colonies were small in size and patchily distributed. Only three hard coral species and one soft coral species were observed, all of which are considered common or abundant in Hong Kong waters.

B.3.24 The six coral colonies identified at T1 and T2 were located more than 40m away from the ALC-HK Cable Bundle alignment and the submarine CLDs. For the section in the vicinity to the identified coral colonies, the installation of the submarine CLDs will be conducted by barge-mounted grab with help of tug boat and assisted by divers. The anticipated width of the trenching works will be 4.5m on each side of the centre line of the submarine CLDs with the use of grab monitored by divers. As the trenching works will only extend to 4.5m from the centre line of submarine CLDs, the coral colonies locating more than 40m away from the alignment of the submarine CLDs and ALC-HK Cable Bundle will not be affected. Once the CLDs are installed, the trench will be backfilled and the seabed will be reinstated to original profile upon completion of the installation works.

B.3.25 In conclusion, precedent surveys indicate that the ecological value of subtidal areas where the ALC-HK Cable Bundle alignment situated is considered to be low to medium.

Marine Mammals

B.3.26 The Indo-pacific Humpbacked Dolphin (*Sousa chinensis*), locally known as the Chinese White Dolphin, and the Indo-Pacific finless porpoise (*Neophocaena phocaenoides*) are the only two resident marine mammal species regularly sighted in Hong Kong waters.

B.3.27 Based on the latest research[5] in 2023, important Chinese White Dolphin habitats are mostly located along the West Lantau and the western portion of Southwest Lantau waters, extending from the Tai O Peninsula toward the Fan Lau Peninsula. In the past decade, dolphin occurrence in the North Lantau region has greatly diminished, and is largely

5. Hung, S. (2023). Monitoring of Marine Mammals in Hong Kong Waters (2022-2023). Report Submitted to Agriculture, Fisheries and Conservation Department. (Monitoring of Marine Mammals in Hong Kong Waters (2023-2024) Report is not referred as its Study Area does not cover the alignment of ALC-HK Cable Bundle.)

confined to the western end since 2016, with no apparent signs of recovery, owing to consecutive implementation of major reclamation and coastal development works.

B.3.28 Continuous and alarming declines in dolphin usage were observed within the Brothers Marine Park and Sha Chau and Lung Kwu Chau Marine Park in North Lantau Waters. On the contrary, their usage has remained fairly steady and high within the Southwest Lantau Marine Park in the past decade.

B.3.29 **Figure B-4** shows the distribution of Chinese White Dolphins in Hong Kong waters over the past six years. As the ALC-HK Cable Bundle alignment will start from CHK landing site and go east toward the eastern boundary of Hong Kong waters, it will not traverse any of the identified areas with sightings of the Chinese White Dolphin.

B.3.30 The finless porpoise is the most common and important cetacean species in the southern waters of Hong Kong. Its distribution varies both temporally and spatially. In general, abundance in Hong Kong is highest in spring and lowest in autumn[6].

B.3.31 Based on the latest research[5], during the 2022-2023 monitoring period, the only concentration of porpoise sightings occurred in surrounding waters of Tai A Chau. On the contrary, only a handful of porpoise sightings were made a few kilometres to the south and west of Shek Kwu Chau, near Cheung Chau and within Pui O Wan, and at the offshore waters to the east of the Po Toi Islands. **Figure B-5** shows the distribution of finless porpoises in Hong Kong waters over the past four years during the wet season and the dry season.

Other Species of Conservation Concern

B.3.32 Amphioxus (*Branchiostoma belcheri*) is a species of high conservation value due to its primitive morphology and previous over-exploitation as a fishery resource in the South China Sea. While there is no statutory protection for amphioxus in Hong Kong, it is listed as a Category II protected species in Mainland China.

B.3.33 Amphioxus species are generally distributed in shallow subtidal sand flats in temperate, subtropical, and tropical seas worldwide[7]. Despite being capable of swimming, adult amphioxus are primarily benthic organisms. They inhabit sandy bottoms with granulometry varying depending on the species and location[8] and are typically found partially buried in the sand[7].

B.3.34 In Hong Kong, amphioxus is primarily found in eastern waters around Sai Kung, with significant populations in Tai Long Wan and Pak Lap Wan. Additional occurrences have been recorded in Nam She Wan, Long Ke Wan, Tung Lung Chau, Hoi Ha Wan, and the waters between Basalt Island and the Ninepin Group.

B.3.35 A review of published literature on subtidal soft bottom assemblages conducted for the New T&T Cable in 2000 did not identify any rare species near its landing site at CHK, which is the same landing point as the ALC-HK Cable Bundle. Similarly, the subtidal marine ecological dive survey carried out for the ADC-HK Cable in September 2020 did not observe any amphioxus. However, given that amphioxus is typically found partially buried in sand, their absence in the survey findings is not conclusive.

6. Jefferson, T.A. & Hung, S.K. & Law, L. & Torey, M. & Tregenza, Nick. (2002). Distribution and abundance of finless porpoises in Hong Kong and adjacent waters of China. Raffles Bulletin of Zoology. 43-55
7. Carvalho J. E., Lahaye F., Schubert M. (2017). Keeping amphioxus in the laboratory: an update on available husbandry methods. Int. J. Dev. Biol. 61: 773-783
8. Escriva, H. (2018). My Favorite Animal, Amphioxus: Unparalleled for Studying Early Vertebrate Evolution. BioEssays, 40(12), 1800130

B.3.36 Based on the available information from surveys of New T&T Cable in 2000 and ADC-HK Cable in 2020, the presence of amphioxus in the vicinity of the proposed landing point and cable bundle route cannot be confirmed. Given the presence of suitable habitat in the form of shallow subtidal sand flats adjacent to the proposed landing area, it is possible that amphioxus may be present in the vicinity. Therefore, for the purpose of this appraisal, the presence of amphioxus will be assumed.

B.4 Impact Appraisal

Construction Phase

Direct Impact to Coral Communities

Intertidal Hard Bottom Assemblages

B.4.1 For the installation of the submarine CLDs from CHK landing point to offshore, it will be conducted by barge-mounted grab with help of tug boat and assisted by divers. The anticipated width of the trenching works will be 4.5m on each side of the centre line of the submarine CLDs with the use of grab monitored by divers. As the trenching works will only extend to 4.5m from the centre line of submarine CLDs and the identified coral colonies are more than 40m away from the submarine CLDs, no adverse impact from the installation works is therefore anticipated.

B.4.2 After that, the only minor works involved will be allowing the messenger rope and cable bundle to enter the CLDs. Cable bundle will be pulled through the CLDs using a winch, and then be fixed inside the BMH. The earthing system will be installed in a similar manner. There will be limited disturbance to the rocky beach area.

B.4.3 Moreover, as concluded in the water quality appraisal in **Appendix A**, no adverse water quality impacts are anticipated from the shore-end installation works with the implementation of the recommended mitigation measures. Therefore, no direct adverse impact on intertidal shore assemblages is expected from the installation of the ALC-HK Cable Bundle.

Intertidal and Subtidal Soft Bottom Assemblages

B.4.4 The soft bottom benthic assemblages in the intertidal and subtidal habitats near the landing site will be directly affected during the installation works in a short-term period. The soft bottom benthic assemblages present at the intertidal and subtidal habitats along the cable installation near the landing site will be affected directly in short term period. However, once the installation works are completed, the benthic fauna is expected to recolonize the soft bottom habitats and restore to the pre-work status. Therefore, the direct impacts on soft bottom benthic assemblages are anticipated to be short-term and insignificant.

Subtidal Hard Bottom Assemblages

B.4.5 As mentioned in **para. B.4.1**, to minimize impacts on coral communities, the cable bundle route has been selected to traverse soft bottom habitats with low coral coverage and ecological value. The cable bundle and the submarine CLDs will be placed in soft sandy seabed, further reducing the possibility of direct impact on coral communities. Therefore, direct impact to coral communities in the vicinity of the proposed cable bundle alignment near the landing beach area is not anticipated.

B.4.6 In addition, given the distance of approximately 330m between the cable bundle alignment and the nearest coral communities of ecological concern along the coast of Po Toi Island, no direct impacts on these communities are anticipated.

B.4.7 Furthermore, as concluded in the water quality appraisal presented in **Appendix A**, no adverse water quality impact is expected from the cable installation works with the implementation of recommended good site practices. Consequently, no adverse impact on subtidal hard bottom assemblages is anticipated from the installation of the ALC-HK Cable Bundle.

Indirect Impact to Coral Communities

B.4.8 Based on assumptions commonly adopted for cable projects (detailed in the **Annex** to **Appendix A**), the appraisal presented in **Appendix A** indicates that sediments disturbed during the use of the cable burial tool will settle back to the seabed within a maximum distance of 180m from the trench in approximately 3.5 minutes. Consequently, the maximum dispersion extent of any sediment plume generated by cable installation works will be limited to 180m.

B.4.9 Given that the nearest coral communities located along the coast of Po Toi Island, are situated 330m away, potential disturbance from the sediment plume generated by the cable laying works is not anticipated. Other coral communities of ecological concern, such as those along the coast of Beaufort Island, Waglan Island, Sung Kong Island, Sung Kong Islet, Cape D'Aguilar, Round Island, and southwest of CHK, are all over 500 meters from the cable bundle alignment. Adverse indirect Impact on the coral communities is not anticipated.

Direct Impact to Marine Mammals

B.4.10 Research[9] indicates that vessel collisions are a contributing factor to cetacean mortality, with high-speed vessels (>40 km/h) posing a significant risk. For the installation of the submarine CLDs, the barge will be stationed at the sea area during the installation works and will not post any threat to the marine mammals. For cable laying operations, given that the maximum speed of the cable-laying barge will be only 1 km/h, the risk of vessel collisions with cetaceans will be minimal. Therefore, direct adverse impacts on marine mammals resulting from vessel collisions are not anticipated.

Indirect Impact to Marine Mammals

B.4.11 During cable installation, increased underwater noise and vibration are anticipated from both marine vessels and water jetting tools. Marine mammals, particularly finless porpoises that frequent the southeastern waters of Hong Kong during the winter and spring seasons, are sensitive to the impacts of marine noise at specific frequencies.

B.4.12 Studies have shown that finless porpoises produce sonar clicks with a peak frequency of approximately 142 kHz[10]. For the cable laying works, marine jetting works and cable laying barges typically emit sound within a frequency range of 0.02 to 1 kHz[10), (11], which is generally below the hearing range of finless porpoises. Construction noise levels are also

9. Parsons, E. C. M., & Jefferson, T. A. (2000). Post-mortem investigations on stranded dolphins and porpoises from Hong Kong waters. Journal of Wildlife Diseases, 36(2), 342–356.
10. Goold J.C. and Jefferson T.A. (2002). Acoustic signals from free-ranging finless porpoises (*Neophocaena phocaenoides*) in waters around Hong Kong. The Raffles Bulletin of Zoology Supplement 10:131-139.
11. Popper, A.; Fay, R.; Platt, C.; Sand, O. (2003). Sound Detection Mechanisms and Capabilities of Teleost Fishes. Sensory Processing in Aquatic Environments, 3-38.

generally below the 8 to 90 kHz hearing range of Chinese White Dolphins[12], though this species is uncommon outside its preferred estuarine habitat in western Hong Kong.

B.4.13 As the marine jetting works and cable laying barges typically emit sound at frequencies much lower than the sonar clicks produced by finless porpoises, these activities are not expected to impact these marine mammals. Therefore, the operation of the jetting works and vessels will not result in indirect adverse impacts on the finless porpoises.

B.4.14 As shown in **Figure B-4,** the cable bundle is not located in areas frequented by the Chinese White Dolphin. Therefore, this species is not expected to be adversely impacted by the cable laying works.

B.4.15 **Figure B-5** shows that a portion of the ALC-HK Cable Bundle, specifically from the CHK landing point to the south, will traverse areas where the finless porpoises have been primarily observed during summer and autumn seasons. The remaining portion of the cable bundle, located in the southern to southeastern waters, will pass through areas where the finless porpoises have been predominantly observed during the winter and spring seasons.

B.4.16 Calculations presented in **Appendix A** show that sediments disturbed during use of the cable burial tool are not expected to rise more that 1m above the seabed. Consequently, any disturbed sediment will be confined near the seabed and will settle back within a maximum distance of 180m from the trench in approximately 3.5 minutes. While indirect impacts due to suspended sediment may occur, they are anticipated to be short-term and transient at any given location.

B.4.17 The anticipated schedule for landing and installing the cable bundle is from the second quarter to the third quarter of 2025. While this construction period covers the summer and autumn seasons, finless porpoises are highly mobile and can move into open waters to avoid short-term and localized seabed disturbance. Additionally, finless porpoises are air-breathing, meaning that any sediment plume they may encounter will not harm their respiratory systems. Therefore, it is anticipated that the landing and installation of the cable bundle will not result in indirect adverse impacts on finless porpoises.

B.4.18 These finless porpoises feed on numerous species of fish, including lion head fish *Collichthys lucida*, various croakers *Johnius spp* and anchovies *Thryssa spp*. Impacts caused by suspended sediments will be short-term and transient, and are not expected to adversely affect the availability of these fish species. Therefore, there is unlikely to be any significant impact on the food sources for finless porpoises.

B.4.19 Nevertheless, as a precautionary measure, a marine mammal exclusion zone will be partitioned during cable laying to mitigate potential indirect impacts on finless porpoises. The details are discussed in **Section B.6** and in **Appendix E**.

B.4.20 Considering the temporal and spatial distribution of Chinese White Dolphins and finless porpoises, and with the implementation of recommended mitigation measures as necessary, it is not anticipated that cable installation works will have any significant adverse impacts on marine mammals.

12. Richardson, W. J., Malme, C. I., Greene, Jr., C. R., & Thomson, D. H. (1995). Marine Mammals and Noise.

Direct and Indirect Impact to Species of Conservation Importance

B.4.21 The onshore cable installation works only involves inserting the cable bundle into the CLDs that connects to the BMH. If Amphioxus are present in this area, they will not be disturbed by the cable works, which will be carried out entirely within the CLDs.

B.4.22 The installation of the submarine CLD from the HWM to seaward of about 64m will be mainly by barge-mounted grab with help of tug boats and assisted by divers. Once the submarine CLDs are installed, the trench will be backfilled and the seabed will be reinstated to original profile. There will be disturbance to the seabed but only localized for the section of submarine CLDs installation. For the cable bundle section of about 234m from the end of the submarine CLDs, in the water depth ranging from 5 to 11m, the cable bundle will be installed by divers with hand-held jetting tools. The seabed will be disturbed but for a short duration, typically a matter of hours. Amphioxus is an agile benthic animal that can quickly escape its burrow, swim a short distance, and rapidly burrow again if disturbed[13]. Therefore, the installation of the submarine CLDs and short-term cable installation by divers will not cause any long-term disturbance to any Amphioxus present, which will simply swim away during the installation.

B.4.23 In the water depth of >11m, the cable bundle will be installed using a cable burial tool towed by the cable installation barge. At this distance from shore, the water depth increases, and the seabed transitions from sand to mud. Amphioxus prefer shallow subtidal sand flats and are therefore unlikely to be present in this area. However, if any are present and are disturbed by the cable burial tool, they will quickly escape their burrow, swim a short distance, and rapidly burrow again. Consequently, cable installation by the cable burial tool will not result in any long-term disturbance to Amphioxus, which will simply swim away during the installation.

Direct Impact to CPA

B.4.24 The landing point and beach section of the cable bundle route fall within the land zoned as CPA, which extends along the coastline of CHK. However, within the CPA, the cable bundle will be installed through the CLDs that connects to the BMH. The BMH and the terrestrial CLDs section and will be constructed prior to the commencement of the cable installation, and do not form part of this Project. Therefore, the CPA at CHK will not be affected by this Project.

B.4.25 Overall, the construction stage of ALC-HK Cable Bundle will not result in any terrestrial ecological impacts.

Operation Phase (including Maintenance)

Emergency Cable Repair Works

B.4.26 During normal operation of the ALC-HK Cable Bundle, no impacts on marine ecological resources are anticipated. However, in the event of damage to a section of the cable, cable repair works will be necessary at that location. The cable repair works will be conducted using either the burial tool or divers with hand-held tools that have less water-jetting power than those used during cable installation. Therefore, the seabed can be expected to naturally restore to its original condition shortly after the completion of the repair works, similar to the recovery observed after cable installation. Consequently, the impacts from any

13. Chen, Y. (2007). The ecology and biology of amphioxus in Hong Kong. PhD thesis. City University of Hong Kong.

future cable repair work are anticipated to be smaller than those from the cable installation, and no adverse marine ecological impacts are expected during operation stage of ALC-HK Cable Bundle.

Cumulative Impacts

B.4.27 As discussed in **Section 2.4** the installation of the ALC-HK Cable Bundle will not be carried out concurrently with other projects in the surroundings and thus no cumulative impact is expected. However, if other projects, such as Hong Kong Wind Farm Project, are scheduled within a time period that overlaps with that for the ALC-HK Cable Bundle, the Project Proponent of ALC-HK Cable Bundle will engage a Liaison Officer who will be responsible for liaising with the Project Proponents of other planned projects in the vicinity to agree on a working schedule that avoids concurrent construction works.

B.5 Impact Review

B.5.1 A review of the impact in accordance with the EIAO TM Annex 8 Table 1 is presented below.

Construction Phase

Habitat Quality

B.5.2 Short-term direct impacts are predicted to occur on subtidal soft bottom habitats along the cable trench and submarine CLDs. Short-term indirect impacts are also anticipated on intertidal and subtidal hard bottom habitats in the vicinity of the cable bundle route, such as the natural, exposed rocky shore at the landing site and the identified patches of corals. However, no rare species of conservation interest and importance are likely to be directly impacted, and the indirect impacts are not anticipated to be significant.

Species

B.5.3 Amphioxus (*Branchiostoma belcheri*) is an important species of high conservation value and is listed as a Category II protected species in Mainland China. Amphioxus may be present in proximity to the cable bundle alignment. Apart from Amphioxus, no other species of high ecological value have been identified in close proximity to the cable bundle alignment and, therefore, will not be directly affected.

B.5.4 The nearest coral community of ecological concern is located approximately 330m from the cable bundle alignment and is unlikely to be affected by the cable installation. This is because the community is situated beyond the maximum sediment dispersion distance of 180m. Additionally, considering the short duration of disturbance at any given location during cable laying, significant adverse impacts from the cable installation works are not anticipated.

B.5.5 Vessel collisions are known to be a major factor to cetacean mortality, with high-speed vessels (>40 km/h) posing a significant risk. Given that the maximum speed of the cable-laying vessel will be limited to 1 km/h, the risk of vessel collisions with cetaceans will be minimal. Therefore, direct impacts on marine mammals resulting from vessel collisions are not anticipated.

B.5.6 The Chinese White Dolphin is not known to be present in the southeastern waters where the ALC-HK Cable Bundle will be laid and, therefore, will not be affected. A portion of the ALC-HK Cable Bundle, specifically from the CHK landing point to the south, will traverse areas where

the finless porpoises have been primarily observed during summer and autumn seasons. The remaining portion of the cable, located in the southern to southeastern waters, will pass through areas where the finless porpoises have been predominantly observed during the winter and spring seasons. Finless porpoises are highly mobile and can move into open waters to avoid short-term and localized seabed disturbance. Additionally, Finless porpoises are air-breathing, meaning that any sediment plume they may encounter will not harm their respiratory systems.

B.5.7 Considering the temporal and spatial distribution of Chinese White Dolphins and finless porpoises, the cable installation works are not expected to cause any significant adverse impacts on marine mammals. Nevertheless, as a precautionary measure, a marine mammal exclusion zone will be implemented during cable laying to mitigate potential indirect impacts on finless porpoises.

Size/Abundance

B.5.8 Within Hong Kong waters, the length of the cable bundle will be about 36.8km with a diameter of 130mm. The cable will be buried using a cable burial tool, which will impact a trench with a width of approximately 0.5m along the alignment. For the submarine CLDs of approx. 64m in length and 1m in width, the installation works will be mainly conducted by barge-mounted grab with help of tug boat and assisted by divers, the trench for placing the submarine CLDs will be backfilled after completion of the installation works.

Duration

B.5.9 The duration of the cable installation will be for around six months.

Reversibility

B.5.10 Impacts on both hard and soft bottom marine communities are anticipated to be short-term, and recolonization of the sediments and hard substrates is expected to occur naturally.

Magnitude

B.5.11 No significant adverse impacts on ecologically important organisms or habitats are anticipated. The severity of the impacts during cable laying is expected to be low and is considered acceptable, given that the disturbances will be small-scale, short-term, and localized.

Operation Phase (including Maintenance)

Emergency Cable Repair Works

B.5.12 As discussed in in **Section B.4.26,** during normal operation of the ALC-HK Cable Bundle, no impacts on marine ecological resources are anticipated. However, in the event of damage to a section of the cable, cable repair works will be necessary at that location. The impacts from any future cable repair work are anticipated to be smaller than those from the cable installation, and no adverse marine ecological impacts are expected during operation stage of ALC-HK Cable Bundle.

B.6 Mitigation Measures

Construction Phase

B.6.1 In accordance with the guidelines provided in the EIAO-TM on marine ecological impact assessment, the general policy for mitigating impacts on marine ecological resources, in order of priority, are:

- **Avoidance.** Potential impacts should be avoided to the maximum extent practicable by adopting suitable alternatives.
- **Minimisation.** Unavoidable impacts should be minimised by taking appropriate and practicable measures such as constraints on intensity of works operations (e.g. dredging rates) or timing or works operations.
- **Compensation.** The loss of important species and habitats may be compensated for elsewhere. Enhancement and other conservation measures should always be considered whenever possible.

B.6.2 Based on the above, mitigation measures are discussed below.

Avoidance of Impacts

B.6.3 Impacts on marine ecological resources during cable laying have been avoided by selecting a landing site and cable bundle alignment that minimize direct impacts on coral communities and by employing cable laying techniques that result in minimal disruption to the marine environment. The ALC-HK Cable Bundle alignment has been carefully planned (see **Section 2.1**) to maximize the distance to known coral communities of ecological concern, as well as to minimize the number of crossings of existing cables, to the extent practicable.

Minimisation of Impacts

B.6.4 Mitigation measures recommended to minimize impacts on water quality will also minimize impacts on marine ecological organisms and habitats. These are listed in **Section A.6** for onshore cable installation, shore-end cable installation, offshore installation with cable burial tool, and emergency cable repair works.

B.6.5 As mentioned in **Section B.4.22**, The installation of the submarine CLDs will be conducted by barge-mounted grab with help of tug boat and assisted by divers. Once the installation works are completed, the trench will be backfilled and the seabed will be reinstated to original profile. Divers in the water will carefully control this installation process. Suspended solids generated during the diver-assisted installation are expected to be localised and of very short term in duration, which would not result in any adverse impact on the marine environment.

B.6.6 The shore-end cable installation will be installed by divers in a shallow sea area near the proposed landing point to minimise the indirect impact from the sediments disturbed during the cable installation works. By selecting a route with soft bottom habitat, with low coral coverage and low ecological value, and being away from the habitat as far as possible, the cable bundle will be installed in soft sand seabed so that direct impacts on the coral communities will be avoided. The diver will use equipment of less water jetting power that the sediment disturbed is considered to be minimal. As the cable installation works by divers will be of short duration at any one location and the elevation of suspended solids is

expected to be low, sediments disturbed are expected to settle rapidly back onto the seabed.

B.6.7 As a precautionary measure, a marine mammal exclusion zone with a radius of 250m from the cable laying barge will be established to mitigate potential indirect impacts on finless porpoises during the cable laying works. Full details of the environmental monitoring and audit (EM&A) requirements are provided in **Appendix E**.

B.6.8 With the implementation of the mitigation measures above, no adverse ecological impact is anticipated.

Compensation

B.6.9 Based on the above mitigation measures, no compensation will be required as there is no predicted unacceptable residual impact on marine ecological resources.

Operation Phase (including Maintenance)

Emergency Cable Repair Works

B.6.10 During normal operation of the ALC-HK Cable Bundle, no impacts on marine ecological resources are anticipated. However, in the event of damage to a section of the cable, cable repair works will be necessary at that location. The impacts from any future cable repair work are anticipated to be smaller than those from the cable installation. Nonetheless, the above-mentioned mitigation measures shall be implemented as practicable and applicable. If cable repair works are needed.

B.7 Conclusion

Impacts

B.7.1 A review of existing information on the marine ecological resources in the vicinity of the cable landing point at the landing beach area in CHK and the ALC-HK Cable Bundle alignment in Hong Kong waters has indicated that the area where the cable bundle is to be laid is generally of low ecological value.

B.7.2 Although soft bottom assemblages will be disturbed by cable laying works, the habitat is expected to be recolonized by similar communities within a short period, and thus the impacts are considered insignificant.

B.7.3 The landing point consists of natural rocky shore, and previous surveys have indicated that the coral communities in the vicinity of the ALC-HK Cable Bundle are of low ecological importance. Besides, the identified coral colonies are located more than 40m away from the Project, as the disturbed sediments are anticipated to settle rapidly back onto the seabed, and any sediment plumes will be small-scale and localized, adverse impact is not anticipated.

B.7.4 The nearest coral community of ecological concern is located along the coast of south Po Toi Island, approximately 330m from the cable bundle alignment. It is unlikely to be affected by the cable installation, as it is situated beyond the 180m sediment plume dispersion limit. Given the small scale of the cable laying work, the short duration of impacts, and the limited dispersion of the sediment plume, potential impact on coral communities is not anticipated.

B.7.5 The closest SSSI is Tai Tam Reservoir SSSI (No. 25), a terrestrial site located over 1.4km from the closest alignment of the cable bundle. The Hok Tsui (Cape D'Aguilar) SSSI (No. 49), D'Aguilar Peninsula SSSI (No. 6), and Cape D'Aguilar Marine Reserve are situated over 4km to the north of the alignment. Given the significant distance between these SSSIs and the Marine Reserve from the cable bundle alignment, they will not be affected by this Project.

B.7.6 The Chinese White Dolphin is not recorded as being present in the south-eastern waters where the ALC-HK Cable Bundle will be laid and so will not be affected. A portion of the ALC-HK Cable Bundle, specifically from the CHK landing point to the south, will traverse areas where the finless porpoises have been primarily observed during summer and autumn seasons.

B.7.7 Finless porpoises are highly mobile and can move into open waters to avoid short-term and localized seabed disturbance. Additionally, finless porpoises are air-breathing, meaning that any sediment plume they may encounter will not harm their respiratory systems. Therefore, it is anticipated that the landing and installation of the cable bundle will not result in indirect adverse impacts on finless porpoises.

B.7.8 While Amphioxus is predominantly a benthic species, they are agile and possess the instinct to swim away from disturbances. If Amphioxus are present in the vicinity of the cable bundle alignment and are disturbed by the cable installation works, they will simply swim away for the duration of the installation and return afterwards. Consequently, potential adverse impacts on Amphioxus are not anticipated.

B.7.9 Impacts to marine ecological resources have been largely avoided through the selection of a landing site, careful consideration of cable bundle alignment, and the use of cable laying techniques that minimize disturbance to the marine environment. Given the small scale of the works, the short duration of impacts, and the limited dispersion of sediment plumes, adverse impacts on marine ecological organisms and habitats are not anticipated to be significant and will be minimized during cable installation and cable repair works.

Mitigation Measures

B.7.10 As a precautionary measure, a marine mammal exclusion zone with a radius of 250m from the cable laying barge will be established to mitigate potential indirect impacts on finless porpoises during the cable laying works.

B.7.11 Precautionary measures and good site practices recommended to minimize impacts on water quality will also minimize impacts on marine ecological resources. Water quality monitoring will be conducted during marine works to demonstrate that no adverse impacts are anticipated.

Figure B-1 Coral Communities of Ecological Concern along ALC-HK Cable Bundle Alignment

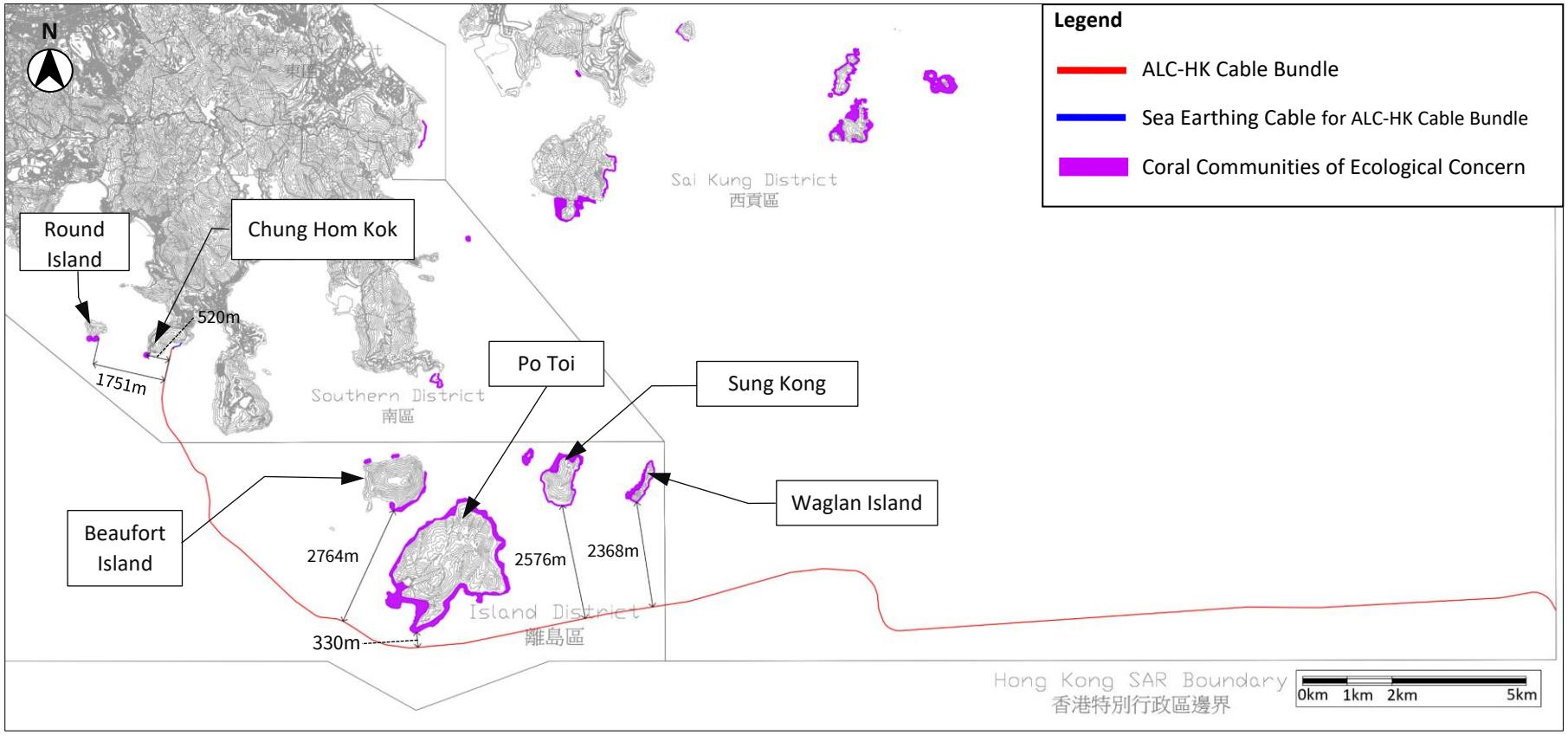


Figure B-2 Location of Marine Ecological Survey and REA Survey for New T&T Cable in 2000

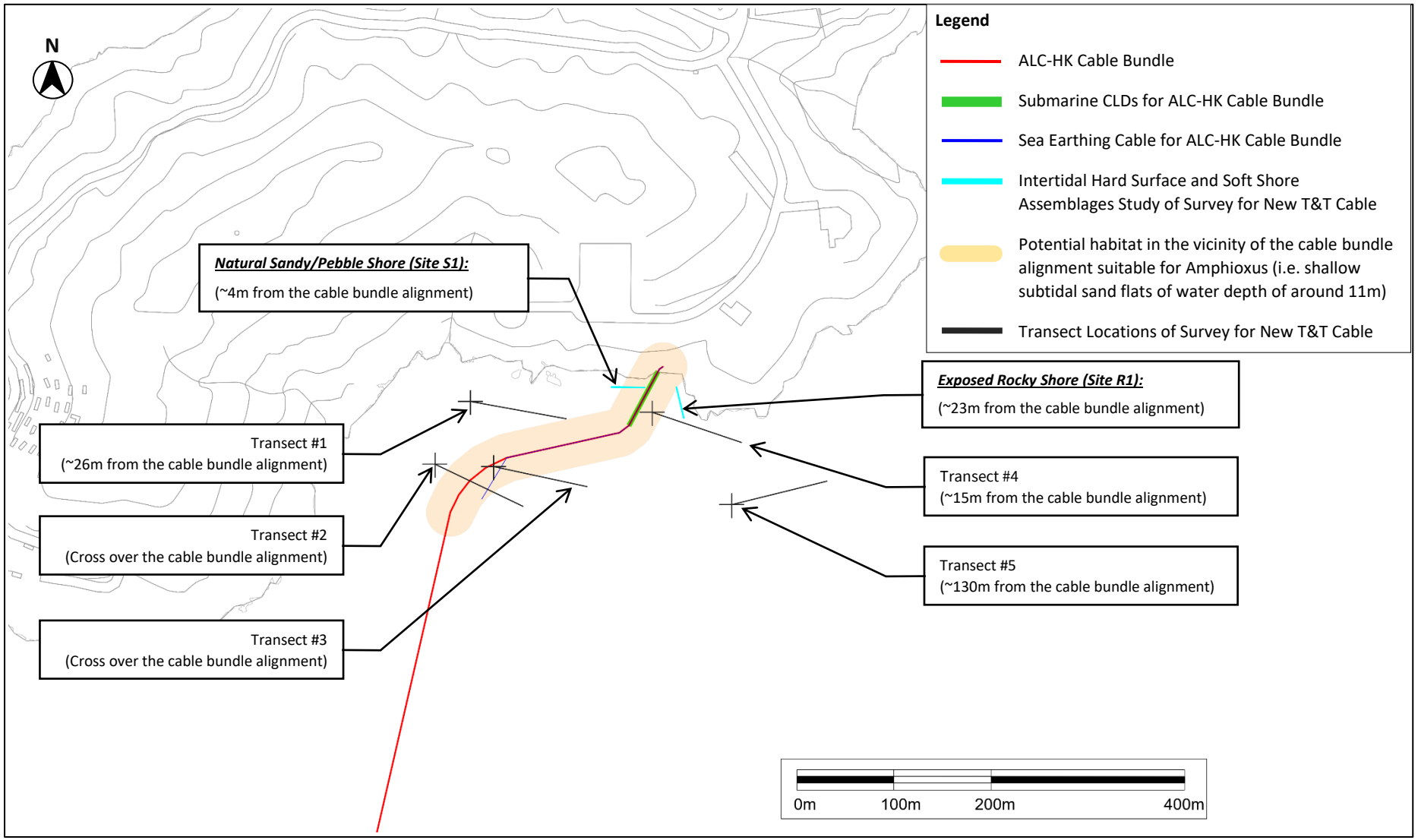


Figure B-3 Location of Marine Ecological Survey and REA Survey for ADC-HK Cable in 2020

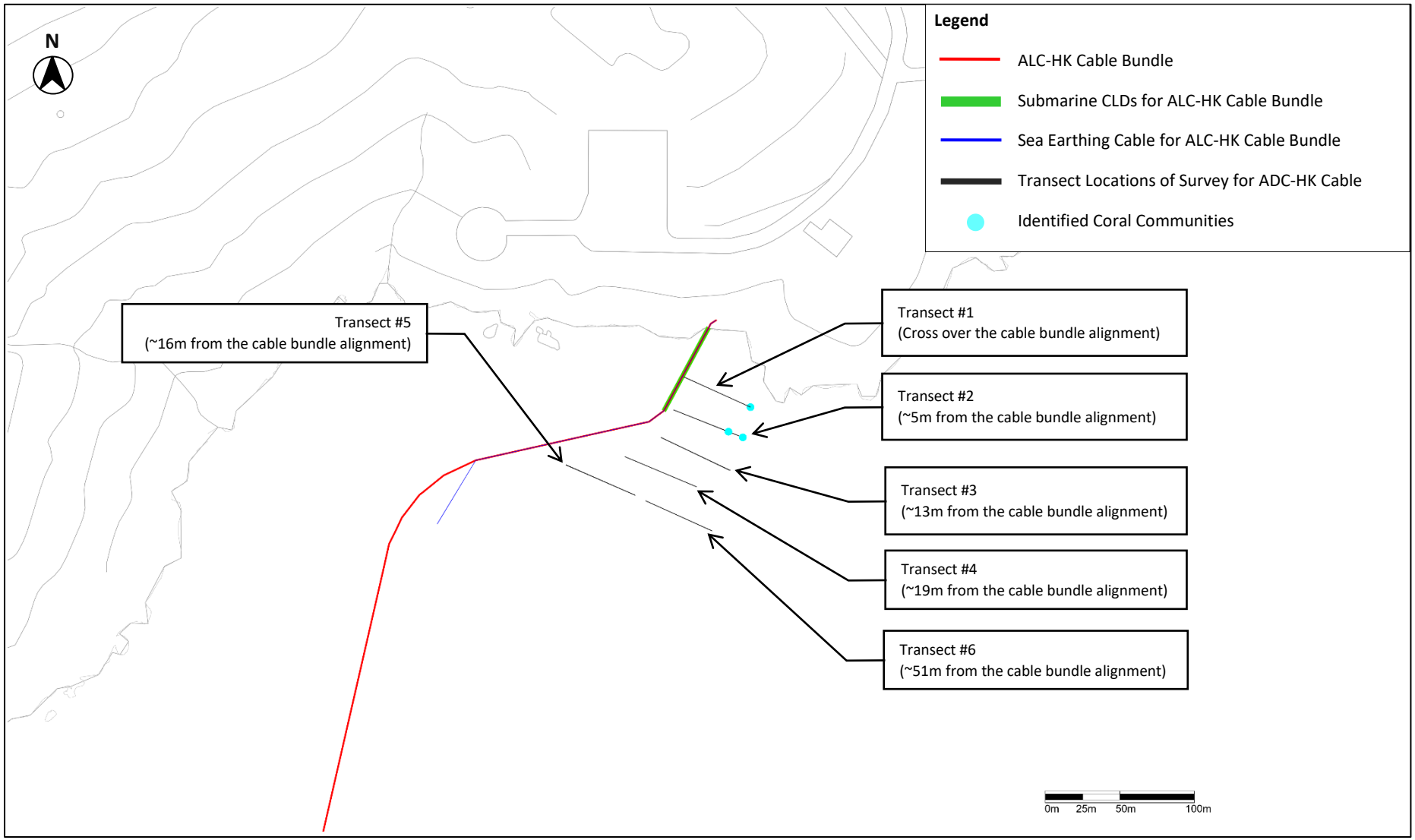
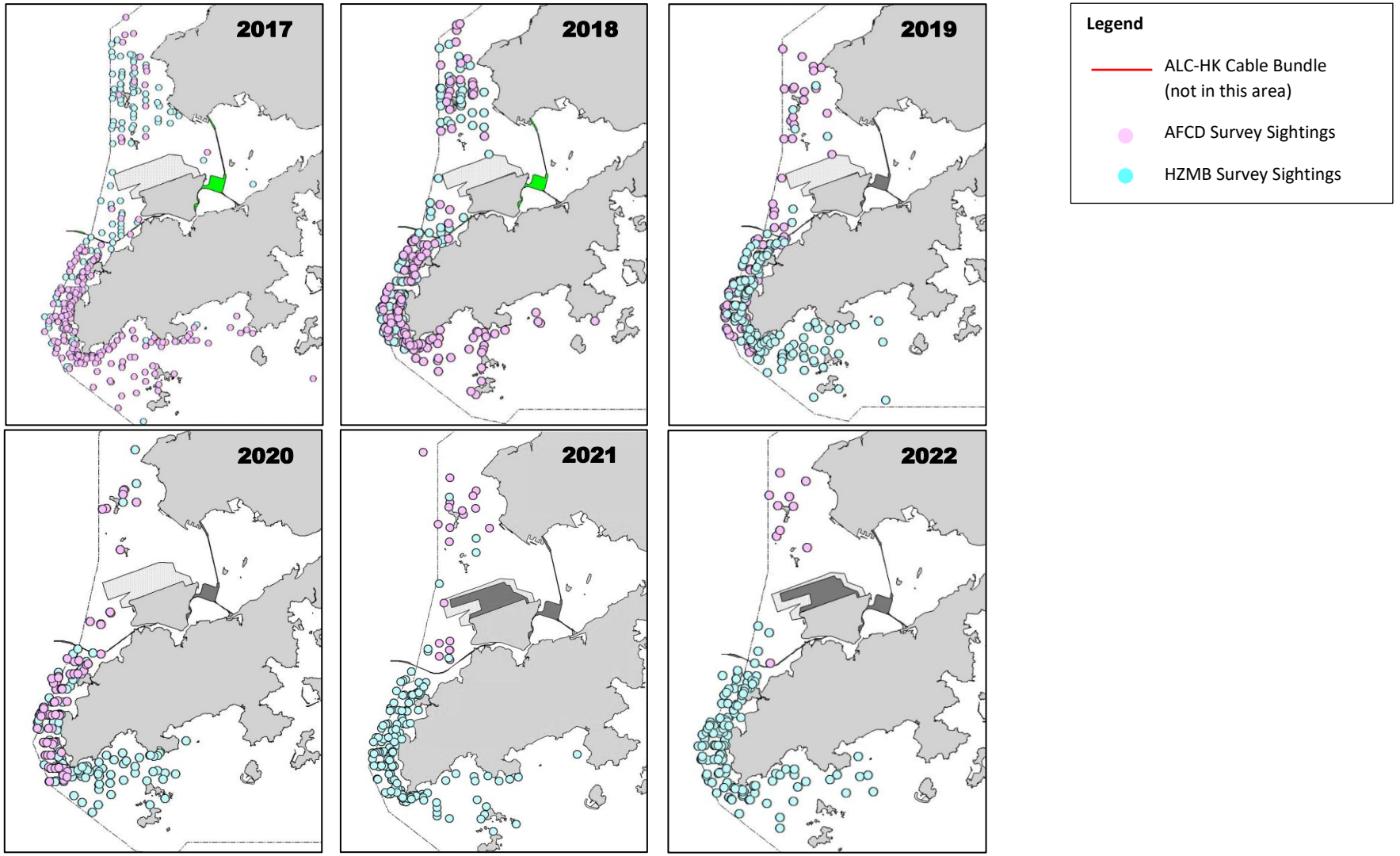
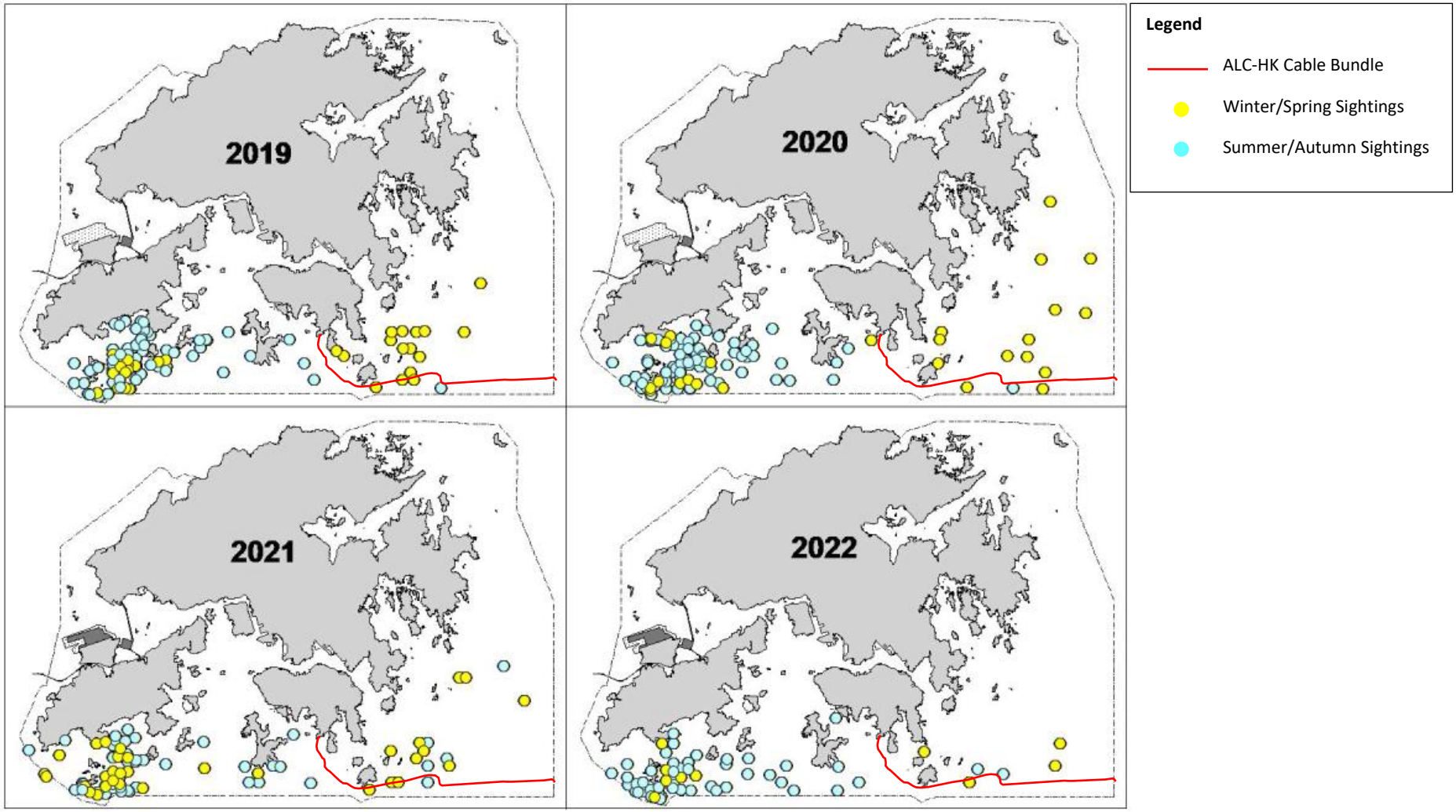


Figure B-4 Chinese White Dolphin Distribution Patterns in Hong Kong Waters (2017 to 2022)



Source: *Marine Mammals Monitoring Reports published by AFCD. (Monitoring of Marine Mammals in Hong Kong Waters (2023-2024) Report is not referred as its Study Area does not cover the alignment of ALC-HK Cable Bundle.)*

Figure B-5 Finless Porpoise Distribution Patterns in Hong Kong Waters (2019 to 2022)



Source: Figure 8 from Monitoring of Marine Mammals in Hong Kong Waters (2022-2023). (Monitoring of Marine Mammals in Hong Kong Waters (2023-2024) Report is not referred as its Study Area does not cover the alignment of ALC-HK Cable Bundle.)

Appendix C Fisheries Impact Appraisal

CONTENTS

FIGURES

TABLES

C FISHERIES APPRAISAL

C.1 Introduction

C.1.1 This appendix reviews the existing fisheries resources and fishing operations along the proposed ALC-HK Cable Bundle alignment and evaluates the potential impacts on these resources.

C.1.2 During normal operation of ALC-HK Cable Bundle, no adverse fishery impact is anticipated. However, maintenance works may be required in the future, such as cable repair works at specific fault locations resulting from unforeseen damage. These repair works will be conducted by divers using hand-held tools with minimal water-jetting power and dredging will not be required for these cable repair works. The seabed is expected to naturally return to its original state soon after the completion of repair works.

C.1.3 The following appraisal will thus focus on reviewing fishery impact arising from the installation of the ALC-HK Cable Bundle and its future emergency maintenance works.

C.1.4 To review the potential environmental impacts on fisheries resources, baseline information was gathered from various sources. The Agriculture, Fisheries and Conservation Department ("AFCD") website[1] and relevant studies near the ALC-HK Cable Bundle alignment were studied to determine if the surrounding waters serve as important spawning or nursery grounds for commercial fisheries. The most recent *Port Survey 2021*[2] was reviewed, along with other pertinent studies, such as the final report on Fisheries Resources and Operations in Hong Kong Waters[3]. Additionally, mariculture information was obtained from the AFCD Annual Report 2022-2023[4].

C.1.5 Within a 500m study area of the cable trench (the typical study area for water quality impacts), no FCZ is identified. The nearest FCZ, Po Toi FCZ, is situated more than 1.3km from the cable bundle alignment. While the cable bundle (and the majority of other existing cables) traverses spawning grounds for commercial fisheries resources, it does not pass through any Nursery Areas of Commercial Fisheries Resources.

C.1.6 The ALC-HK Cable Bundle commences at the landing site at CHK which falls into the Southern WCZ. As it travels eastward beyond the HKSAR Boundary, it encroaches the Mirs Bay WCZ. Throughout its alignment, particular consideration has been taken for the fishing grounds, fishing activities, and spawning grounds of commercial fisheries resources as well as the Po Toi FCZ locating over 1.3km from the cable bundle alignment.

C.2 Relevant Legislation

C.2.1 The following legislation and associated guidance or non-statutory guidelines are applicable to the appraisal of fisheries impacts and the regulation of fishing practices in Hong Kong:

- Environmental Impact Assessment Ordinance (Cap. 499. S.16) and the Technical Memorandum on EIA Process (EIAO-TM), Annexes 9 and 17.
- Fisheries Protection Ordinance (Cap171).
- Marine Fish Culture Ordinance (Cap 353).

1. AFCD (2023). Hong Kong Fisheries Profile (2023). Agriculture, Fisheries and Conservation Department.
2. AFCD (2022) Port Survey 2021. Agriculture, Fisheries and Conservation Department
3. ERM (1998). Fisheries Resources and Fishing Operations in Hong Kong Waters (prepared for AFCD)
4. AFCD (2023). Department Annual Report 2022-2023

C.3 Existing Situation

Fishing Background

C.3.1 Commercial fishing plays a vital role in ensuring a stable supply of fresh marine fish to consumers in Hong Kong. In 2023, local fishermen supplied approximately 87,000 tonnes of fisheries produce, valued at around $2.4 billion. With reference to the AFCD website[(1)], the industry currently comprises approximately 5,090 fishing vessels and 10,240 local fishermen. The fishery industry also provides employment in ancillary sectors such as fish wholesale and retail marketing, fuel and fishing gear supply and ice manufacturing.

C.3.2 Hong Kong's fisheries industry encompasses capture fisheries, mariculture, and pond fish culture. In 2022, the combined production from capture fisheries and mariculture contributed approximately 17% to the total seafood consumed in Hong Kong[(4)].

C.3.3 The latest comprehensive territory-wide survey of fisheries was undertaken as part of the *Port Survey 2021*[(2)]. This survey provides an overview of the geographical distribution and estimated levels of fishing operations and fisheries production in Hong Kong waters. The survey data is presented in the form of grids, with each grid cell representing an area of 720ha.

C.3.4 The following appraisal has been based on the *Port Survey 2021*, other relevant and more recent studies, and from a review of information from AFCD's Annual Report 2022-2023.

Capture Fisheries

C.3.5 Capture fishing activities within Hong Kong waters are primarily carried out by sampans utilizing various fishing gears, as well as smaller non-trawler vessels such as gill netters, long liners, and purse seiners. These vessels are typically operated by family members with the assistance of hired Mainland deckhands. In contrast, trawlers and larger non-trawlers generally operate in the neighbouring waters of the South China Sea.

Fisheries Operations

C.3.6 The southern and eastern waters of Hong Kong serve as important spawning grounds of commercial fisheries resources.

C.3.7 As shown in **Figure C-1**, the ALC-HK Cable Bundle traverses 20 Port Survey Grids, with varying levels of fishing activity. Eight grids recorded no fishing vessel, one grid had between 0 and 50 vessels, two grids had between 50 and 100 vessels, five grids had between 100 and 200 vessels, and four grids had between 200 and 400 vessels.

C.3.8 **Figure C-2** depicts the distribution of sampan fishing operations along the ALC-HK Cable Bundle alignment. Eight grids recorded no sampan activity, three grids had between 0 and 50 sampans, one grid had between 50 and 100 sampans, five grids had between 100 and 200 sampans, and three grids had between 200 and 400 sampans.

C.3.9 **Figure C-3** illustrates the distribution of fishing operations conducted by vessels other than sampans along the ALC-HK Cable Bundle alignment. Eight grids recorded no such fishing activity, six grids had between 0 and 50 vessels, two grids had between 50 and 100 vessels, and four grids had between 100 and 200 vessels.

Fisheries Production

C.3.10 According to the *Port Survey 2021*, the overall fisheries production within the grids intersected by the ALC-HK Cable Bundle varies from 0kg/ha to 300kg/ha while most grids exhibit production weights below 100 kg/ha, as shown on **Figure C-4**.

C.3.11 Fisheries production (with sampan) was highest (>50 to 100kg/ha) in the grids to the south of Po Toi Island and the value decreases (0 to 50kg/ha) when the cable bundle goes eastward to the eastern boundary of Hong Kong, as shown on **Figure C-5**.

C.3.12 Similar to fishing production (with sampan), fisheries production (with other types of fishing vessels) was highest (>200 to 300kg/ha) in the girds to the south of Po Toi Island, and the value gradually decreases to >100-200 kg/ha then 0-50 kg/ha when going further to the eastern waters, as shown on **Figure C-6**.

C.3.13 In December 2017, AFCD published a *Hong Kong Fisheries Resources Monitoring Report* prepared by the South China Sea Fisheries Research Institute. This report detailed demersal fisheries surveys conducted at 16 stations across four areas in Hong Kong (i.e. north-eastern, south-eastern, south-western, and north-western waters) every two months from 2010 to 2015. The ALC-HK Cable Bundle alignment falls within the south-eastern waters. The primary commercial fish families found within the study area include: *Leiognathidae, Platycephalidae, Sparidae, Portunidae, Sciaenidae, Polynemidae, Cynoglossidae, Penaeidae, Terapontidae, Synodontidae, Carangidae, Clupeidaem Engraulidae, Trichiuridae, Stromateidae* and *Nemipteridae*.

Fish Fry Production / Spawning Grounds of Commercial Fisheries Resources and Nursey Areas of Commercial Fisheries Resources

C.3.14 The south-eastern and eastern waters of Hong Kong are recognized as spawning grounds of commercial fisheries resources for high value commercial species[3]. The key species that are recorded to spawn in the southern waters include *Cynoglossus macrolepidotus* (Largescale Tonguesole) and *Pseudosciaena crocea* (Yellow Croaker). In the eastern waters, key spawning species include: *Apogon quadrifasciatus* (Twostripe Cardinal), *Parapristipoma trilineatum* (Chicjen Grunt), *Sebastiscus marmratus* (Common Rockfish), *Trichiurus lepturus* (Hairtail), *Upeneus sulphureus* (Sulphur Goatfish) and *Upeneus tragula* (Freckled Goatfish).

C.3.15 As stated in the *Port Survey 2021,* fish fry collection in Hong Kong is minimal. Therefore, the ALC-HK Cable Bundle is not expected to significantly impact fish fry production in the areas it traverses. However, these areas are recognized as important spawning grounds for commercially valuable fish species[3].

C.3.16 The seasonal abundance of fish fry in Hong Kong generally peaks between March and September for most commercial species, with a maximum abundance occurring from June to August. This corresponds to the spawning period for the majority of these species, which typically occurs between June and September[3]. Commercially important crustaceans, on the other hand, have a broader spawning period, extending from April to December.

C.3.17 **Figure C-7** indicates the location of the spawning grounds of commercial fisheries resources and the ALC-HK Cable Bundle alignment.

C.3.18 Nursery areas in Hong Kong Waters provide critical habitats for juvenile commercial fish and crustaceans. These areas have been identified in southern waters extending from Lantau Island to Lamma Island. As shown on **Figure C-7**, the ALC-HK Cable Bundle and submarine CLD do not traverse any designated nursery areas of commercial fisheries resources.

Artificial Reef Deployment

C.3.19 Since its inception in 1996, the AFCD's artificial reef project has played a vital role in bolstering Hong Kong's marine ecosystem and supporting its fisheries industry. Artificial reefs mimic natural underwater structures, providing essential habitat for a diverse array of marine organisms. These organisms, in turn, serve as a vital food source and refuge for fish, contributing to the overall health and productivity of the marine environment.

C.3.20 To date, over 600 artificial reef units have been placed in suitable waters throughout Hong Kong, including marine parks, fish farming zones, and critical spawning and nursery areas. These reefs have a combined volume of approximately 180,000m^3, creating a significant underwater habitat that supports a wide range of marine life. As shown on **Figure C-7**, it is noted that the ALC-HK Cable Bundle alignment and the submarine CLD do not intersect with any designated artificial reef areas.

Culture Fisheries

C.3.21 Marine fish culture is an important industry in Hong Kong, providing a significant portion of the locally consumed live marine fish. The AFCD has designated 28 FCZs in sheltered coastal areas to support this industry, with a total sea area of 650ha with some 910 licensed operators who rear marine fish from fry or fingerlings to marketable size in cages suspended by floating rafts[4]. In 2023, the estimated production for marine fish culture was 499 tonnes, accounting for approximately 2% of all local demand for live marine fish. This highlights the significant contribution of marine fish culture to Hong Kong's food security and local economy.

C.3.22 As indicated in **Figure C-7**, the ALC-HK Cable Bundle alignment has been carefully planned to avoid any direct impacts on FCZs. The closest FCZ to the cable bundle alignment is the Po Toi FCZ, which is located more than 1.3km to the north. This ensures that the cable installation and operation will not interfere with FCZ activities or the marine environment within these designated areas.

Fisheries Importance

C.3.23 As summarised above, the fishing operations and fisheries resources in the vicinity of the cable bundle alignment are considered to be low, with only a short section of the cable bundle passing through areas with low-moderate fisheries production. The size of the fishing areas that will be temporarily occupied by the cable installation barge will also be small.

C.3.24 As a result, the ALC-HK Cable Bundle is anticipated to have a low impact on fisheries. The project will not result in any permanent loss of fishing grounds, and the temporary disturbance to fishing activities and fisheries resources during cable installation will be minimal.

Sensitive Receivers

C.3.25 The identified sensitive receivers are listed in **Table C-1**, below.

Table C-1 Shortest Separation Distances of Fisheries Sensitive Receivers to the Cable Bundle Alignment

ID	SENSITIVE RECEIVER DESCRIPTION	SHORTEST SEPARATION DISTANCE TO ALC-HK CABLE BUNDLE
F1	Po Toi FCZ	>1.3km to the north
-	Tung Lung Chau FCZ	>10km to the north
-	Po Toi O FCZ	>12km to the north
-	Nursery Areas of Commercial Fisheries Resources	>15km to the north
F2	Spawning Grounds of Commercial Fisheries Resources	0m – Cable bundle passes through
-	Artificial Reefs in Port Shelter WCZ	>11km to the north

C.4 Impact Appraisal

Direct Impacts

C.4.1 The ALC-HK Cable Bundle alignment (and most of other existing cables) intersects with spawning grounds of commercial fisheries resources that there may be potential short-term impacts during cable installation.

C.4.2 As mentioned in **para. C.3.14**, the majority of the ALC-HK Cable Bundle alignment traverses areas designated as spawning grounds of commercial fisheries resources. However, according to the *Port Survey 2021*, fish fry collection in these areas is minimal. Therefore, the ALC-HK Cable Bundle is not expected to have a significant impact on fish fry production.

C.4.3 The proposed landing point of the ALC-HK Cable Bundle in CHK where the installation works of the submarine CLD will be carried out is approximately 570m north of the designated spawning grounds of commercial fisheries resources in the Southern WCZ. At the landing point, the submarine CLD will be installed for the cable bundle to descend through steep rocky terrain followed by a sandy seabed. Three other cables have been installed in this area in the past. Given the distance from the spawning grounds, the installation of the ALC-HK Cable Bundle in CHK is not expected to cause significant impact on the spawning grounds or on fisheries in general.

C.4.4 During installation of marine CLD and cable-laying operations, the barge will occupy a portion of the sea surface, making it temporarily unavailable for use by other marine vessels, including fishing vessels. However, the area occupied by the barge is relatively small (70m x 25m) and is comparable to the space occupied by other marine vessels passing through Hong Kong Waters. Therefore, the temporary loss of fishing grounds due to the barge is minimal and no different from the impact of other marine traffic. Aside from the area occupied by the barge, there is no other temporary loss of fishing grounds.

C.4.5 The movement of the cable-laying barge may interrupt fishing operations, but it is no different from the navigation of any other marine vessel in Hong Kong Waters. The cable burial tool, which is typically 6m x 1m in size, operates on the seabed and does not occupy the sea surface. Therefore, there will be no interruption to fishing activities due to the operation of the cable burial tool.

C.4.6 The EIAO-TM recognizes spawning grounds of commercial fisheries resources as important habitats crucial for the regeneration and survival of marine organisms. After the installation of the submarine CLD and ALC-HK Cable Bundle, the seabed will naturally reinstate itself through the resettlement of disturbed sediments. This process will be followed by the immediate recolonization of benthic fauna, which serve as a food source for fish.

C.4.7 Furthermore, the area of seabed disturbed during cable installation and installation of the submarine CLD will be limited at any given time. Therefore, the disturbance to fisheries will be short-term and minor, and is unlikely to have a significant impact on fisheries production.

C.4.8 Overall, the direct impacts arising from the ALC-HK Cable Bundle on the fishery resources are minimal.

Indirect Impacts

C.4.9 For the installation of submarine CLD, the works would be carried out by barge-mounted grab with the help of tug boat and assisted by divers. The potential indirect impact would be the potential disturbance to the seabed. For the cable installation works, the indirect impact to consider is the potential disturbance of WSRs, such as fisheries, within a 180m sediment plume dispersion caused by the elevation of suspended solids during cable laying works on the seabed. However, this disturbance is expected to be localized, temporary, and short-lived. As mentioned in **Appendix A**, under the worst-case scenario, the maximum estimated distance for sediment plume travel resulting from cable-laying operations is 180m from the cable trench. The sediment plume is expected to settle back onto the seabed within 3.5 minutes. As a result, the seabed will naturally recover as disturbed sediments resettle and benthic fauna, which serve as a food source for fish, recolonize the area.

C.4.10 For those sensitive receivers located more than 180m away from the cable bundle alignment, they are not expected to be affected. As indicated in **Table C-1**, it shows that the cable bundle alignment is far from areas designated as FCZs, nursery areas of commercial fisheries resources, and artificial reefs.

C.4.11 The nearest FCZ, Poi Toi FCZ, locates 1.3km away, which is approximately 8 times the maximum estimated travel distance for sediment plume. Therefore, it is unlikely that there will be any negative impact on the water quality of Po Toi FCZ, and subsequently no unacceptable indirect impact on associated fisheries. The nursery areas of commercial fisheries resources and artificial reefs are located more than 11km away, which is more than 60 times the maximum estimated travel distance for sediment plume. Therefore, it is not expected that there will be any adverse effects on water quality in these areas or on associated fisheries.

C.4.12 Overall, long-term indirect impact on fisheries resources or fishing operations is not anticipated.

Fisheries Impact Review

C.4.13 A review of fisheries impact is presented in **Table C-2**, in accordance with EIAO-TM Annex 9.

Table C-2 Review of Fisheries Impact

ASPECTS	REVIEW OF IMPACT
Nature of Impact	The installation of submarine CLDs would be carried out by barge-mounted grab with the help of tug boat and assisted by divers. This process may have direct impacts on the immediate seabed, while indirect impacts may arise from the elevation of suspended solids in the water column disturbed by the installation process. Similarly for the offshore cable installation, the cable bundle will be directly laid and buried using a cable burial tool, below the seabed. This process may have direct impacts on the immediate seabed, while indirect impacts may arise from the elevation of suspended solids in the water column disturbed by the burial process. However, these impacts are expected to be localized, temporary, and short-lived in duration.
Size of Affected Area	The "temporary loss" of fishing grounds will be confined to the area occupied by the cable laying barge or tug boat/barge for installation of the submarine CLDs, which would not be greater than 70m x 25m at any given time along the 36.8km alignment. The cable laying process is expected to take about 6 months to complete for the entire alignment in Hong Kong.
Loss of Fisheries Resources and Production	In the affected area, fisheries production ranges from 0 kg/ha to 300 kg/ha in terms of production weight of fish, which is considered to be low-moderate fisheries production. The cable laying process is expected to take approximately 6 months to complete for the entire alignment in Hong Kong Waters, and the disturbance from suspended solids is expected to be localized and short-term. Additionally, the seabed will be restored soon after the disturbed sediments settle. Therefore, it is not expected that there will be any unacceptable impact on fisheries resources and production.
Destruction and Disturbance of Spawning and Nursery Grounds	The cable bundle does not pass through any recognized important nursery grounds of commercial fisheries species. The southeastern and eastern waters where the cable bundle will be laid have been identified as spawning grounds of commercial fisheries resources. The maximum predicted distance for suspended solids resulting from the cable burial process is 180m from the cable trench, and this sediment is expected to settle back onto the seabed within 3.5 minutes under worst-case assumptions. Therefore, there will only be a short-term and minimal disturbance to the seabed in the spawning grounds of commercial fisheries resources.
Impact on Fishing Activities	Fishing activities along the cable bundle alignment and submarine CLDs are limited, and the area occupied by the barge at any given time is relatively small. Therefore, the impact of the Project on the fishing industry is expected to be minimal.
Impact on Aquaculture Activity	The nearest FCZ is Po Toi FCZ, located approximately 1.3km from the cable bundle alignment. Considering the separation distance, it is not expected that there will be any adverse impact from the cable laying works on the FCZ.

Cumulative Impacts

C.4.14 As discussed in **Section 2.4** the installation of the ALC-HK Cable Bundle will not be concurrent with any other projects in the vicinity and so no cumulative impact is expected. However, if other projects, such as, Hong Kong Wind Farm Project, are scheduled within a time period that overlaps with that for the ALC-HK Cable Bundle, the Project Proponent of ALC-HK Cable Bundle will engage a Liaison Officer who will be responsible for liaising with

the Project Proponents of other planned projects in the vicinity to agree on a working schedule that avoids concurrent construction works.

C.5 Mitigation Measures

C.5.1 As no significant adverse impacts on fisheries are anticipated, no specific mitigation measures are required. However, the mitigation measures proposed in **Section A.6** to protect water quality will also benefit fisheries resources and must be fully implemented.

C.5.2 As mentioned in **para. A.5.18**, it is recommended that water quality monitoring be conducted at the area along the cable bundle near FCZ, spawning grounds of commercial fisheries resources, and coral communities along the coast of Po Toi Island as a precautionary measure. Although the nearest designated FCZ, Po Toi FCZ, is over 1.3km from the cable trench and any adverse impacts from the cable laying works are unlikely, this monitoring can help to detect any unpredicted adverse impacts.

C.6 Residual Impact

C.6.1 The residual impacts to fisheries resources, habitats and fishing operations during construction phase and normal operation of the cable bundle are considered to be within acceptable level and no specific fisheries monitoring programme is necessary.

C.7 Conclusion

C.7.1 By reviewing the available information on the fisheries resources and fishing operations in the vicinity of the ALC-HK Cable Bundle and the submarine CLDs, it can be concluded that concerned study area is in low to moderate production.

C.7.2 The southeastern and eastern waters where the cable bundle will be laid have been identified as spawning grounds of commercial fisheries resources. Once the cable burial tool has buried the cable bundle, the seabed will naturally be restored through the resettlement of disturbed sediments and the immediate recolonization of benthic fauna, which serve as a food source for fish.

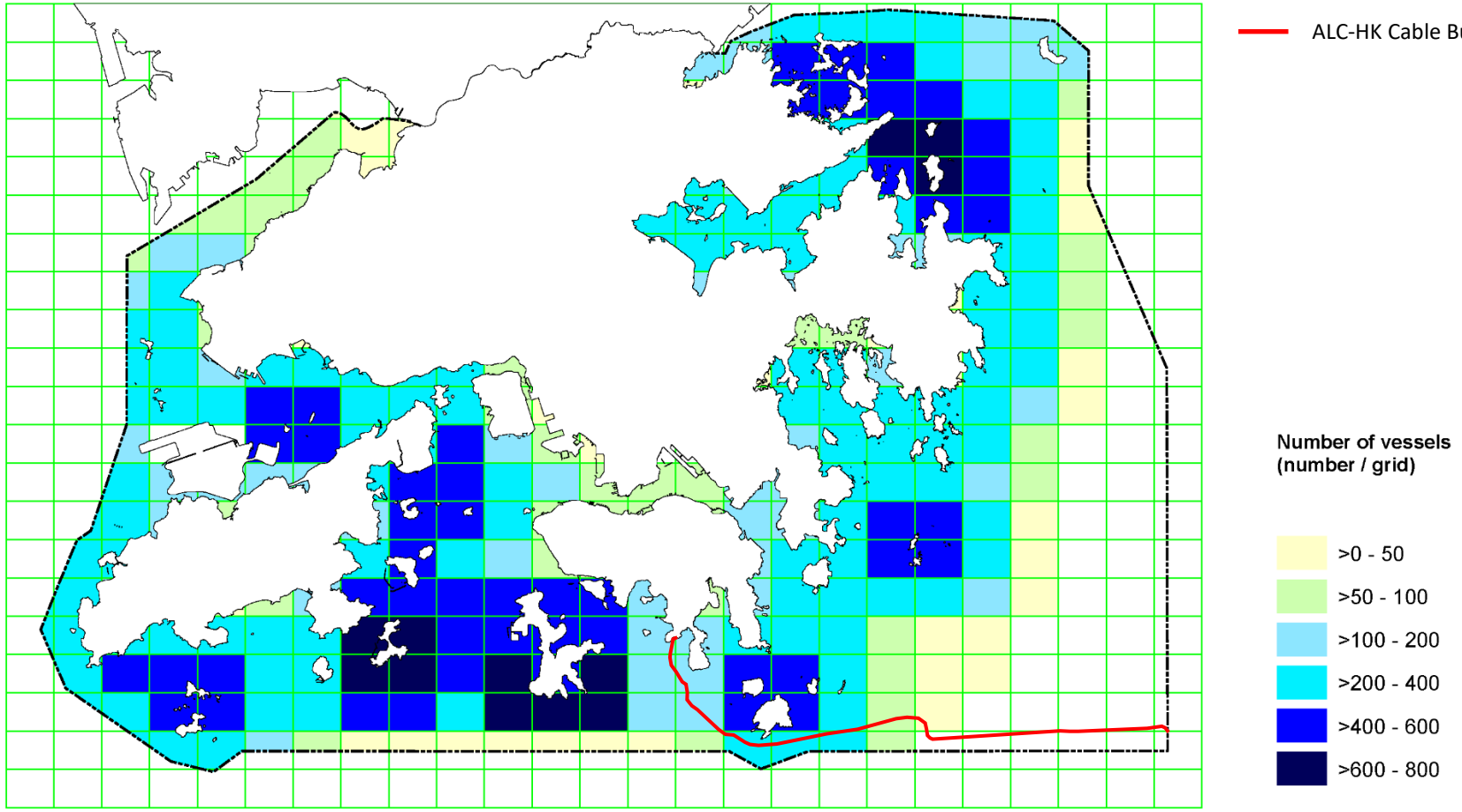
C.7.3 The maximum predicted dispersion distance for suspended solids resulting from the cable burial process is 180m from the cable trench, and this sediment is expected to settle back onto the seabed within 3.5 minutes under worst-case assumptions. Therefore, there will only be a short-term and minimal disturbance to the seabed in the spawning grounds of commercial fisheries resources.

C.7.4 Fishing activities along the cable bundle alignment are limited, and the area occupied by the barge at any given time is relatively small. Therefore, the impact of the Project on the fishing industry is expected to be minimal.

C.7.5 For other sensitive receivers, none of them are located within 180m dispersion limit of the sediment plume from the cable bundle alignment. As such, their fishery resources not expected to be affected by the ALC-HK Cable Bundle.

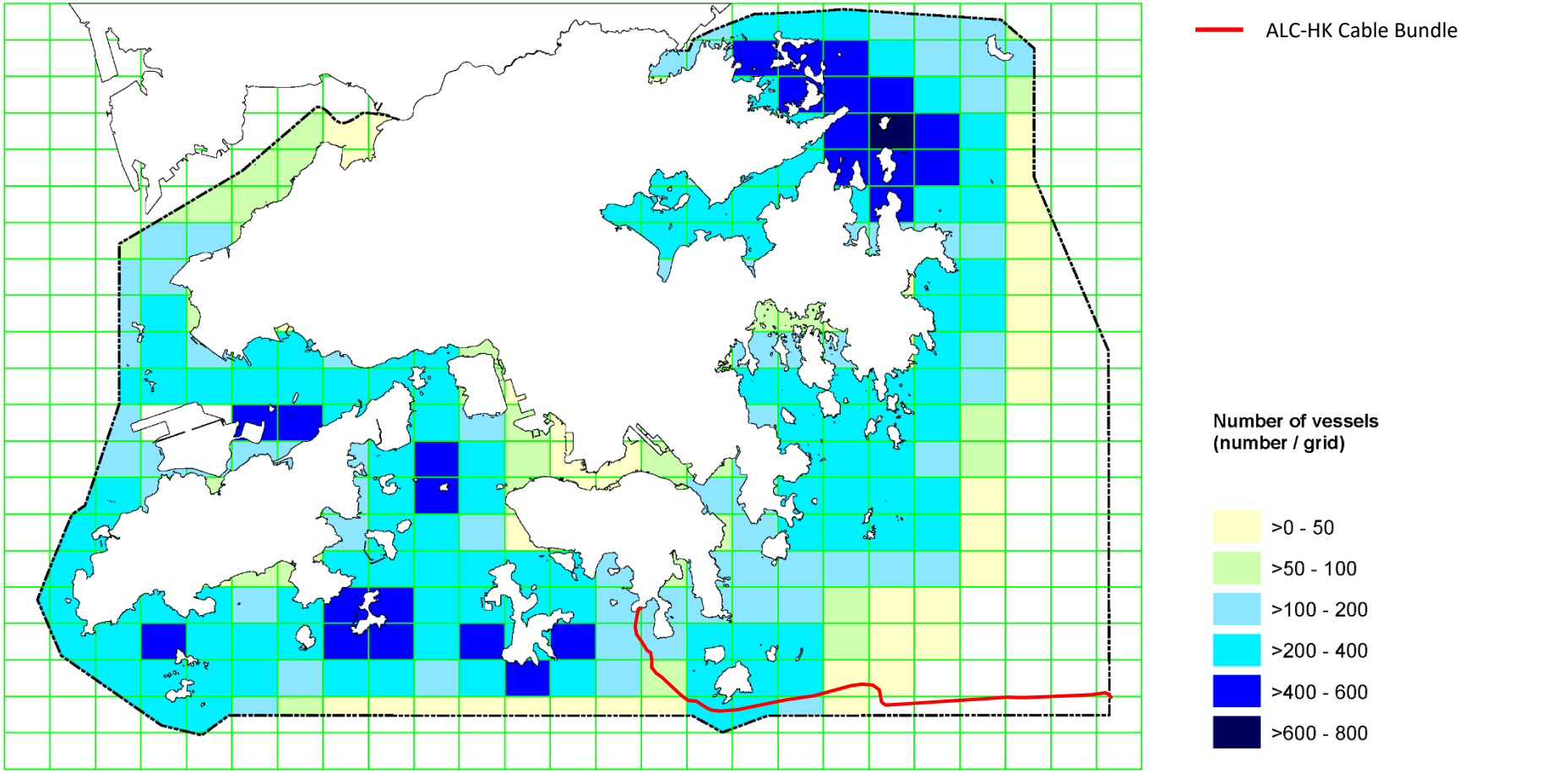
C.7.6 Based on the information provided, it is not expected that there will be any significant adverse impacts on fisheries as a result of the cable laying works, normal operation of the cable bundle and future maintenance works. The seabed is expected to naturally return to its original level and conditions soon after short-term disturbance. Overall, it is not predicted that there will be any unacceptable impacts on fisheries.

Figure C-1 Distribution of Fishing Operations in Hong Kong Waters and Location of the ALC-HK Cable Bundle



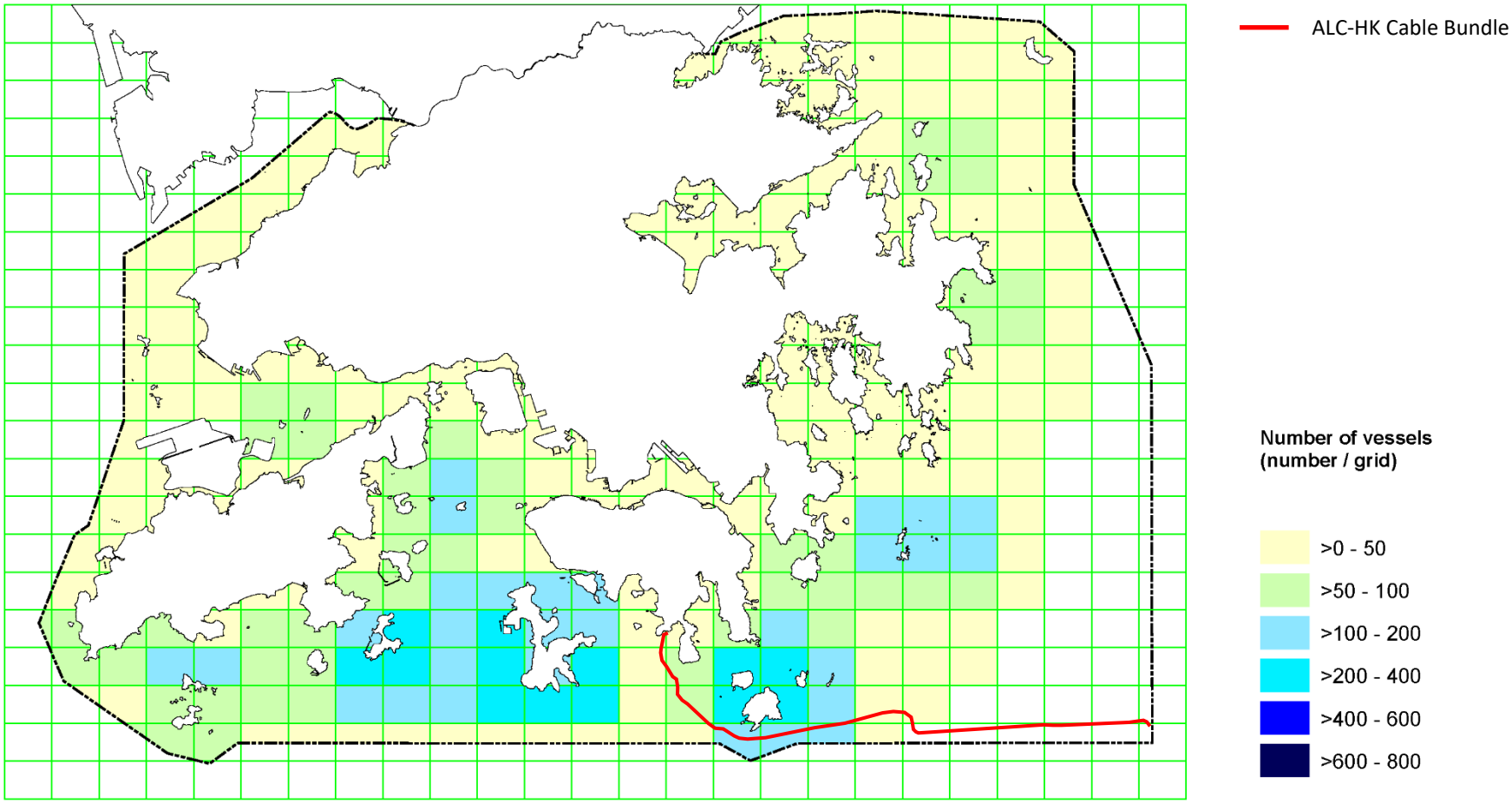
Source: Port Survey 2021, AFCD.

Figure C-2 Distribution of Fishing Operations (with Sampan) and Location of the ALC-HK Cable Bundle



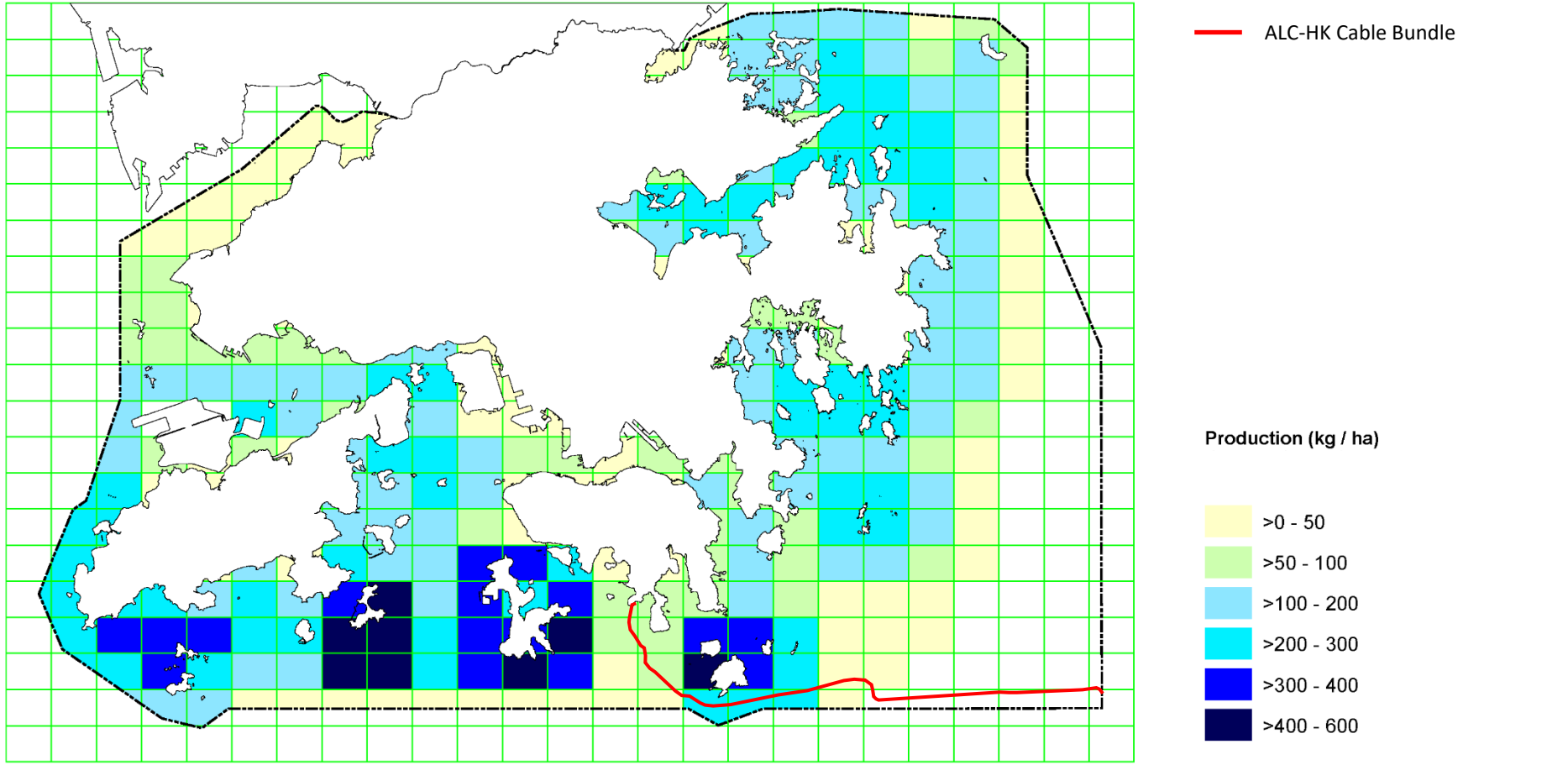
Source: Port Survey 2021, AFCD.

Figure C-3 Distribution of Fishing Operations (with Other Types of Fishing Vessels) and Location of the ALC-HK Cable Bundle



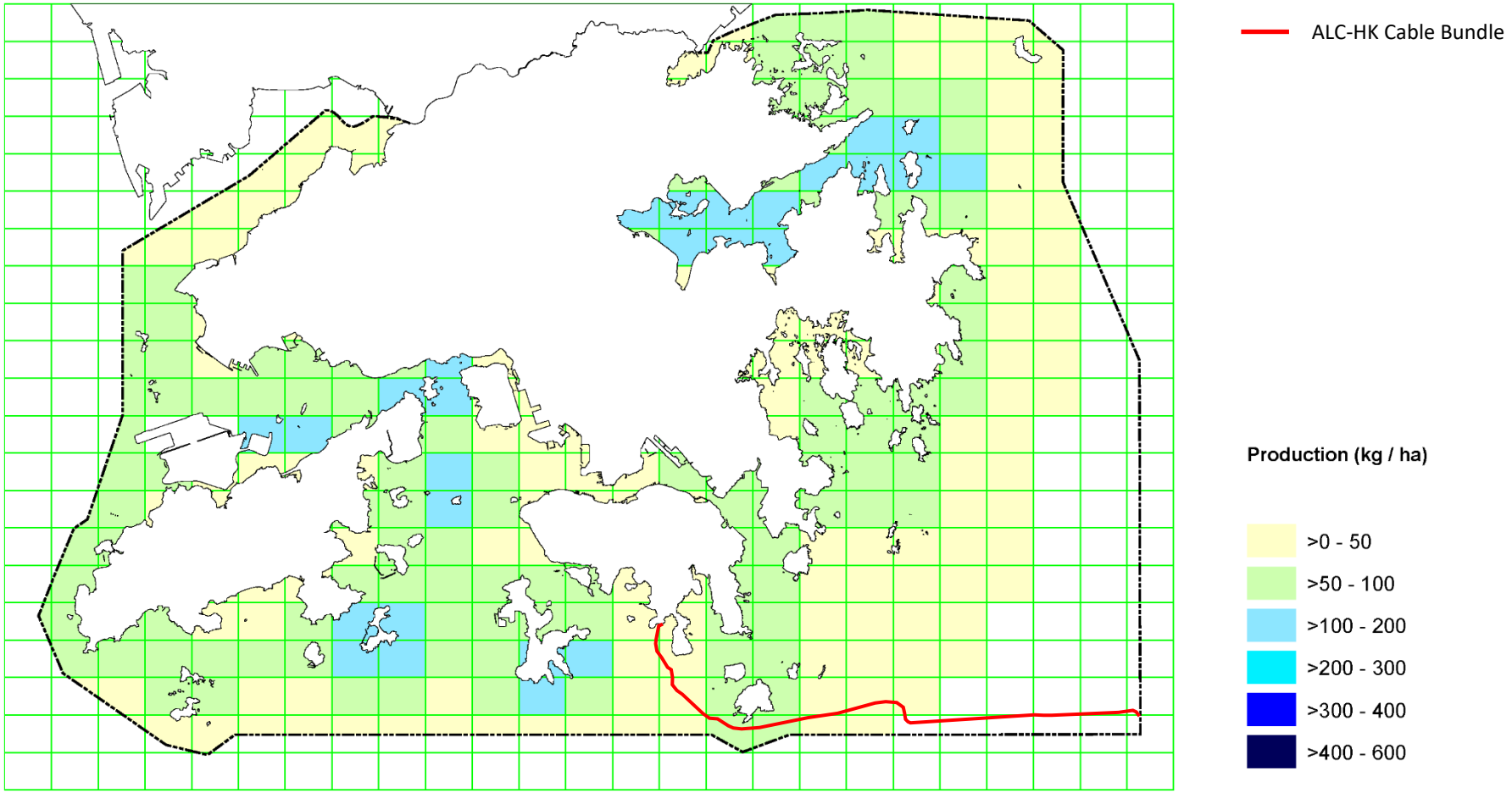
Source: Port Survey 2021, AFCD.

Figure C-4 Distribution of Fisheries Production and Location of the ALC-HK Cable Bundle



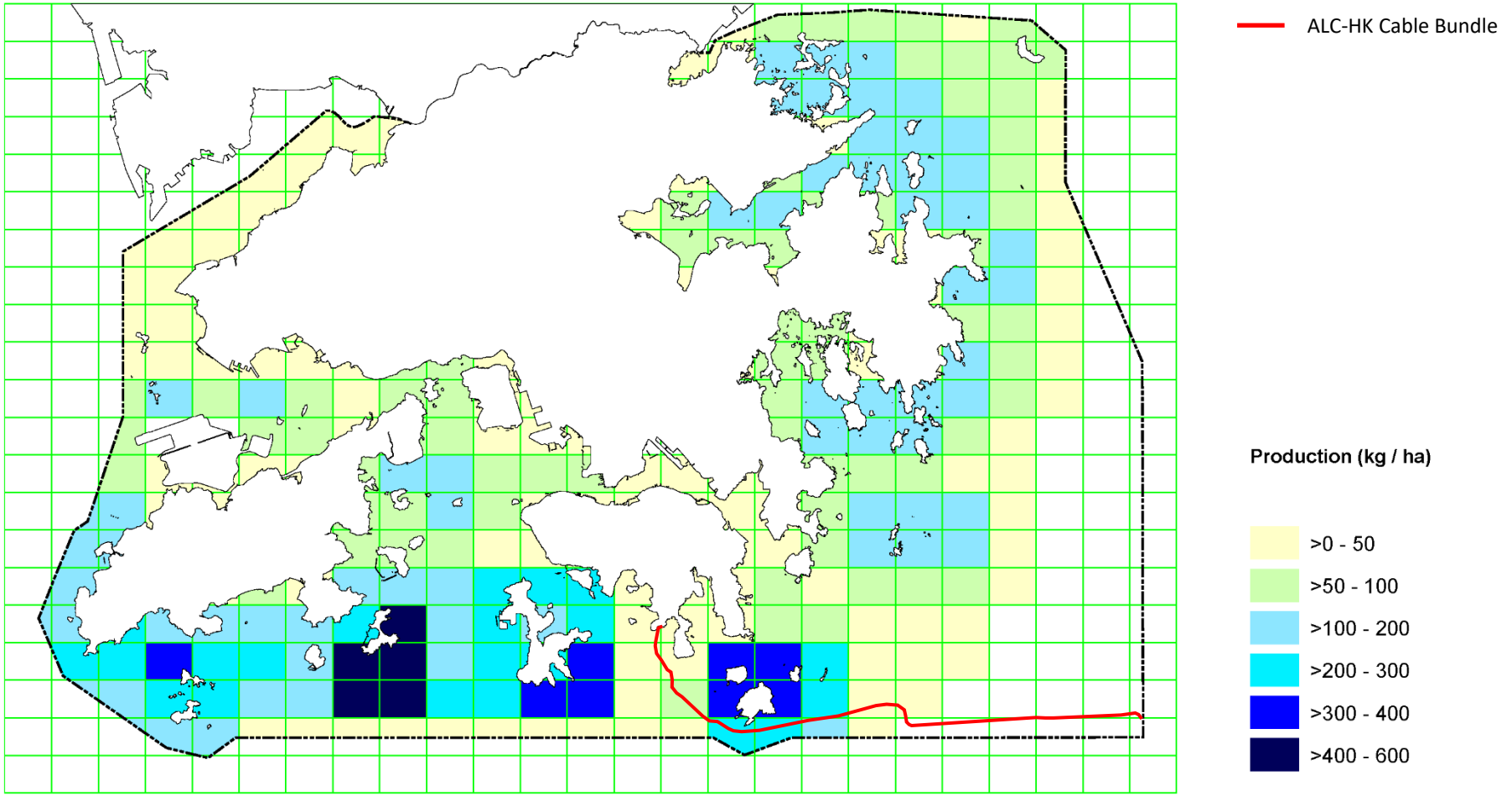
Source: Port Survey 2021, AFCD.

Figure C-5 Distribution of Fisheries Production (with Sampan) and Location of the ALC-HK Cable Bundle



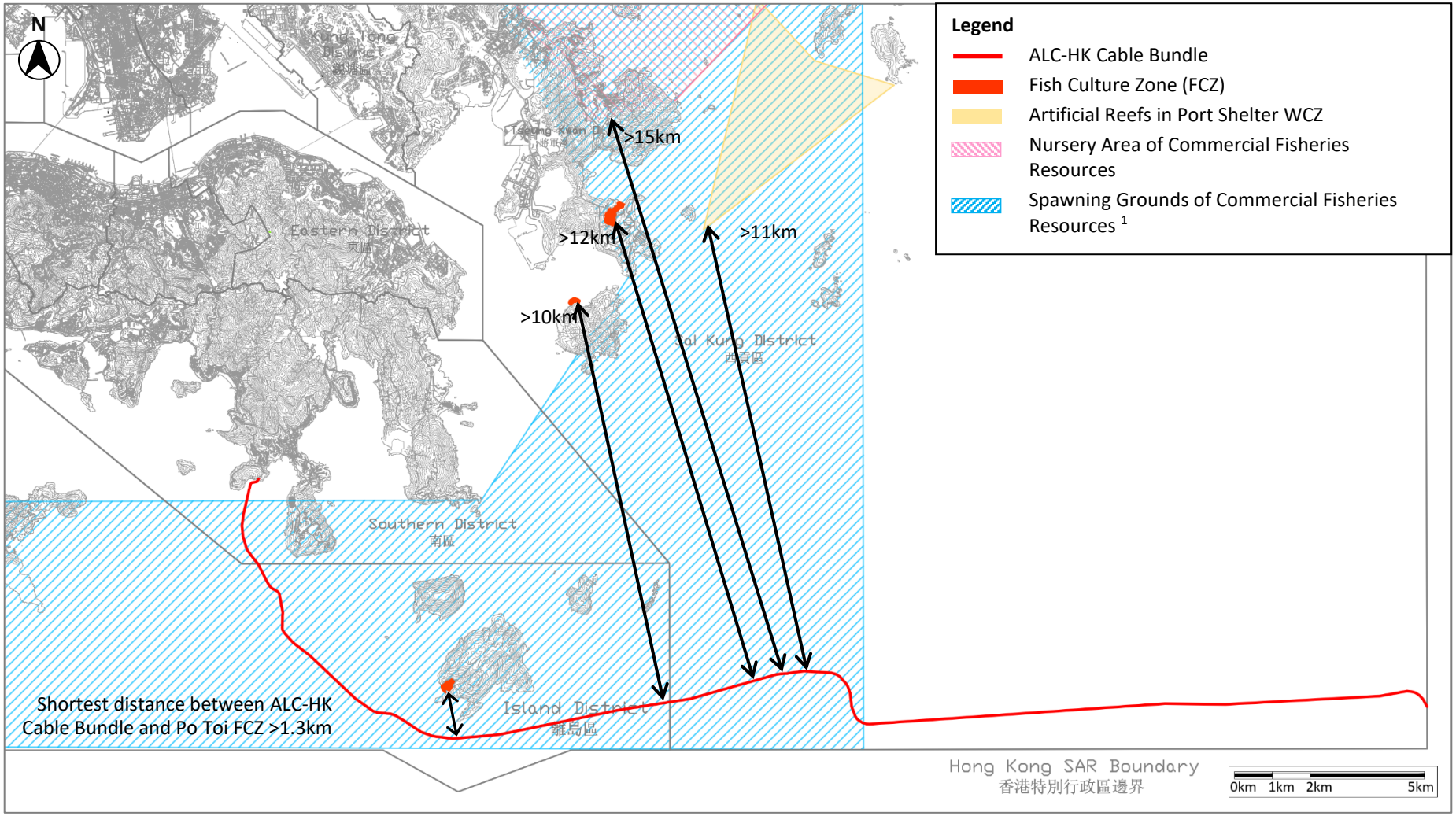
Source: Port Survey 2021, AFCD.

Figure C-6 Distribution of Fisheries Production (with Other Types of Fishing Vessels) and Location of the ALC-HK Cable Bundle



Source: Port Survey 2021, AFCD.

Figure C-7 Fisheries Sensitive Receivers



Note 1: The total area of Spawning Ground of Commercial Fisheries Resources is approximately 477 sq. km. With the 180m maximum sediment plume settlement distance, the maximum impacted area [$\pi(0.18km)^2$ = 0.1 sq. km] at any time is less than 0.1% of the total area of Spawning Ground of Commercial Fisheries Resources.

Appendix D Cultural Heritage Appraisal

CONTENTS

FIGURES

TABLES

D CULTURAL HERITAGE APPRAISAL

D.1 Introduction

D.1.1 This appendix studies and reviews impact on cultural heritage arising from the Project.

D.2 Relevant Legislation and Guidelines

D.2.1 Legislation and associated guidelines applicable to the appraisal of cultural heritage impact in Hong Kong include the followings:

- Environmental Impact Assessment Ordinance (Cap 499) and the associated Technical Memorandum on the EIAO Process (EIAO-TM), Annexes 10 and 19.
- Antiquities and Monuments Ordinance (Cap 53).
- Hong Kong Planning Standards and Guidelines ("HKPSG").
- Guidelines for Marine Archaeological Investigation ("MAI") issued by the Antiquities and Monuments Office ("AMO").

EIAO-TM

D.2.2 EIAO-TM and its Annexes provide general guidelines and criteria for reviewing impact on Sites of Cultural Heritage.

D.2.3 Annex 10 outlines the criteria for evaluation of impact on sites of cultural heritage including the general presumption in favour of the protection and conservation of all sites of cultural heritage and requires that adverse impacts on sites of cultural heritage shall be kept to the absolute minimum.

D.2.4 Annex 19 notes that full preservation will be a beneficial impact and will enhance the cultural and socio-economic environment if suitable measures are proposed to integrate the sites of cultural heritage into the proposed project. In case partial presentation is possible due to site constraints and other factors, this shall be fully justified with alternative proposals or layout designs confirming the impracticability of full preservation.

Antiquities and Monuments Ordinance, Cap 53

D.2.5 The *Antiquities and Monuments Ordinance* (Cap 53) provides statutory requirements for protecting declared or proposed monuments from the threat of development, and ensuring their preservation for posterity. The Ordinance also sets up statutory procedures in making a declaration on monuments that deserve preservation.

Hong Kong Planning Standards and Guidelines

D.2.6 Chapter 10 of HKPSG on Conservation establishes general guidelines and measures for conservation of historic buildings, sites of archaeological interest and other antiquities.

Guidelines for MAI

D.2.7 The *Guidelines for MAI* provides the methodology, procedures and standard practice to be followed when defining the marine archaeological potential identifying the archaeological artefacts and proposing suitable mitigation measures.

D.3 Appraisal Methodology

D.3.1 The objectives of the MAI are to carry out a review/investigation of two phases of a Study Area following the Guidelines for MAI. The Study Area comprise appraisal corridor along the cable bundle alignment with 25m width on both sides, i.e. 50m wide in total. The MAI comprises a Phase I Appraisal, which determine if a Phase II Appraisal is required.

D.3.2 During Phase I Appraisal, the following shall be undertaken by a qualified marine archaeologist:

- Baseline review of the Study Area including MAI studies of previous projects.
- Review of Geophysical Survey data.
- Establishing marine archaeological potential.
- Conducting MAI appraisal.

D.3.3 Subject to the findings of Phase I Appraisal, further investigation may or may not be required. Should a Phase II Appraisal be required, it includes the following tasks:

- Remote Operated Vehicle/Visual Diver Survey/Watching Brief if potential sites are identified during Phase I work.
- Reporting the findings on these aspects.

D.4 Baseline Review

D.4.1 The ALC-HK Cable Bundle alignment shares a similar appraisal corridor to the previous MAIs of other submarine cable systems, such as the ADC-HK, SJC2-HK, SJC, and VSNL Cables. Information from the MAIs for the ADC-HK, SJC2-HK, SJC and VSNL Cables has been reviewed to evaluate the prevailing geophysical conditions and MAI results of these submarine cable systems.

Inventory of Heritage within Study Area

D.4.2 With reference to AMO's *List of Sites of Archaeological Interest in Hong Kong*[1], the Chung Hom Wan Site of Archaeological Interest is located about 420m north of the landing site, as shown on **Figure D-1**. The site had been investigated by the Hong Kong Archaeological Society in 1968, 1970, 1974-75 and 1977. Abundant painted pottery and stone implements of the Neolithic period were unearthed by these excavations. Declared monuments, proposed monuments, graded historic sites/buildings, or government historic sites identified by AMO are not found within 500m of the cable landing site.

D.4.3 The submarine CLDs and the ALC-HK Cable Bundle is in the vicinity of several existing submarine cable systems, such as ADC-HK which has the same landing area at the rocky beach in CHK and SJC2-HK landing in Sha Shek Tan. According to the precedent MAIs of these cable systems, marine archaeological resources, or seabed features with marine archaeological potential were not identified. For the Study Area of the proposed ALC-HK Cable Bundle overlapping with that of these cable systems, it is unlikely that any marine archaeological resources will fall within the Study Area of ALC-HK Cable Bundle. Around 50% of the Study Area of the proposed ALC-HK Cable Bundle is covered by the precedent MAIs for existing cables, a geophysical survey has been conducted for ALC-HK Cable Bundle to

1. AMO (2012). List of Sites of Archaeological Interest in Hong Kong. Antiquities and Monuments Office

fully cover its Study Area and review the marine archaeological resources within the Study Area. Details are further discussed in **Section D.5.3** below.

D.4.4 United Kingdom Hydrographic Office ("UKHO") wrecks database[2] has been reviewed and no potential wreck is identified within the Study Area of the ALC-HK Cable Bundle. The closest wreck, UKHO46766 shown in **Figure D-1**, is located at least 464m from the cable bundle alignment and is outside the Study Area.

Possible Threats to Terrestrial Cultural Heritage

D.4.5 At the terrestrial area of CHK landing point, the only cable installation works will be using a winch to pull the cable bundle into the CLDs to reach the BMH. The works are small on scale and the induced impact is limited and localised. The Chung Hom Wan Site of Archaeological Interest is located about 420m away from the landing site. Also, declared monuments, proposed monuments, graded historic sites/buildings, and government historic sites are not found within 500m from the landing site. Therefore, the impact on the terrestrial cultural heritage is not anticipated and the following appraisal will focus on marine archaeological resources.

Possible Threats to Marine Archaeological Resources

D.4.6 The potential marine archaeological features identified in the previous MAIs for ADC-HK, SJC2-HK, SJC and VSLN are reviewed to evaluate whether any of these features are marine archaeological resources. A new MAI has also been conducted for the ALC-HK Cable Bundle to ensure entire concerned seabed was studied and are discussed in **Section D.6**.

D.4.7 The installation of the submarine CLDs (i.e. from HWM to about 64m offshore) will be by barge-mounted grab with the help of tug boats and assisted by divers. The anticipated width of the trenching works will be 4.5m on each side of the centre line of the submarine CLDs with the use of grab monitored by divers. Shore-end cable installation (i.e. from end of CLDs to about 234m offshore) will be conducted by divers using jetting tools. The rest of the cable bundle will be laid by using an injector burial tool fluidising the seabed to form a trench with 0.5m width and 5m depth. A 50m wide corridor (i.e. 25m from either side of ALC-HK Cable Bundle) along the cable bundle alignment is established as Study Area to allow a buffer zone for the cable installation works.

D.5 Review of Geophysical Survey Data

United Kingdom's Hydrographic Office (UKHO)

D.5.1 The marine data sets for wrecks and obstructions downloaded from UKHO was reviewed. According to the database, no shipwreck could be found within the 50m Study Area. The nearest shipwreck is located at approximately 464m away from the ALC-HK Cable Bundle route.

Geophysical Surveys from Other Cable Projects

D.5.2 ALC-HK Cable Bundle route is in the vicinity of several other submarine cable systems, so reference has been made to these projects for baseline review:

2. UK Hydrographic Office (2024). Wrecks and Obstructions Shapefiles. Admiralty Marine Data Portal, UK Hydrographic Office.

- Asia Direct Cable System – Hong Kong Segment (ADC-HK) – Chung Hom Kok Project Profile (Application No. DIR-285/2021).
- South East Asia – Japan 2 Cable System – Hong Kong Segment (SJC2-HK) – Chung Hom Kok – Project Profile (Application No. DIR-269/2019).
- South-East Asia Japan Cable System (SJC) Hong Kong Segment – Project Profile (Application No. DIR-213/2011).
- VSNL Intra Asia Submarine Cable System – Deep Water Bay Project Profile (Application No. DIR-155/2007)

D.5.3 Around 50% of the Study Area of the ALC-HK Cable Bundle route has been reviewed by pervious project (as mentioned in **Section D.4.3**). It has been concluded that no features of archaeological value or potential were identified in these areas. Findings from each previous survey are discussed below.

D.5.4 To evaluate the entire Study Area, a geophysical survey for ALC-HK Cable Bundle was conducted in August 2023 to review the depth and nature of the seabed sediments as well as any seabed and sub-bottom anomalies. Analysis from the geophysical survey is provided in **Section D.6**.

ADC-HK Cable

D.5.5 The section of the Study Area of ADC-HK Cable at the west of Stanley Peninsula is in the vicinity of the Study Area of the ALC-HK Cable Bundle. A geophysical survey, side scan sonar, sub bottom profiler, echo sounder and magnetic survey for ADC-HK MAI Study Area was conducted in 2020 [3]. The MAI of ADC-HK Cable shown that that the seabed along its ADC-HK alignment has been disturbed from trawling, the dumping of materials and installation of previous cables. The previous seabed disturbance would have significantly reduced the archaeological potential of the seabed in the vicinity of the cable.

D.5.6 The geophysical survey of the ADC-HK Cable alignment also found that the seabed has numerous scattered trench scars and debris/boulders along the alignment. It identified two sonar contacts within the 50m MAI Study Area, and one of them is classified as debris while the other one is found to be a possible abandoned fishing net or cable that are considered to have no archaeological value.

D.5.7 14 nos. magnetic contacts were identified within the 50m corridor, but all of these are either in-service cables/pipeline, out-of-service cables or unknown objects. Other magnetic contacts and sub-bottom anomalies that were found during the geophysical surveys have been identified as related to existing or out-of-service cables and gas pipeline, and though there are also some anomalies that are unknown in origin, they most likely represent buried or partially buried debris. Thus, the unknown magnetic contacts are not considered to have any archaeological value. The MAI of ADC-HK concluded that there is no evidence for marine archaeological resources and hence no marine archaeological impacts are expected.

3. SMEC (2021). Project Profile for Asia Direct Cable System - Hong Kong Segment (ADC-HK) - Chung Hom Kok. Report for China Telecom Global Limited, (DIR-285/2021).

SJC2-HK Cable

D.5.8 The section of the SJC2-HK Cable from the west of Beaufort Island to the southeast Po Toi Island is in the vicinity of the Study Area of the ALC-HK Cable Bundle. A geophysical survey was conducted in 2018[4], including a side scan sonar, sub bottom profiler, echo sounder and magnetic survey covering the MAI Study Area. The MAI of SJC2-HK reveal that seabed along the SJC2-HK Cable alignment has been heavily impacted from trawling and the dumping of materials and installation of the previous cables. The previous seabed disturbance would have significantly reduced the archaeological potential of the seabed in the vicinity of the cable.

D.5.9 The geophysical survey of the SJC2-HK Cable alignment revealed that the seabed has numerous scars and debris/boulder along the alignment. It identified 19 nos. sonar contacts within its 50m MAI Study Area, but with one exception, all of these are identified as debris/possible discarded manmade objects/boulders. The exception is a "new" wreck close to the landing site. The wreck appears to a small sampan which was probably sunk after 2011. Since this wreck is recent, the MAI of SJC2-HK considered that the wreck would not have any archaeological potential.

D.5.10 16 nos. magnetic contacts were identified within the 50m corridor, most likely associated with existing cables and their installation. Other magnetic contacts and sub-bottom anomalies that were found during the geophysical surveys relate to other cables, the HKE Gas Pipeline, and dumped materials/debris.

D.5.11 The MAI of SJC2-HK concluded that that there is no evidence for marine archaeological resources and hence no marine archaeological impacts are expected.

SJC Cable

D.5.12 The section of the SJC Cable to the east of Po Toi Island is in the vicinity of the Study Area of the ALC-HK Cable Bundle. A geophysical survey was conducted for SJC Cable in 2011[5], and sonar contacts for the section of SJC Cable are listed in **Table D-1** and shown on **Figure D-1**. There were two sonar contacts within 100m from the ALC-HK Cable Bundle alignment and classified as debris/boulder. No further investigation was required, and it was concluded that there were no features of archaeological value in the vicinity of the SJC Cable.

Table D-1 Side Scan Sonar Contacts from the 2011 SJC Cable Geophysical Survey

REF	LATITUDE LONGITUDE	SIZE (m)*	DESCRIPTION
SC039	22° 11.101' N 114° 12.886' E	3 x 1 x <1	Debris
SC050	22° 9. 520' N 114° 15.512' E	10 x 4.5 x <1	Debris/boulder

Source: Extracted from Section F.3, Project Profile for SJC Cable, June 2011.

4. SMEC (2019). Project Profile for South East Asia - Japan 2 Cable System - Hong Kong Segment (SJC2-HK) - Chung Hom Kok. Report for China Mobile International Limited, (DIR-269/2019).
5. Atkins (2011). Project Profile for South-East Asia Japan Cable System (SJC) Hong Kong Segment. Report for China Telecom (Hong Kong) International Limited, (DIR-213/2011).

VSNL Cable

D.5.13 The section of the VSNL Cable from the west of Beaufort Island to the south of Po Toi Island is similar to the route of the ALC-HK Cable Bundle. Although no geophysical survey was conducted, a MAI based on literature review was carried out for VSNL Cable[6] and a wreck was identified at approx. 375m to the east of the cable alignment adjacent to the western coast of Middle Island. It was concluded that the impact to the shipwreck is not anticipated and thus the marine archaeological potential is considered in low level. It is therefore reasonable to deduce that the MAI study area of VSNL has covered at least 380m from the cable alignment. As such, impact to any resources of marine archaeological importance within the Study Area due to the cable installation work was not anticipated.

D.5.14 This identified shipwreck from the MAI of VSNL Cable is over 3km from the route alignment of the ALC-HK Cable Bundle and so its marine archaeological potential is not a concern.

D.6 Marine Archaeological Investigation

D.6.1 A MGS for the ALC-HK Cable Bundle was conducted in August 2023 by a local marine surveying company, EGS (Asia) Ltd ("EGS"). Data from these geophysical surveys was processed by EGS' geophysicists and reviewed by a qualified marine archaeologist, Sarah HEAVER, of SDA Marine Limited.

D.6.2 The MGS for ALC-HK Cable Bundle used the following equipment:

- C-Nav GcGPS (globally corrected GPS)
- Single-beam echo sounder
- Multi-beam echo sounder
- Side scan sonar system
- Sub-bottom profiler
- Marine magnetometer system
- EGS Diver survey

D.6.3 In the geophysical survey, the seabed in the Study Area generally comprises very soft to soft clay and very soft to soft gravelly sandy clay. The seabed is characterized by scattered depressions, scars, debris and debris patches and dumped materials. At the eastern end of the ALC-HK Cable Bundle, scars are largely scattered along the survey area, these scars may implicate possible trawling activities. Image records of the geophysical survey for ALC-HK Cable Bundle are shown on **Figure D-2**.

D.6.4 No features or objects of potential archaeological value could be identified within the Study Area according to the survey result.

D.6.5 14 nos. sonar contacts from the ALC-HK Cable Bundle geophysical survey in 2023 within the 50m corridor are listed in **Table D-2** and shown on **Figure D-1**. The sonar contacts were mainly debris, linear debris, possible fishing nets and gears, and tyre that have no archaeological significance. Three of them is classified as possible fishing gears while the other is identified as debris or linear debris. Modern debris is commonly and frequently found in the area due to the fishing activity as fishing boats towing fishing nets, marker buoys were observed during the survey and installation works of previous cable systems as

6. ERM (2007). Project Profile for VSNL Intra Asia Submarine Cable System - Deep Water Bay. Report for Tata Communications (Bermuda) Limited, (DIR-155/2007).

cable installation trenches were observed. Moreover, patches of dumped materials were observed occasionally along different sections of the route. These possible fishing gears and debris are considered to have no marine archaeological potential and there is no indication that these could be archaeological artefacts.

D.6.6 All of the 127 sonar contacts (including the 14 nos. sonar contacts within the 50m corridor) discovered in the ALC-HK Cable Bundle geophysical survey area is either debris, tyres, fishing gears or fishing net. These items are to have no marine archaeological potential and no need for any further investigation.

Table D-2 Side Scan Sonar Contacts Identified within the 50m Study Area in the ALC-HK Cable Bundle Geophysical Survey in 2023

CONTACT NUMBER	LOCATION	DIMENSION (m)*	DISTANCE FROM CABLE BUNDLE	DESCRIPTION
SC017	22° 12.325' N 114° 12.133' E	418 x <1 x <1	17m E	Linear debris
SC020	22° 12.324' N 114° 12.039' E	224 x <1 x nmh	1m W	Linear debris
SC021	22° 12.328' N 114° 12.043' E	39 x <1 x nmh	2m W	Linear debris
SC022	22° 12.308' N 114° 12.075' E	102 x <1 x nmh	2m E	Linear debris
SC024	22° 12.193' N 114° 12.212' E	406 x <1 x nmh	7m E	Linear debris
SC055	22° 11.544' N 114° 12.245' E	3 x <1 x 1	18m SW	Debris
SC061	22° 11.183' N 114° 12.539' E	547 x <1 x nmh	15m SW	Possible fishing gear
SC065	22° 11.183' N 114° 12.542' E	2 x <1 x nmh	18m NE	Debris
SC066	22° 11.181' N 114° 12.547' E	1.5 x <1 x <1	21m NE	Debris
SC075	22° 10.923' N 114° 12.625' E	646 x <1 x nmh	18m E	Possible fishing gear
SC079	22° 10.758' N 114° 12.612' E	622 x <1 x <1	18m W	Possible fishing gear
SC092	22° 9.085' N 114° 15.569' E	26x <1 x nmh	23m S	Linear debris
SC097	22° 9.339' N 114° 17.002' E	2.9 x <1 x <1	19m N	Debris
SC0100	22° 9.435' N 114° 17.627' E	2.7 x <1 x <1	25m S	Debris

Note: nmh = no measurable height.

D.6.7 To identify locations of the existing cables pipelines along the alignment, magnetic surveys were carried out for the ALC-HK Cable Bundle in 2023. Within the 50m corridor, 47 nos. magnetic contacts are found and they are either in-service cables/HKE Gas Pipeline, out-of-service cables, debris or unknown objects, as listed in **Table D-3** and shown on **Figure D-1**.

Table D-3 Magnetic Contacts from the ALC-HK Cable Bundle Geophysical Survey 2023

CONTACT NUMBER	LATITUDE LONGITUDE	MAGANETIC ANOMALY (nT)	DISTANCE FROM CABLE BUNDLE	DESCRIPTION
MC182	22° 12.420' N 114° 12.153' E	14.9	17m E	OOS Guam-Hong Kong
MC183	22° 11.880' N 114° 12.051' E	24.2	17m E	OOS Guam-Hong Kong
MC186	22° 11.874' N 114° 12.045' E	86.6	4m E	OOS SHT B
MC187	22° 11.873' N 114° 12.045' E	99.6	3m E	OOS SHT B
MC189	22° 11.859' N 114° 12.033' E	14.7	25m W	Unknown
MC205	22° 11.747' N 114° 12.101' E	13.7	16m NE	Unknown
MC256	22° 11.494' N 114° 12.269' E	14.6	24m SW	OOS SHT B
MC261	22° 11.471' N 114° 12.284' E	11.1	21m SW	OOS SHT B
MC262	22° 11.477' N 114° 12.300' E	10.9	11m NE	Unknown
MC281	22° 11.232' N 114° 12.447' E	12.5	8m NE	Unknown
MC304	22° 11.191' N 114° 12.494' E	28.9	8m SW	Unknown
MC306	22° 11.189' N 114° 12.495' E	4.1	9m SW	Debris
MC307	22° 11.191' N 114° 12.500' E	12.9	1m SW	Possible IS T&T seg 2
MC308	22° 11.198' N 114° 12.509' E	29.4	17m NE	Possible IS T&T seg 2
MC341	22° 11.106' N 114° 12.572' E	13.3	13m W	Unknown
MC343	22° 11.098' N 114° 12.567' E	151.1	25m W	Possible IS SEA-ME-WE 3 seg 1.10
MC344	22° 11.098' N 114° 12.569' E	203.4	22m W	Possible IS SEA-ME-WE 3 seg 1.10
MC345	22° 11.097' N 114° 12.572' E	92	16m W	Possible IS SEA-ME-WE 3 seg 1.10
MC346	22° 11.097' N 114° 12.574' E	206.4	16m W	Possible IS SEA-ME-WE 3 seg 1.10
MC353	22° 11.075' N 114° 12.575' E	8.3	19m W	Unknown
MC354	22° 11.070' N 114° 12.578' E	20.5	14m W	Unknown
MC356	22° 11.069' N 114° 12.576' E	31.9	19m W	Unknown
MC375	22° 10.973' N 114° 12.596' E	14.8	17m W	Unknown

CONTACT NUMBER	LATITUDE LONGITUDE	MAGANETIC ANOMALY (nT)	DISTANCE FROM CABLE BUNDLE	DESCRIPTION
MC377	22° 10.972' N 114° 12.595' E	10.8	19m W	Unknown
MC395	22° 10.810' N 114° 12.636' E	8.8	21m E	Unknown
MC399	22° 10.796' N 114° 12.623' E	3.3	1m W	IS SJC2
MC400	22° 10.795' N 114° 12.624' E	6.7	1m E	IS SJC2
MC422	22° 10.680' N 114° 12.624' E	17.1	9m E	IS Intra Asia seg 9
MC423	22° 10.680' N 114° 12.624' E	18.4	9m E	IS Intra Asia seg 9
MC425	22° 10.651' N 114° 12.607' E	10	20m W	Unknown
MC428	22° 10.579' N 114° 12.660' E	25.4	14m NE	Possible IS T&T seg 1
MC429	22° 10.579' N 114° 12.659' E	61.6	11m NE	Possible IS T&T seg 1
MC434	22° 10.568' N 114° 12.678' E	5.9	24m NE	Unknown
MC476	22° 10.368' N 114° 12.866' E	12.3	17m SW	Possible OOS HJK seg B2 and possible IS H2HE
MC477	22° 10.376' N 114° 12.886' E	14	16m NE	Unknown
MC524	22° 9.437' N 114° 14.117' E	8.1	4m S	IS SJC2
MC539	22° 9.429' N 114° 14.192' E	64.7	5m S	IS Intra Asia seg 9
MC540	22° 9.442' N 114° 14.213' E	12.6	25m N	Unknown
MC557	22° 9.147' N 114° 14.762' E	37.4	25m S	Debris
MC564	22° 9.150' N 114° 14.766' E	43	17m S	Debris
MC565	22° 9.164' N 114° 14.775' E	45.3	14m N	Unknown
MC566	22° 9.168' N 114° 14.778' E	6.7	23m N	Unknown
MC632	22° 9.903' N 114° 21.200' E	11.8	0	IS Intra Asia seg 9
MC642	22° 9.764' N 114° 21.297' E	25.2	0	IS SJC seg 10
MC645	22° 9.609' N 114° 21.332' E	721.9	12m E	IS HKE Gas Pipe
MC652	22° 9.486' N 114° 21.362' E	15.1	17m E	IS H2HE
MC657	22° 9.429' N 114° 21.375' E	13.7	0	IS SJC2

D.6.8 Most of the magnetic contacts and sub-bottom anomalies that were found during the geophysical surveys have been identified as related to either existing or out-of-service cables and HKE Gas Pipeline. There are also some sub-bottom anomalies unknown in origin that could potentially represent buried or partially buried debris. As the seabed is significantly disturbed by previous fishing activities and cable installation works, the seabed as well as the unknown contacts have low archaeological potential. Therefore, the unknown magnetic contacts are not considered to have any archaeological value and no further investigation or mitigation is required.

D.6.9 The seabed condition in the area between the intertidal zone and the inshore of Chung Hom Kok landing area was collected by a diver swim survey with diver sampling and probing. Photographs of seabed conditions are shown in **Figure D-2**.

D.6.10 The geophysical surveys of previous MAIs and the one carried out for the ALC-HK Cable Bundle in 2023 reveal that seabed along the ALC-HK Cable Bundle alignment has been extensively disturbed from fishing activities, dumping of materials and installation works of a number of previous in-service or out-of-service cables. Along the surveyed area, the ALC-HK Cable Bundle alignment makes a total of 32 nos. cable crossings, in which 16 nos. crossings are made with in-service cables while 16 nos. crossings are made with out-of-service cables. The north-up charts of geophysical survey which could be found in the **Annex 1** show evidence of extensive cable installation trenches, scars and depressions that substantiate the seabed has been heavily disturbed. The archaeological potential of the seabed is greatly reduced in consideration of the seabed disturbance.

D.6.11 The evaluations by EGS have been reviewed by a qualified marine archaeologist, Sarah HEAVER, who concurs with the conclusion made by EGS that all of the 47 nos. magnetic contacts are associated with the previous/ existing cables, modern debris, and previous seabed disturbance would have significantly reduced the archaeological potential of the seabed in the vicinity of the ALC-HK Cable Bundle.

D.7 Conclusion

D.7.1 Declared monuments, proposed monuments, graded historic sites/buildings, or government historic sites identified by AMO are not found within 500m of the cable landing site. There will be no threat to terrestrial cultural heritage from both land-based and marine works. At the landing point, the only works will be using a winch to pull the cable bundle with into the CLDs to reach the BMH. The work is in small scale and the induced impact is limited and localised. The Chung Hom Wan Site of Archaeological Interest is located about 420m away from the landing site, impact on the Site of Archaeological Interest is not expected. Hence no further investigation or mitigation measures are required.

D.7.2 The geophysical surveys of previous MAIs and the one carried out for the ALC-HK Cable Bundle in 2023 also concluded that seabed along the ALC-HK Cable Bundle alignment has been significantly disturbed from fishing activities, dumping of materials and previous in-service or out-of-service cables installation works. It also found that the nature of the sediments to be very soft to soft clay and very soft to soft sandy gravelly clay as well as loose to medium dense sand. The archaeological potential of the seabed in the vicinity of the cable bundle is greatly reduced in consideration of the seabed nature and disturbance.

D.7.3 The seabed along the ALC-HK Cable Bundle alignment were mainly debris, linear debris, possible fishing nets and gears, and tyre based on the geophysical survey result. It is considered to have no archaeological significance. A total 14 nos. sonar contacts were

identified within the 50m (25m from either side of cable bundle alignment) Study Area corridor, and three of them are fishing gears, the others are either debris or linear debris. All of them are identified to be no marine archaeological potential and further investigation is not required.

D.7.4 A total of 47 nos. magnetic contacts were identified within the 50m Study Area corridor. All of them are either in-service cables/ pipeline, out-of-service cables or debris or unknown objects. Some anomalies that are unknown in origin, and could potentially represent buried or partially buried debris. Regarding the significantly disturbed seabed, the unknown magnetic contacts are not considered to have any archaeological value that further investigation or mitigation is not required.

D.7.5 The ALC-HK Cable Bundle route partially overlaps with four other cables, for each of which a MAI was conducted and did not identify any marine archaeological resources. A qualified marine archaeologist, Sarah HEAVER, has reviewed in February 2024 the survey findings of the geophysical survey carried done by EGS. She agreed with the conclusion that all of the 14 nos. sonar contacts identified within the 50m Study Area corridor are fishing gears and debris that are considered to be no marine archaeological potential and further investigation is not required; while all of the 47 nos. magnetic contacts are associated with either the previous or existing cables, or modern debris, and that previous seabed disturbance would have significantly reduced the archaeological potential of the seabed in the vicinity of the ALC-HK Cable Bundle.

D.7.6 Reference to UKHO wrecks databases, there were no shipwreck sites identified within the 50m Study Area corridor. The nearest site is located at more than 464m away from the ALC-HK Cable Bundle route.

D.7.7 The MAI study concluded that no evidence for marine archaeological resources is found and hence marine archaeological impacts are not anticipated. Mitigation measures or further action will therefore be not required.

D.8 References

1. AMO (2012). List of Sites of Archaeological Interest in Hong Kong. Antiquities and Monuments Office.
2. UK Hydrographic Office (2024). Wrecks and Obstructions Shapefiles. Admiralty Marine Data Portal, UK Hydrographic Office.
3. SMEC (2021). Project Profile for Asia Direct Cable System - Hong Kong Segment (ADC-HK) - Chung Hom Kok. Report for China Telecom Global Limited, (DIR-285/2021).
4. SMEC (2019). Project Profile for South East Asia - Japan 2 Cable System - Hong Kong Segment (SJC2-HK) - Chung Hom Kok. Report for China Mobile International Limited, (DIR-269/2019).
5. Atkins (2011). Project Profile for South-East Asia Japan Cable System (SJC) Hong Kong Segment. Report for China Telecom (Hong Kong) International Limited, (DIR-213/2011).
6. ERM (2007). Project Profile for VSNL Intra Asia Submarine Cable System - Deep Water Bay. Report for Tata Communications (Bermuda) Limited, (DIR-155/2007).

Figure D-1 Location of Site of Archaeological Interest and Side Scan Sonar and Magnetic Contacts from the 2023 Geophysical Survey

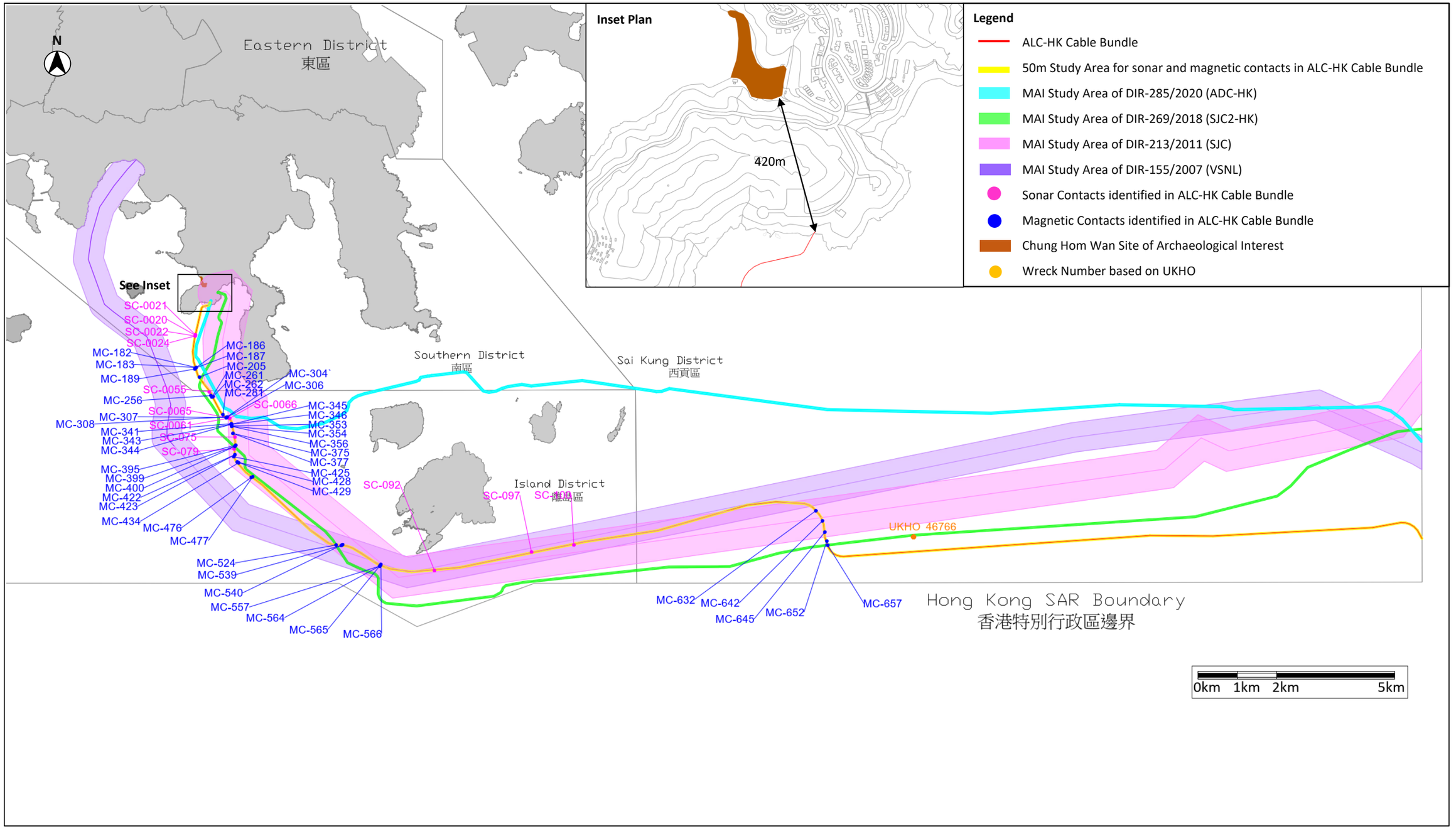
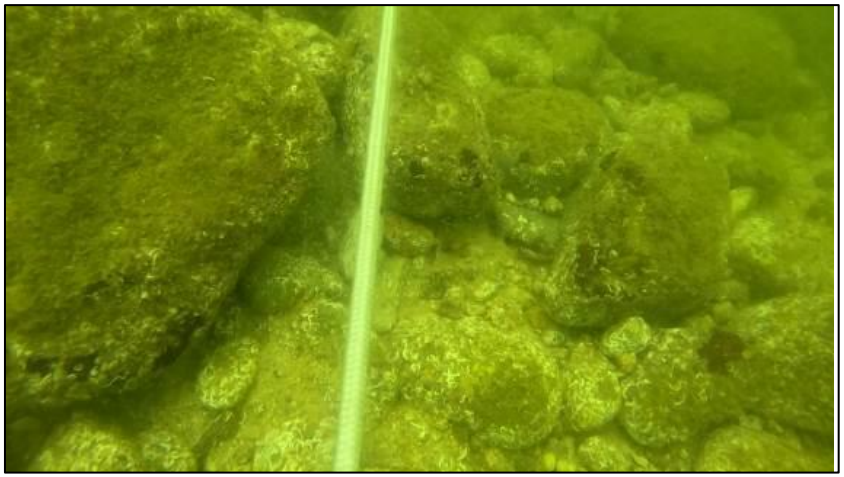
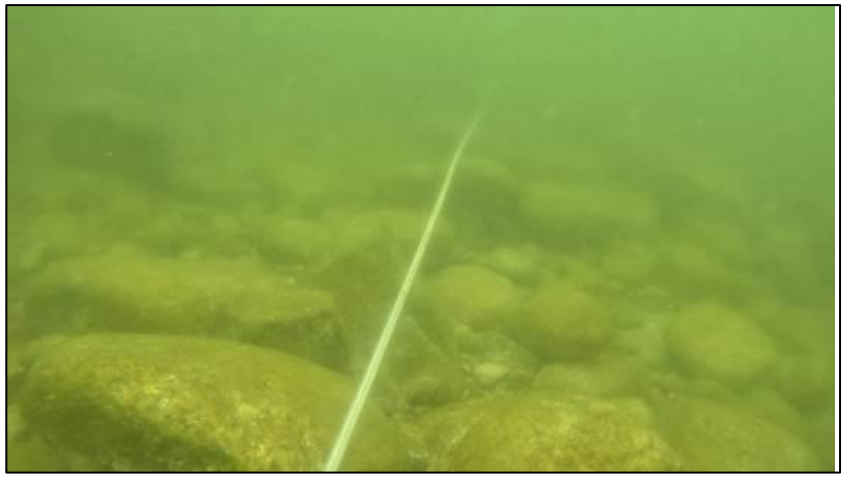


Figure D-2 Records from Geophysical Survey for ALC-HK Cable Bundle

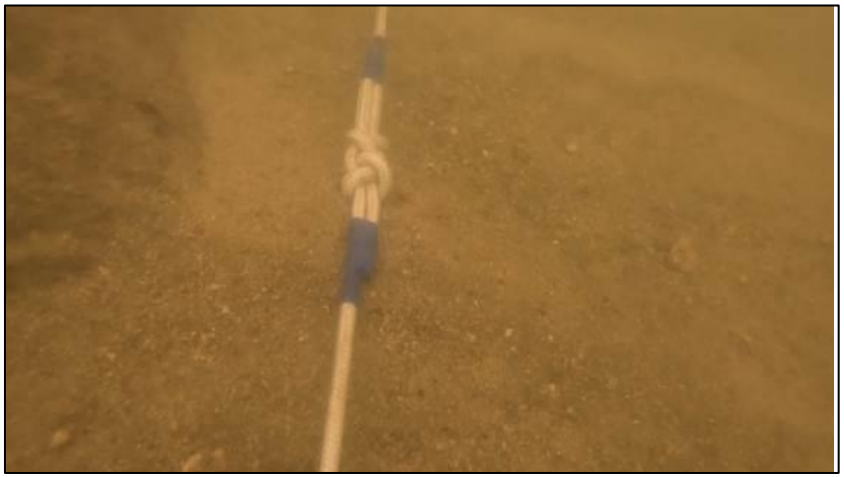
(Underwater photographs are from the diver survey carried out between the landfall topographic survey and the start of the inshore geophysical survey.)



Boulders and Cobbles

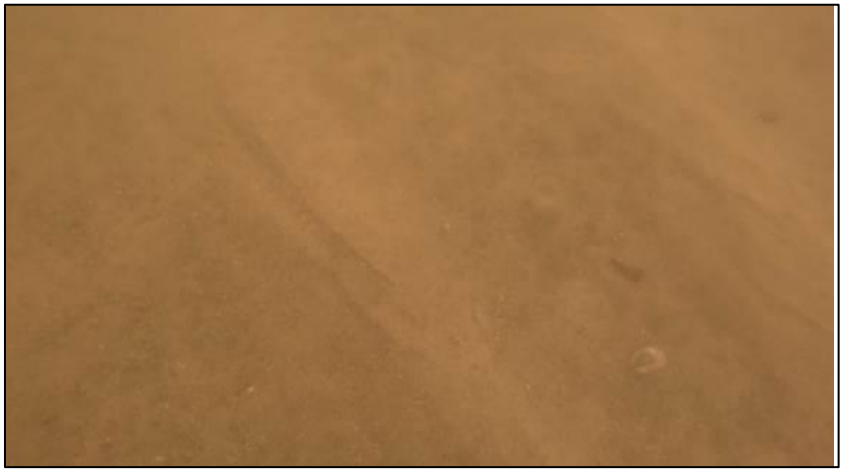


Boulders



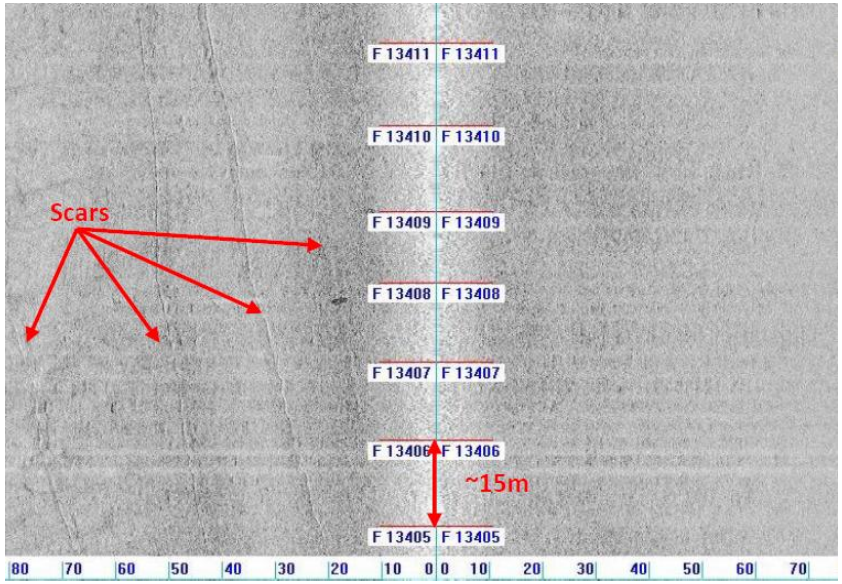
Gravelly Sand and Rock

Rope (debris)

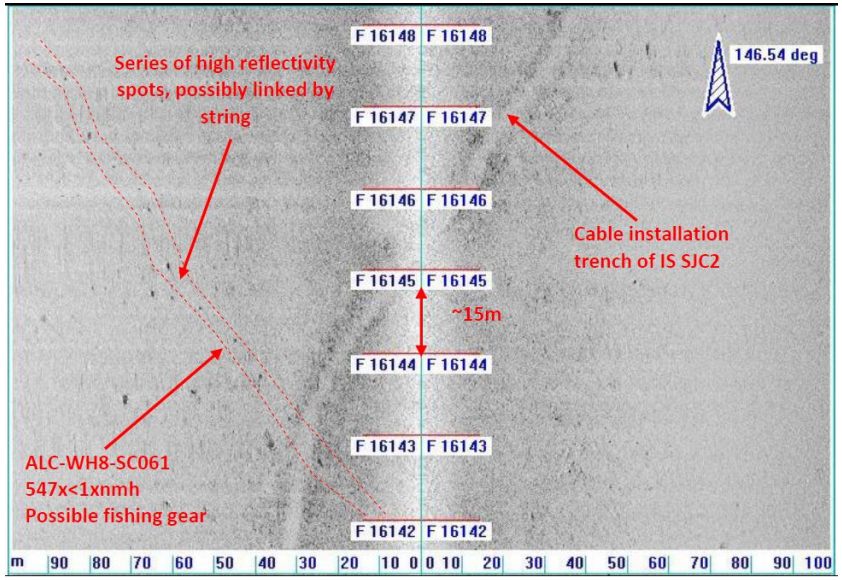


Gravelly Sand with Ripples

Gravelly sand with a cobble

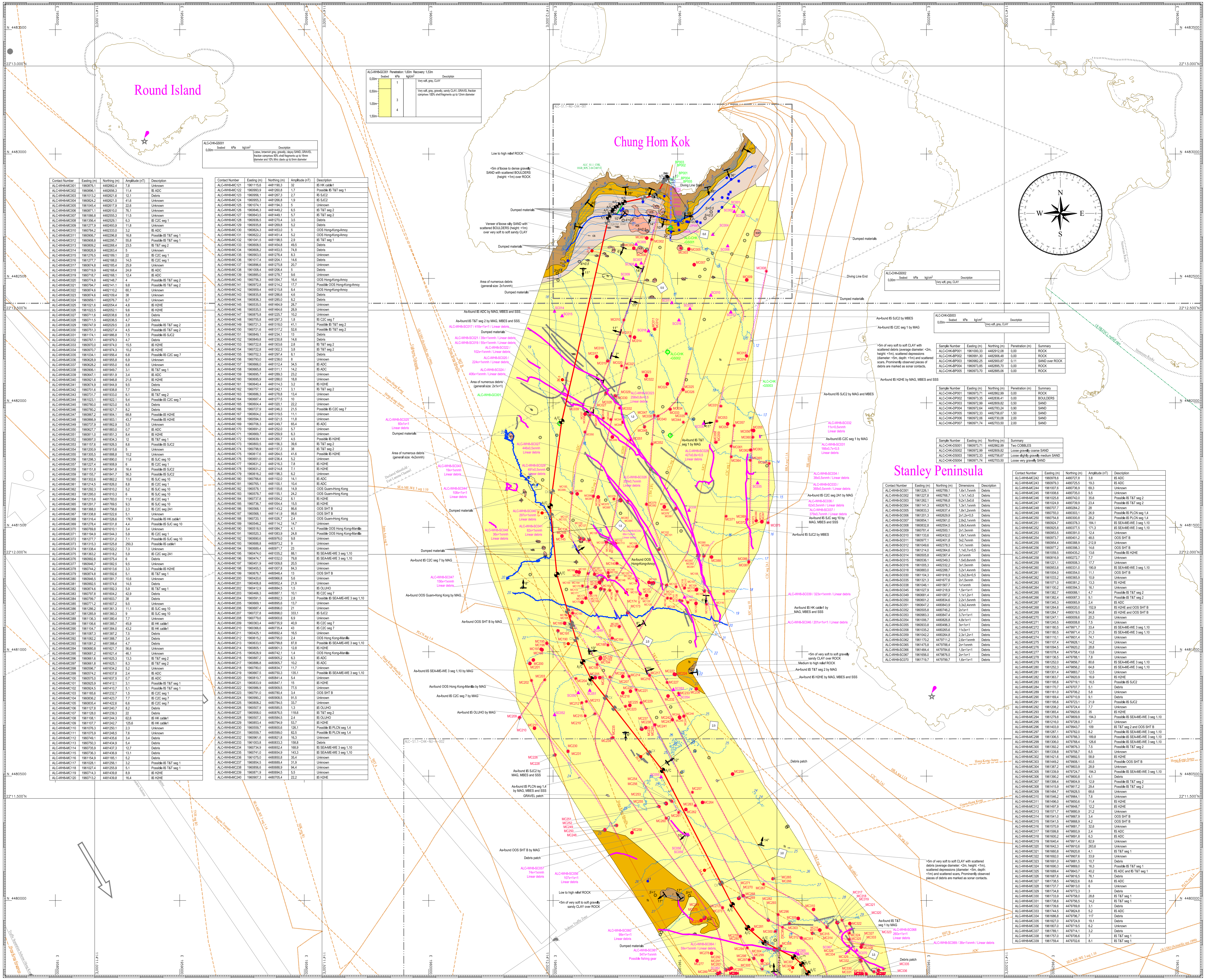


As found cables and trench scar from cable installation



Possible abandoned fishing gear or cable trench

Annex 1 Geophysical Survey Result



ALC-WH8-GC001 Penetration: 1.60m Recovery: 1.53m

Depth	Seabed	kPa	kg/cm²	Description
0.00m		1		Very soft, gray, CLAY
0.50m		3		Very soft, gray, gravelly, sandy CLAY. GRAVEL fraction comprises 100% shell fragments up to 12mm diameter
1.00m		4		
1.50m				

ALC-CHK-GS001

Depth	Seabed	kPa	kg/cm²	Description
0.00m				Loose, brownish gray, gravelly, clayey SAND. GRAVEL fraction comprises 90% shell fragments up to 16mm diameter and 10% lithic clasts up to 5mm diameter

ALC-CHK-GS002

Depth	Seabed	kPa	kg/cm²	Description
0.00m				Very soft, gray, CLAY

ALC-CHK-GS003

Depth	Seabed	kPa	kg/cm²	Description
0.00m				Very soft, gray, CLAY

Contact Number	Easting (m)	Northing (m)	Amplitude (nT)	Description
ALC-WH8-MC001	1960876.1	4482662.4	7.8	Unknown
ALC-WH8-MC002	1960896.1	4482656.3	11.4	IS ADC
ALC-WH8-MC003	1961013.2	4482621.6	12.1	Debris
ALC-WH8-MC004	1960824.2	4482621.5	41.6	Unknown
ALC-WH8-MC005	1961045.4	4482617.9	22.6	Unknown
ALC-WH8-MC006	1960871.1	4482610.0	76.1	Unknown
ALC-WH8-MC007	1961066.8	4482555.3	11.5	Unknown
ALC-WH8-MC008	1961356.4	4482529.1	6.3	IS C2C seg 1
ALC-WH8-MC009	1961277.9	4482493.9	11.8	Unknown
ALC-WH8-MC010	1960784.2	4482333.0	3.2	IS ADC
ALC-WH8-MC011	1960906.7	4482296.8	16.8	Possible IS T&T seg 1
ALC-WH8-MC012	1960908.8	4482295.7	55.8	Possible IS T&T seg 1
ALC-WH8-MC013	1960809.2	4482268.4	23.5	IS T&T seg 2
ALC-WH8-MC014	1960826.9	4482263.4	5	Unknown
ALC-WH8-MC015	1961276.5	4482189.1	22	IS C2C seg 1
ALC-WH8-MC016	1961277.7	4482188.0	14.5	IS C2C seg 1
ALC-WH8-MC017	1960674.8	4482185.4	25.9	Unknown
ALC-WH8-MC018	1960719.9	4482168.4	24.9	IS ADC
ALC-WH8-MC019	1960718.7	4482168.1	12.4	IS ADC
ALC-WH8-MC020	1960774.8	4482148.7	4	Possible IS T&T seg 2
ALC-WH8-MC021	1960794.7	4482141.1	9.8	Possible IS T&T seg 2
ALC-WH8-MC022	1960874.6	4482110.2	60.1	Unknown
ALC-WH8-MC023	1960874.6	4482109.4	38	Unknown
ALC-WH8-MC024	1960959.1	4482076.7	6.7	Unknown
ALC-WH8-MC025	1961021.6	4482054.4	4.6	IS H2HE
ALC-WH8-MC026	1961022.5	4482052.1	9.6	IS H2HE
ALC-WH8-MC027	1960711.6	4482038.6	5.8	Debris
ALC-WH8-MC028	1960711.5	4482036.5	4.7	Debris
ALC-WH8-MC029	1960747.9	4482029.5	2.8	Possible IS T&T seg 2
ALC-WH8-MC030	1960751.3	4482027.4	4.5	Possible IS T&T seg 2
ALC-WH8-MC031	1961174.1	4481986.8	7.5	Possible IS SJC2
ALC-WH8-MC032	1960767.1	4481979.3	4.7	Debris
ALC-WH8-MC033	1960970.0	4481974.0	15.5	IS H2HE
ALC-WH8-MC034	1960970.7	4481974.3	10.2	IS H2HE
ALC-WH8-MC035	1961034.1	4481956.4	6.8	Possible IS C2C seg 7
ALC-WH8-MC036	1960628.9	4481955.8	6.9	Unknown
ALC-WH8-MC037	1960628.2	4481955.0	6.6	Unknown
ALC-WH8-MC038	1960906.1	4481949.7	3.1	IS T&T seg 1
ALC-WH8-MC039	1960647.1	4481951.9	3.4	IS ADC
ALC-WH8-MC040	1960921.6	4481946.8	21.5	IS H2HE
ALC-WH8-MC041	1960674.9	4481944.9	9.5	Debris
ALC-WH8-MC042	1960701.6	4481938.8	7.7	Debris
ALC-WH8-MC043	1960731.7	4481933.0	6.1	IS T&T seg 2
ALC-WH8-MC044	1961023.1	4481922.1	9.4	Possible IS C2C seg 7
ALC-WH8-MC045	1960780.0	4481923.0	6.5	Debris
ALC-WH8-MC046	1960780.2	4481921.7	8.2	Debris
ALC-WH8-MC047	1960867.2	4481904.1	68.8	Possible IS H2HE
ALC-WH8-MC048	1960866.9	4481903.1	43.7	Possible IS H2HE
ALC-WH8-MC049	1960737.9	4481862.9	5.5	Unknown
ALC-WH8-MC050	1960627.7	4481883.0	0.7	IS ADC
ALC-WH8-MC051	1960811.0	4481851.3	8.4	IS H2HE
ALC-WH8-MC052	1960897.0	4481834.3	12	IS T&T seg 1
ALC-WH8-MC053	1961157.6	4481926.5	8.6	Possible IS SJC2
ALC-WH8-MC054	1961200.9	4481915.6	5	Unknown
ALC-WH8-MC055	1961305.5	4481888.8	10.2	Unknown
ALC-WH8-MC056	1961298.3	4481890.0	11.6	IS SJC seg 10
ALC-WH8-MC057	1961227.4	4481908.9	6	IS C2C seg 1
ALC-WH8-MC058	1961151.8	4481841.6	16.4	Possible IS SJC2
ALC-WH8-MC059	1961155.7	4481841.7	56.3	Possible IS SJC2
ALC-WH8-MC060	1961302.6	4481862.2	10.8	IS SJC seg 10
ALC-WH8-MC061	1961214.5	4481826.0	8.8	IS C2C seg 1
ALC-WH8-MC062	1961292.3	4481810.2	5.2	IS SJC seg 10
ALC-WH8-MC063	1961295.0	4481810.3	6	IS SJC seg 10
ALC-WH8-MC064	1961215.6	4481783.0	11.8	IS C2C seg 1
ALC-WH8-MC065	1961291.7	4481769.5	9.3	IS SJC seg 10
ALC-WH8-MC066	1961368.0	4481756.6	2.3	IS C2C seg 2A1
ALC-WH8-MC067	1961338.8	4481522.6	5.1	Unknown
ALC-WH8-MC068	1961316.4	4481526.6	176.7	Possible IS HK cable1
ALC-WH8-MC069	1961278.4	4481531.8	4.4	Possible IS SJC seg 10
ALC-WH8-MC070	1960769.8	4481610.1	3.4	Unknown
ALC-WH8-MC071	1961194.9	4481544.3	5.9	IS C2C seg 1
ALC-WH8-MC072	1961277.7	4481531.2	7.1	Possible IS SJC seg 10
ALC-WH8-MC073	1961315.3	4481525.8	250.3	Possible IS cable1
ALC-WH8-MC074	1961338.4	4481522.2	7.3	Unknown
ALC-WH8-MC075	1961363.2	4481518.2	5.9	IS C2C seg 2A1
ALC-WH8-MC076	1960992.6	4481575.4	6	Debris
ALC-WH8-MC077	1960946.7	4481582.5	9.5	Unknown
ALC-WH8-MC078	1960744.2	4481613.6	3.3	Possible IS H2HE
ALC-WH8-MC079	1960874.8	4481592.6	5.1	IS T&T seg 1
ALC-WH8-MC080	1960946.5	4481581.7	10.6	Unknown
ALC-WH8-MC081	1960992.5	4481574.6	14.5	Debris
ALC-WH8-MC082	1960874.6	4481592.3	5.9	IS T&T seg 1
ALC-WH8-MC083	1960797.8	4481604.2	42.9	Debris
ALC-WH8-MC084	1960799.7	4481603.7	38	Debris
ALC-WH8-MC085	1960771.2	4481607.2	9.5	Unknown
ALC-WH8-MC086	1961286.2	4481361.3	11.1	IS SJC seg 10
ALC-WH8-MC087	1961285.9	4481360.3	9	IS SJC seg 10
ALC-WH8-MC088	1961136.3	4481380.4	7.7	Unknown
ALC-WH8-MC089	1961106.6	4481385.7	45.9	IS HK cable1
ALC-WH8-MC090	1961104.7	4481384.0	43.2	IS HK cable1
ALC-WH8-MC091	1961087.3	4481387.2	7.5	Debris
ALC-WH8-MC092	1961082.2	4481388.7	3.4	Debris
ALC-WH8-MC093	1961081.2	4481388.4	4.7	Debris
ALC-WH8-MC094	1960680.8	4481621.7	56.6	Unknown
ALC-WH8-MC095	1960681.2	4481621.4	46.1	Unknown
ALC-WH8-MC096	1960661.6	4481625.3	13.3	IS T&T seg 2
ALC-WH8-MC097	1960661.8	4481625.1	8.3	IS T&T seg 2
ALC-WH8-MC098	1960596.7	4481634.2	5.2	Unknown
ALC-WH8-MC099	1960574.2	4481637.8	2.4	IS ADC
ALC-WH8-MC100	1960575.0	4481637.5	0.7	IS ADC
ALC-WH8-MC101	1960925.9	4481412.1	3.1	Possible IS T&T seg 1
ALC-WH8-MC102	1960924.5	4481410.7	5.1	Possible IS T&T seg 1
ALC-WH8-MC103	1961185.6	4481232.7	1.5	IS C2C seg 1
ALC-WH8-MC104	1960836.2	4481423.7	7.7	IS C2C seg 7
ALC-WH8-MC105	1960835.4	4481422.6	6.6	IS C2C seg 7
ALC-WH8-MC106	1961127.8	4481240.7	8.2	Debris
ALC-WH8-MC107	1961128.0	4481239.3	22	Debris
ALC-WH8-MC108	1961108.1	4481244.3	62.6	IS HK cable1
ALC-WH8-MC109	1961107.7	4481242.7	125.6	IS HK cable1
ALC-WH8-MC110	1961076.3	4481250.1	2.3	Unknown
ALC-WH8-MC111	1961075.9	4481248.5	7.6	Unknown
ALC-WH8-MC112	1960749.1	4481435.6	3.4	Debris
ALC-WH8-MC113	1960750.3	4481434.9	5.4	Debris
ALC-WH8-MC114	1960735.9	4481437.3	12.7	Debris
ALC-WH8-MC115	1960736.3	4481436.9	13.1	Debris
ALC-WH8-MC116	1961154.9	4481185.1	5.2	Debris
ALC-WH8-MC117	1961028.1	4481256.1	3.2	Possible IS T&T seg 1
ALC-WH8-MC118	1961027.4	4481255.9	5.1	Possible IS T&T seg 1
ALC-WH8-MC119	1960714.3	4481439.8	8.9	IS H2HE
ALC-WH8-MC120	1960713.2	4481439.8	16.4	IS H2HE

Contact Number	Easting (m)	Northing (m)	Amplitude (nT)	Description
ALC-WH8-MC121	1961115.6	4481190.3	32	IS HK cable1
ALC-WH8-MC122	1960993.9	4481260.8	1.7	Possible IS T&T seg 1
ALC-WH8-MC123	1960956.1	4481267.3	2.7	IS SJC2
ALC-WH8-MC124	1960955.3	4481266.8	1.9	IS SJC2
ALC-WH8-MC125	1961074.1	4481194.3	5	Unknown
ALC-WH8-MC126	1960646.3	4481449.2	6.5	IS T&T seg 2
ALC-WH8-MC127	1960643.5	4481449.1	5.7	IS T&T seg 2
ALC-WH8-MC128	1960936.5	4481270.4	3.5	Debris
ALC-WH8-MC129	1960935.8	4481269.8	5.2	Debris
ALC-WH8-MC130	1960624.3	4481453.0	5	OOS Hong-Kong-Amoy
ALC-WH8-MC131	1960622.2	4481451.4	5.2	OOS Hong-Kong-Amoy
ALC-WH8-MC132	1961041.5	4481198.5	2.9	IS T&T seg 1
ALC-WH8-MC133	1960608.5	4481454.8	49.5	Debris
ALC-WH8-MC134	1960608.2	4481453.5	74.8	Debris
ALC-WH8-MC135	1960903.5	4481276.4	8.3	Unknown
ALC-WH8-MC136	1961017.4	4481204.1	14.6	Debris
ALC-WH8-MC137	1960896.6	4481275.8	20.7	Unknown
ALC-WH8-MC138	1961008.4	4481206.4	5	Debris
ALC-WH8-MC139	1960885.0	4481278.7	9.6	Unknown
ALC-WH8-MC140	1960756.3	4481354.7	16.4	OOS Hong-Kong-Amoy
ALC-WH8-MC141	1960972.8	4481214.2	17.7	Possible OOS Hong-Kong-Amoy
ALC-WH8-MC142	1960959.4	4481215.8	8.4	OOS Hong-Kong-Amoy
ALC-WH8-MC143	1960835.8	4481286.6	4.6	Debris
ALC-WH8-MC144	1960836.3	4481285.0	8.2	Debris
ALC-WH8-MC145	1960535.5	4481464.9	28.7	Unknown
ALC-WH8-MC146	1960535.5	4481464.6	28.9	Unknown
ALC-WH8-MC147	1960875.8	4481225.7	10.2	Unknown
ALC-WH8-MC148	1960755.8	4481297.3	1.8	IS C2C seg 7
ALC-WH8-MC149	1960721.3	4481318.0	41.1	Possible IS T&T seg 2
ALC-WH8-MC150	1960721.6	4481317.2	52.6	Possible IS T&T seg 2
ALC-WH8-MC151	1960849.1	4481234.1	13	Debris
ALC-WH8-MC152	1960849.8	4481230.8	14.6	Debris
ALC-WH8-MC153	1960722.8	4481303.6	2.8	IS T&T seg 2
ALC-WH8-MC154	1960722.8	4481302.3	3.8	IS T&T seg 2
ALC-WH8-MC155	1960702.3	4481297.4	8.1	Debris
ALC-WH8-MC156	1960793.0	4481238.0	8	Unknown
ALC-WH8-MC157	1960666.0	4481312.4	34.5	IS ADC
ALC-WH8-MC158	1960665.8	4481311.1	14.2	IS ADC
ALC-WH8-MC159	1960695.7	4481289.3	23.2	Unknown
ALC-WH8-MC160	1960695.9	4481288.0	18.8	Unknown
ALC-WH8-MC161	1960640.4	4481314.3	3.2	IS H2HE
ALC-WH8-MC162	1960757.1	4481242.1	3.1	IS T&T seg 2
ALC-WH8-MC163	1960686.3	4481278.8	13.4	Unknown
ALC-WH8-MC164	1960687.4	4481277.5	10	Unknown
ALC-WH8-MC165	1960604.4	4481320.1	22.2	Unknown
ALC-WH8-MC166	1960727.9	4481246.3	21.5	Possible IS C2C seg 7
ALC-WH8-MC167	1960604.2	4481319.5	11.1	Unknown
ALC-WH8-MC168	1960594.3	4481321.5	11.8	Unknown
ALC-WH8-MC169	1960706.3	4481249.7	65.4	IS ADC
ALC-WH8-MC170	1960691.2	4481252.0	5.7	Unknown
ALC-WH8-MC171	1960669.7	4481259.9	6.3	Unknown
ALC-WH8-MC172	1960639.1	4481260.7	4.5	Possible IS H2HE
ALC-WH8-MC173	1960800.5	4481156.3	39.6	IS T&T seg 2
ALC-WH8-MC174	1960798.9	4481157.3	38	IS T&T seg 2
ALC-WH8-MC175	1960617.6	4481264.5	41.6	Possible IS H2HE
ALC-WH8-MC176	1960651.0	4481236.4	5.2	Unknown
ALC-WH8-MC177	1960631.2	4481216.3	7.8	IS H2HE
ALC-WH8-MC178	1960631.2	4481214.8	7.1	IS H2HE
ALC-WH8-MC179	1960616.2	4481198.3	6.2	Unknown
ALC-WH8-MC180	1960766.6	4481102.0	14.1	IS ADC
ALC-WH8-MC181	1960765.1	4481100.1	10.4	IS ADC
ALC-WH8-MC182	1960578.1	4481155.6	14.9	OOS Guam-Hong Kong
ALC-WH8-MC183	1960578.7	4481155.1	24.2	OOS Guam-Hong Kong
ALC-WH8-MC184	1960737.8	4481054.2	8.1	IS H2HE
ALC-WH8-MC185	1960736.7	4481054.4	15.5	IS H2HE
ALC-WH8-MC186	1960568.1	4481143.2	86.6	OOS SHT B
ALC-WH8-MC187	1960568.1	4481141.9	99.6	OOS SHT B
ALC-WH8-MC188	1960720.1	4481026.7	2.4	OOS Guam-Hong Kong
ALC-WH8-MC189	1960546.2	4481114.2	14.7	Unknown
ALC-WH8-MC190	1960518.5	4481084.7	4.1	Possible OOS Hong Kong-Manilla
ALC-WH8-MC191	1960520.3	4481083.9	24.8	Possible OOS Hong Kong-Manilla
ALC-WH8-MC192	1960690.6	4480976.0	9.8	Unknown
ALC-WH8-MC193	1960688.8	4480973.2	9	Unknown
ALC-WH8-MC194	1960689.4	4480971.7	23	Unknown
ALC-WH8-MC195	1960474.0	4481035.2	88.1	IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC196	1960474.7	4481032.0	79.8	IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC197	1960451.9	4481009.8	20.5	Unknown
ALC-WH8-MC198	1960455.5	4481007.8	84.3	Unknown
ALC-WH8-MC199	1960676.7	4480948.4	13	OOS SHT B
ALC-WH8-MC200	1960420.6	4480966.8	5.6	Unknown
ALC-WH8-MC201	1960406.8	4480952.4	21.9	Unknown
ALC-WH8-MC202	1960412.9	4480884.5	1.5	IS OLUHO
ALC-WH8-MC203	1960466.3	4480887.1	10.1	IS C2C seg 7
ALC-WH8-MC204	1960591.5	4480892.3	2.8	Possible IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC205	1960669.1	4480895.6	13.7	Unknown
ALC-WH8-MC206	1960687.4	4480896.0	21	Unknown
ALC-WH8-MC207	1960727.8	4480898.0	333.1	IS SJC2
ALC-WH8-MC208	1960779.6	4480900.6	6.9	Unknown
ALC-WH8-MC209	1960363.4	4480735.9	40.9	IS C2C seg 7
ALC-WH8-MC210	1960366.6	4480735.4	43	IS C2C seg 7
ALC-WH8-MC211	1960425.1	4480692.4	16.5	Unknown
ALC-WH8-MC212	1960615.2	4480795.0	2.4	OOS Hong Kong-Manilla
ALC-WH8-MC213	1960633.5	4480799.8	87.8	Possible IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC214	1960805.1	4480901.3	12.8	IS H2HE
ALC-WH8-MC215	1960628.9	4480742.1	1.4	OOS Hong Kong-Manilla
ALC-WH8-MC216	1960887.2	4480905.2	6.3	IS ADC
ALC-WH8-MC217	1960886.8	4480905.7	10.2	IS ADC
ALC-WH8-MC218	1960780.0	4480834.7	11.7	Unknown
ALC-WH8-MC219	1960667.5	4480750.3	135.1	Possible IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC220	1960810.7	4480841.4	5.4	Unknown
ALC-WH8-MC221	1960833.9	4480847.1	15	IS H2HE
ALC-WH8-MC222	1960986.9	4480909.5	77.5	Unknown
ALC-WH8-MC223	1960791.0	4480780.4	3.4	OOS SHT B
ALC-WH8-MC224	1960990.2	4480908.5	91.5	Unknown
ALC-WH8-MC225	1960808.2	4480784.5	33.7	Unknown
ALC-WH8-MC226	1960507.9	4480585.5	1.3	IS OLUHO
ALC-WH8-MC227	1960958.0	4480876.5	118.6	IS T&T seg 2
ALC-WH8-MC228	1960507.3	4480584.5	2.4	IS OLUHO
ALC-WH8-MC229	1960853.4	4480794.9	53.7	IS H2HE
ALC-WH8-MC230	1960559.7	4480600.6	126.1	Possible IS PLCN seg 1.4
ALC-WH8-MC231	1960559.7	4480599.0	82.5	Possible IS PLCN seg 1.4
ALC-WH8-MC232	1960961.6	4480821.8	16.3	Unknown
ALC-WH8-MC233	1961003.8	4480833.3	158.8	Debris
ALC-WH8-MC234	1960734.9	4480652.4	168.9	IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC235	1960741.0	4480654.9	143.3	IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC236	1961075.0	4480850.8	35.4	Unknown
ALC-WH8-MC237	1960854.5	4480689.4	31.9	Unknown
ALC-WH8-MC238	1960856.6	4480688.9	94.4	Unknown
ALC-WH8-MC239	1960871.9	4480694.5	5.5	Unknown
ALC-WH8-MC240	1960907.3	4480705.4	22.2	IS H2HE

Sample Number	Easting (m)	Northing (m)	Penetration (m)	Summary
ALC-CHK-BP001	1961000.33	4482912.08	0.00	ROCK
ALC-CHK-BP002	1960991.30	4482906.48	0.00	ROCK
ALC-CHK-BP003	1960982.25	4482900.87	0.11	SAND over ROCK
ALC-CHK-BP004	1960973.85	4482895.70	0.00	ROCK
ALC-CHK-BP005	1960973.70	4482885.06	0.00	ROCK

Sample Number	Easting (m)	Northing (m)	Penetration (m)	Summary
ALC-CHK-DP001	1960973.71	4482862.99	0.00	ROCK
ALC-CHK-DP002	1960973.35	4482836.41	0.00	BOULDERS
ALC-CHK-DP003	1960972.99	4482809.82	0.50	SAND
ALC-CHK-DP004	1960972.64	4482783.24	0.90	SAND
ALC-CHK-DP005	1960972.33	4482756.67	1.50	SAND
ALC-CHK-DP006	1960972.06	4482730.08	2.00	SAND
ALC-CHK-DP007	1960971.74	4482703.50	2.00	SAND

Sample Number	Easting (m)	Northing (m)	Summary
ALC-CHK-DS001	1960973.71	4482862.99	Two COBBLES
ALC-CHK-DS002	1960972.99	4482809.82	Loose gravelly coarse SAND
ALC-CHK-DS003	1960972.33	4482756.67	Loose slightly gravelly medium SAND
ALC-CHK-DS004	1960971.74	4482703.50	Loose very gravelly SAND

Contact Number	Easting (m)	Northing (m)	Dimensions	Description
ALC-WH8-SC001	1961226.1	4482789.1	1.6x1.7xnmh	Debris
ALC-WH8-SC002	1961227.8	4482768.7	1.1x1.1x0.5	Debris
ALC-WH8-SC003	1961262.1	4482766.8	9.2x1.5x0.6	Debris
ALC-WH8-SC004	1961141.3	4482676.3	1.3x1.1xnmh	Debris
ALC-WH8-SC005	1960833.3	4482637.4	1.8x1.2xnmh	Debris
ALC-WH8-SC006	1961201.3	4482629.9	2x1.2x<0.5	Debris
ALC-WH8-SC007	1960854.1	4482561.0	2.8x2.1xnmh	Debris
ALC-WH8-SC008	1960832.8	4482554.5	3.8x3.4xnmh	Debris
ALC-WH8-SC009	1960781.4	4482500.1	2x1.3xnmh	Debris
ALC-WH8-SC010	1961133.6	4482432.0	1.6x1.1xnmh	Debris
ALC-WH8-SC011	1960977.1	4482401.8	3x2.7xnmh	Debris
ALC-WH8-SC012	1961049.6	4482378.3	1x1.1xnmh	Debris
ALC-WH8-SC013	1961214.0	4482364.6	1.1x0.7x<0.5	Debris
ALC-WH8-SC014	1960505.8	4482367.4	2x1xnmh	Debris
ALC-WH8-SC015	1960536.1	4482349.3	1.5x0.8xnmh	Debris
ALC-WH8-SC016	1961005.3	4482332.2	3x1.5xnmh	Debris
ALC-WH8-SC018	1960883.0	4482288.7	3.2x1.4xnmh	Debris
ALC-WH8-SC030	1961104.3	4481916.9	5.2x2.8x<0.5	Debris
ALC-WH8-SC035	1961321.3	4481677.6	2x1.5xnmh	Debris
ALC-WH8-SC038	1961046.1	4481567.7	1x1xnmh	Debris
ALC-WH8-SC045	1961027.9	4481218.9	1.5x<1x<1	Debris
ALC-WH8-SC049	1960681.4	4481097.2	1.1x1.2x<1	Debris
ALC-WH8-SC050	1960601.2	4480834.6	2.2x1.5xnmh	Debris
ALC-WH8-SC051	1960647.2	4480843.9	3.3x2.4xnmh	Debris
ALC-WH8-SC052	1960505.8	4480746.2	2x1x<1	Debris
ALC-WH8-SC053	1960983.3	4480847.4	3.7x<1x<1	Debris
ALC-WH8-SC054	1961006.7	4480826.8	4.8x1x<1	Debris
ALC-WH8-SC055	1960933.8	4480496.3	3x<1x<1	Debris
ALC-WH8-SC058	1961035.2	4480265.6	11x3x<1	Debris
ALC-WH8-SC059	1961042.2	4480264.8	2.3x1.2x<1	Debris
ALC-WH8-SC062	1961170.2	4479711.2	2.6x<1xnmh	Debris
ALC-WH8-SC065	1961475.8	4479788.4	2x<1xnmh	Debris
ALC-WH8-SC066	1961484.4	4479784.6	1.5x<1x<1	Debris
ALC-WH8-SC067	1961656.0	4479876.5	2x<1x<1	Debris
ALC-WH8-SC070	1961719.7	4479799.7	1.6x<1x<1	Debris

Contact Number	Easting (m)	Northing (m)	Amplitude (nT)	Description
ALC-WH8-MC242	1960978.6	4480727.8	3.8	IS ADC
ALC-WH8-MC243	1960979.3	4480725.5	19.3	IS ADC
ALC-WH8-MC244	1961007.6	4480736.9	69.3	Unknown
ALC-WH8-MC245	1961008.6	4480735.0	9.5	Unknown
ALC-WH8-MC246	1961025.8	4480742.0	35.6	Possible IS T&T seg 2
ALC-WH8-MC247	1961024.9	4480739.9	23.4	Possible IS T&T seg 2
ALC-WH8-MC248	1960707.7	4480284.2	28	Unknown
ALC-WH8-MC249	1960755.0	4480303.1	26.9	Possible IS PLCN seg 1.4
ALC-WH8-MC250	1960754.8	4480300.8	28.2	Possible IS PLCN seg 1.4
ALC-WH8-MC251	1960924.7	4480378.3	184.1	IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC252	1960925.8	4480377.5	171.3	IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC253	1960953.5	4480391.0	12.4	Unknown
ALC-WH8-MC254	1960973.7	4480401.2	48.5	OOS SHT B
ALC-WH8-MC255	1960954.4	4480388.9	212.9	Unknown
ALC-WH8-MC256	1960977.2	4480398.3	14.6	OOS SHT B
ALC-WH8-MC257	1961059.5	4480435.2	13.6	Possible IS H2HE
ALC-WH8-MC258	1960816.9	4480272.7	7.7	Unknown
ALC-WH8-MC259	1961221.1	4480508.3	17.7	Unknown
ALC-WH8-MC260	1960953.8	4480331.0	190.9	IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC261	1961004.0	4480354.0	11.1	OOS SHT B
ALC-WH8-MC262	1961033.2	4480365.9	10.9	Unknown
ALC-WH8-MC263	1961071.0	4480381.2	13.3	IS H2HE
ALC-WH8-MC264	1961100.2	4480394.3	16.1	Unknown
ALC-WH8-MC265	1961382.7	4480088.1	4.7	Possible IS T&T seg 2
ALC-WH8-MC266	1961382.4	4480087.3	9.1	Possible IS T&T seg 2
ALC-WH8-MC267	1961345.3	4480065.9	2.4	IS ADC
ALC-WH8-MC268	1961264.8	4480020.0	152.9	IS H2HE and OOS SHT B
ALC-WH8-MC269	1961264.7	4480019.5	84.8	IS H2HE and OOS SHT B
ALC-WH8-MC270	1961247.1	4480009.6	20.3	Unknown
ALC-WH8-MC271	1961245.5	4480008.8	7.5	Unknown
ALC-WH8-MC272	1961180.5	4479971.7	33.4	IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC273	1961180.5	4479971.4	21.3	IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC274	1961110.1	4479931.4	74.1	Unknown
ALC-WH8-MC275	1961107.4	4479928.1	14.2	Unknown
ALC-WH8-MC276	1961094.5	4479920.2	28.8	Unknown
ALC-WH8-MC277	1961078.4	4479758.4	13.6	Unknown
ALC-WH8-MC278	1961136.5	4479788.1	7.8	Unknown
ALC-WH8-MC279	1961252.0	4479856.7	80.6	IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC280	1961252.3	4479856.2	64.8	IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC281	1961301.4	4479883.7	12.5	Unknown
ALC-WH8-MC282	1961363.7	4479920.9	16.9	IS H2HE
ALC-WH8-MC283	1961195.6	4479719.1	16.5	Possible IS SJC2
ALC-WH8-MC284	1961170.2	4479707.7	5.1	Debris
ALC-WH8-MC289	1961161.0	4479706.2	5.8	Unknown
ALC-WH8-MC290	1961169.4	4479710.9	9.1	Debris
ALC-WH8-MC291	1961195.6	4479723.1	21.9	Possible IS SJC2
ALC-WH8-MC292	1961208.2	4479724.4	7.7	Unknown
ALC-WH8-MC293	1961365.4	4479920.6	35	IS H2HE
ALC-WH8-MC294	1961279.8	4479809.9	194.3	Possible IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC295	1961216.0	4479728.0	6.7	Unknown
ALC-WH8-MC296	1961403.9	4479943.7	109	IS T&T seg 2 and OOS SHT B
ALC-WH8-MC297	1961287.1	4479762.0	8.2	Possible IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC298	1961306.5	4479766.3	189.8	Possible IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC299	1961306.0	4479768.4	126.6	Possible IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC300	1961392.2	4479876.3	7.5	Possible IS T&T seg 2
ALC-WH8-MC301	1961339.8	4479758.7	6.5	Unknown
ALC-WH8-MC302	1961421.6	4479892.5	58.9	IS H2HE
ALC-WH8-MC303	1961449.2	4479908.1	40.5	Possible OOS SHT B
ALC-WH8-MC304	1961387.2	4479803.9	28.9	Unknown
ALC-WH8-MC305	1961339.9	4479724.7	194.3	Possible IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC306	1961390.2	4479800.8	4.1	Debris
ALC-WH8-MC307	1961399.4	4479804.9	12.9	Possible IS T&T seg 2
ALC-WH8-MC308	1961415.9	4479817.2	29.4	Possible IS T&T seg 2
ALC-WH8-MC309	1961484.7	4479928.5	68.6	Unknown
ALC-WH8-MC310	1961546.2	4479964.1	7.6	Unknown
ALC-WH8-MC311	1961496.0	4479850.6	11.4	IS H2HE
ALC-WH8-MC312	1961497.9	4479848.7	12.2	IS H2HE
ALC-WH8-MC313	1961571.7	4479880.9	21.2	Unknown
ALC-WH8-MC314	1961541.0	4479867.9	3.4	OOS SHT B
ALC-WH8-MC315	1961541.5	4479868.9	4.2	OOS SHT B
ALC-WH8-MC316	1961570.9	4479881.7	32.6	Unknown
ALC-WH8-MC317	1961599.8	4479893.9	2.4	IS ADC
ALC-WH8-MC318	1961600.2	4479891.8	6.3	IS ADC
ALC-WH8-MC319	1961640.4	4479911.4	82.9	Unknown
ALC-WH8-MC320	1961642.3	4479910.6	263.6	Unknown
ALC-WH8-MC321	1961660.8	4479920.8	4.1	IS T&T seg 1
ALC-WH8-MC322	1961692.0	4479907.6	33.9	Unknown
ALC-WH8-MC323	1961691.0	4479881.5	10.7	Debris
ALC-WH8-MC324	1961690.3	4479869.0	16.3	Possible IS T&T seg 1
ALC-WH8-MC325	1961689.4	4479843.7	40.2	IS ADC and IS T&T seg 1
ALC-WH8-MC326	1961687.6	4479816.5	76.1	Debris
ALC-WH8-MC327	1961738.5	4479822.6	8.6	IS ADC
ALC-WH8-MC328	1961737.7	4479813.0	6	Unknown
ALC-WH8-MC329	1961734.8	4479772.3	3	Debris
ALC-WH8-MC330	1961733.9	4479758.0	28.8	IS T&T seg 1
ALC-WH8-MC331	1961738.6	4479756.5	14.2	IS T&T seg 1
ALC-WH8-MC332	1961739.6	4479769.8	3.1	Debris
ALC-WH8-MC333	1961744.5	4479824.8	5.2	IS ADC
ALC-WH8-MC334	1961686.8	4479796.7	117	Debris
ALC-WH8-MC335	1961827.0	4479724.9	19.1	Debris
ALC-WH8-MC336	1961807.0	4479719.5	6.2	Unknown
ALC-WH8-MC337	1961789.1	4479714.1	3.2	Debris
ALC-WH8-MC338	1961757.0	4479706.6	7	IS T&T seg 1
ALC-WH8-MC339	1961759.4	4479702.6	8.1	IS T&T seg 1

CARTOGRAPHIC SYMBOLS

- KP, KPR: Post survey route with kilometre post and reverse kilometre post
- Adjacent route
- BMH/AC/BU: Beach manhole / Alter course / Branching Unit
- POL/CX/PX: Point on line / Cable crossing / Pipeline crossing
- Coastline (from Admiralty charts)
- Chart matchline
- Submerged wreck / Exposed wreck / Obstruction / Well / Platform / Explosives dumping ground and symbol or line feature in grey, plotted from desk top study (as-found in magenta). (for general symbols and abbreviations refer to British Admiralty Chart)
- Telecommunications cable position, In-service/Out of service/Planned (as-found in magenta)
- Pipeline position, In-service/Out of service/Planned (as-found in magenta)
- Power cable position, In-service/Out of service/Planned (as-found in magenta)
- Maritime boundaries
- Restricted zones and special areas
- Concession block

BATHYMETRY

- 30: Bathymetric contours in metres. Contour interval may be reduced to aid in clarity.
- Approximate limit of swath bathymetry coverage (shown only in areas of flat seabed)
- 6°: Downslope gradient in degrees (°) as measured over the shortest significant distance

SEABED FEATURES AND SHALLOW GEOLOGY

- cor: Coral
- fs: Fine sediment (predominantly CLAY/SILT)
- cs: Coarse sediment (SAND and GRAVEL)
- vcs: Very coarse sediment (COBBLES and BOULDERS)
- fs/cs/vcs: Very dense/Very stiff sediment
- fs/cs/vcs: Subcropping ROCK with predominant sediment classification (sediment thickness < target burial depth)
- r: ROCK outcrop
- Sediment or feature boundary
- Inferred sediment or feature boundary
- Approximate limit of side scan sonar coverage and survey swath
- Seabed scar (trawl or anchor)
- MC001 5.0: Unidentified magnetic anomaly with reference number and amplitude (in nano-Tesla)
- MC002 5.0: Cable/Pipeline position, as determined by magnetometer, with reference number and amplitude (in nano-Tesla)
- SC001 5x5x1: Isolated sonar contact with reference number (length x width x height in metres where measurable; nmh = no measurable height)
- 50x0.5x1: Linear sonar contact, dashed where partially buried
- SC001 20x10x7: Located wreck with reference no. (length x width x height in metres where measurable)
- SEI001 -2.5: Seimic contact with reference number (level at the top of contact is stated in metres, +/- equivalent to above or below ambient seabed)
- GC001: Gravity core (GC); Grab sample (GS) location with reference number
- CP001: MiniCPT (CP) location with reference number
- 0.5: Small outcrop of rock with height in metres if discernible
- d/D: Seabed depression or pockmark with diameter (d) and depth (D) in metres, where discernible
- 50/3: Orientation of sandwave crest (with wavelength and height in metres)
- 4/0.8: Orientation of megaripple crest (with wavelength and height in metres)
- Orientation of sediment ribbon
- -25: Fault with depth below seafloor (Hachures on down side)
- BP001 / BS001: Beach probe (BP); Beach sample (BS) location with reference number
- DP001 / DS001: Diver probe (DP); Diver sample (DS) location with reference number

Note: Contours and slope notations in this chart were derived from the optimized grid of bathymetry as per the actual data density. Seabed morphological analysis based on side-scan sonar images gives a complementary presentation for localized terrain features. Due to physical and operational limitations, resolution of this chart degrades with increasing water depths and some localized seabed features are not expected to be fully resolved. This chart serves the general purposes of route engineering and cable installation. Closer inspections are recommended for operations sensitive to small terrain features in deep waters.

CHART COMMENT:

BATHYMETRY	Along Final Route	Within Survey Corridor
Minimum depth (m)	~6.3 (above LAT, estimated)	83.1 (above LAT, on land)
Maximum depth (m)	29.2	29.5
Maximum gradient (°)	13 (on land)	66

From the BMH, the route heads briefly south-southwest and doglegs nearshore to a more southerly direction. It then starts to curve to southeast from the central portion of this chart.
The seabed is generally gentle off the coastline area. Moderate to very steep slopes are locally present with different features such as rocky areas, depressions, cable installation trenches.

SEABED FEATURES
Scattered BOULDERS (height: <1m) and scattered patches of dumped materials were mapped mainly near the coastline in the northern part of the chart.
Scattered debris/patches of debris, depressions (diameter: <5m, depth: <1m) and scars are present.
Sonar Contacts: ALC-WH8-SC001 to SC062 and ALC-WH8-SC064 to SC070.
Magnetometer Contacts: ALC-WH8-MC001 to MC284 and ALC-WH8-MC289 to MC339.
Seismic Contacts: Nil.

SHALLOW GEOLOGY
Rocky areas and subcropping areas were mapped in the northern and the southern part of the chart.
The seabed mainly features >5m of very soft to soft CLAY. Superficial sandy sediments were observed in the northern part of the chart close to the shoreline.
Sediment Samples: ALC-CHK-BP001 to BP004, ALC-CHK-DP001 to DP007, ALC-CHK-DS001 to DS004, ALC-CHK-GS001 to GS003 and ALC-CHK-GC001.
CPT: Nil.

ADDITIONAL INFORMATION
The route crosses 6 IS cables and 6 OOS cables.
The route exits Declared Minefield - East Lamma Channel and Inshore Traffic Zone.
The route runs inside Hong Kong waters and Guangzhou VTS.

GENERAL NOTES

Shallow Water

Survey vessel	MV Wing Hung 8
Surface positioning system	NovAtel GNSS Position System Qinsy Navigation System
Underwater positioning System	Kongsberg microPAP 200 USBL System
Bathymetry	Kongsberg EA440 Singlebeam Echo Sounder System R2Sonic Sonic 2024 MBES System
Morphology and stratigraphy	EdgeTech 4205 SSS System Innomar SES-2000 medium-100 SBP System C-Boom Low Voltage Boomer System
Magnetometer survey	Geometrics G-882 Marine Magnetometer

Target burial depth: 5m within Hong Kong Waters
Descriptive terms and definitions: The criteria used for interpretations and descriptions are presented in survey reports

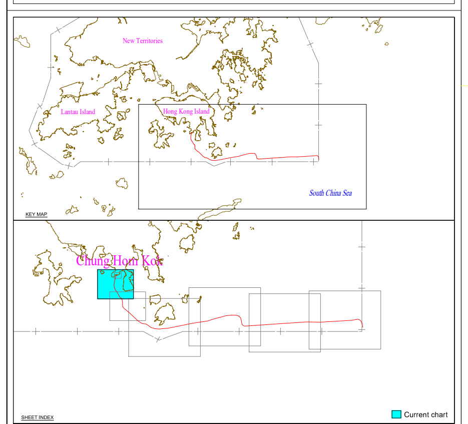
GEODETIC PARAMETERS

Ellipsoidal parameters
Ellipsoid : WGS84
Semi-major axis (a) (m) : 6378137.000
Inverse flattening (1/f) : 298.257223563

Projection parameters
Projection : Mercator
Longitude of origin : 110°E
Standard parallel : 10°N
Scale factor : 1
False easting : 1 500 000
False northing : 2 000 000

VERTICAL DATUM

In Inshore and Shallow Water Survey charts: Bathymetry data has been reduced to Low Astronomical Tide (LAT) using the relationship between LAT and MSL at Quarry Bay (7110) as stated in Admiralty Tide Tables, Volume 6, 2023 and tidal measurements at the tide gauge installed at Tai Miu Wan.



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Survey date: August 2023

Scale : NATURAL SCALE 1 : 5,000 at 10°N
(At mid-latitude of chart) TRUE SCALE 1 : 4702.47
0 100 200 300 400 500 m

Landing Party : 中国电信 CHINA TELECOM
Contractor : HMNTECH
Surveyor : EGS EARTH SCIENCES & SURVEYING
EGS JOB NO.: HK268023

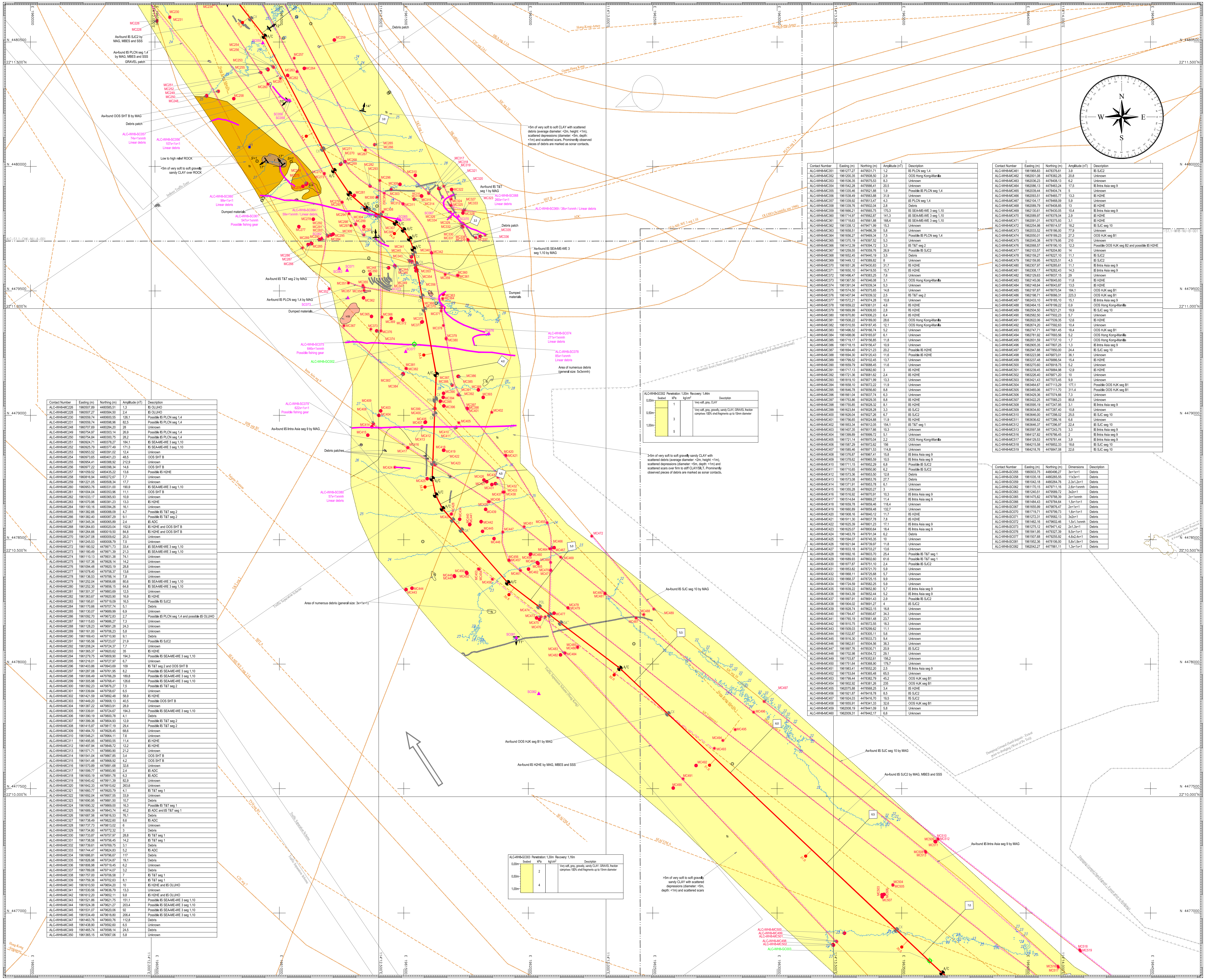
Project name: Asia Link Cable System (ALC) CHK(Hongkong) to HKSAR Boundary Marine Route Survey

Document title: CHK(Hongkong) to HKSAR Boundary NORTH UP CHART CHART NO. 001 OF 002 (KP 0.00 - KP 3.49)

Rev	Date	Prepared by	Checked by	Approved by
1.2	Jul 2024	Chester Quek	Howard Wang	Even Mak
1.1	Dec 2023	Chester Quek	Jacky Lee	Even Mak
1	Dec 2023	Chester Quek	Jacky Lee	Even Mak

Draft Final

Route based upon: ALC S1.1 CHK(Hong Kong) to HKSAR Boundary RPL 2-04 240718.xls
File name: ALC-S1.1-CHK-NU-A-001



Contact Number	Easting (m)	Northing (m)	Amplitude (nT)	Description
ALC-WH8-MC226	1960507.89	4480585.51	1.3	IS OLUHO
ALC-WH8-MC228	1960507.27	4480584.50	2.4	IS OLUHO
ALC-WH8-MC230	1960559.74	4480600.55	126.1	Possible IS PLCN seg 1.4
ALC-WH8-MC231	1960559.74	4480598.96	82.5	Possible IS PLCN seg 1.4
ALC-WH8-MC248	1960707.69	4480284.20	28	Unknown
ALC-WH8-MC249	1960754.97	4480303.14	26.9	Possible IS PLCN seg 1.4
ALC-WH8-MC250	1960754.84	4480300.75	28.2	Possible IS PLCN seg 1.4
ALC-WH8-MC251	1960924.71	4480378.27	184.1	IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC252	1960925.79	4480377.49	171.3	IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC253	1960953.52	4480391.02	12.4	Unknown
ALC-WH8-MC254	1960973.65	4480401.23	48.5	OOS SHT B
ALC-WH8-MC255	1960954.41	4480388.92	212.9	Unknown
ALC-WH8-MC256	1960977.22	4480398.34	14.6	OOS SHT B
ALC-WH8-MC257	1961059.52	4480435.22	13.6	Possible IS H2HE
ALC-WH8-MC258	1960816.94	4480272.67	7.7	Unknown
ALC-WH8-MC259	1961221.05	4480508.34	17.7	Unknown
ALC-WH8-MC260	1960953.76	4480331.00	190.9	IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC261	1961004.04	4480353.96	11.1	OOS SHT B
ALC-WH8-MC262	1961033.17	4480365.93	10.9	Unknown
ALC-WH8-MC263	1961070.96	4480381.23	13.3	IS H2HE
ALC-WH8-MC264	1961100.16	4480394.26	16.1	Unknown
ALC-WH8-MC265	1961382.66	4480088.09	4.7	Possible IS T&T seg 2
ALC-WH8-MC266	1961382.40	4480087.29	9.1	Possible IS T&T seg 2
ALC-WH8-MC267	1961345.34	4480065.89	2.4	IS ADC
ALC-WH8-MC268	1961264.83	4480020.04	152.9	IS H2HE and OOS SHT B
ALC-WH8-MC269	1961264.66	4480019.50	84.8	IS H2HE and OOS SHT B
ALC-WH8-MC270	1961247.08	4480009.62	20.3	Unknown
ALC-WH8-MC271	1961245.53	4480008.79	7.5	Unknown
ALC-WH8-MC272	1961180.52	4479971.73	33.4	IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC273	1961180.49	4479971.39	21.3	IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC274	1961110.13	4479931.38	74.1	Unknown
ALC-WH8-MC275	1961107.36	4479928.14	14.2	Unknown
ALC-WH8-MC276	1961094.48	4479920.19	28.8	Unknown
ALC-WH8-MC277	1961078.40	4479758.37	13.6	Unknown
ALC-WH8-MC278	1961136.53	4479788.14	7.8	Unknown
ALC-WH8-MC279	1961252.04	4479856.68	80.6	IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC280	1961252.30	4479856.15	64.8	IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC281	1961301.37	4479883.69	12.5	Unknown
ALC-WH8-MC282	1961363.67	4479920.90	16.9	IS H2HE
ALC-WH8-MC283	1961195.61	4479719.09	16.5	Possible IS SJC2
ALC-WH8-MC284	1961170.66	4479707.74	5.1	Debris
ALC-WH8-MC285	1961130.07	4479689.99	6.9	Unknown
ALC-WH8-MC286	1961092.70	4479672.83	2.7	Possible IS PLCN seg 1.4 and possible IS OLUHO
ALC-WH8-MC287	1961115.63	4479686.27	7.3	Unknown
ALC-WH8-MC288	1961128.23	4479691.28	24.3	Unknown
ALC-WH8-MC289	1961161.00	4479706.23	5.8	Unknown
ALC-WH8-MC290	1961169.43	4479710.90	9.1	Debris
ALC-WH8-MC291	1961195.56	4479723.07	21.9	Possible IS SJC2
ALC-WH8-MC292	1961208.24	4479724.37	7.7	Unknown
ALC-WH8-MC293	1961365.37	4479920.62	35	IS H2HE
ALC-WH8-MC294	1961279.75	4479809.90	194.3	Possible IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC295	1961216.01	4479727.97	6.7	Unknown
ALC-WH8-MC296	1961403.86	4479943.69	109	IS T&T seg 2 and OOS SHT B
ALC-WH8-MC297	1961287.08	4479761.95	8.2	Possible IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC298	1961306.49	4479766.29	189.8	Possible IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC299	1961305.98	4479768.41	126.6	Possible IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC300	1961392.23	4479876.27	7.5	Possible IS T&T seg 2
ALC-WH8-MC301	1961339.84	4479758.67	6.5	Unknown
ALC-WH8-MC302	1961421.59	4479892.48	58.9	IS H2HE
ALC-WH8-MC303	1961449.20	4479908.13	40.5	Possible OOS SHT B
ALC-WH8-MC304	1961387.22	4479803.91	28.9	Unknown
ALC-WH8-MC305	1961339.91	4479724.67	194.3	Possible IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC306	1961390.19	4479800.78	4.1	Debris
ALC-WH8-MC307	1961399.36	4479804.93	12.9	Possible IS T&T seg 2
ALC-WH8-MC308	1961415.87	4479817.19	29.4	Possible IS T&T seg 2
ALC-WH8-MC309	1961484.70	4479928.45	68.6	Unknown
ALC-WH8-MC310	1961546.21	4479964.11	7.6	Unknown
ALC-WH8-MC311	1961495.95	4479850.55	11.4	IS H2HE
ALC-WH8-MC312	1961497.94	4479848.72	12.2	IS H2HE
ALC-WH8-MC313	1961571.71	4479880.90	21.2	Unknown
ALC-WH8-MC314	1961541.04	4479867.85	3.4	OOS SHT B
ALC-WH8-MC315	1961541.48	4479868.92	4.2	OOS SHT B
ALC-WH8-MC316	1961570.89	4479881.68	32.6	Unknown
ALC-WH8-MC317	1961599.77	4479893.90	2.4	IS ADC
ALC-WH8-MC318	1961600.19	4479891.78	6.3	IS ADC
ALC-WH8-MC319	1961640.42	4479911.39	82.9	Unknown
ALC-WH8-MC320	1961642.33	4479910.62	263.6	Unknown
ALC-WH8-MC321	1961660.77	4479920.79	4.1	IS T&T seg 1
ALC-WH8-MC322	1961692.04	4479907.55	33.9	Unknown
ALC-WH8-MC323	1961690.95	4479881.50	10.7	Debris
ALC-WH8-MC324	1961690.52	4479869.00	16.3	Possible IS T&T seg 1
ALC-WH8-MC325	1961689.39	4479843.74	40.2	IS ADC and IS T&T seg 1
ALC-WH8-MC326	1961687.56	4479816.53	76.1	Debris
ALC-WH8-MC327	1961738.49	4479822.60	8.6	IS ADC
ALC-WH8-MC328	1961737.73	4479813.02	6	Unknown
ALC-WH8-MC329	1961734.80	4479772.32	3	Debris
ALC-WH8-MC330	1961733.87	4479757.97	28.8	IS T&T seg 1
ALC-WH8-MC331	1961738.58	4479756.45	14.2	IS T&T seg 1
ALC-WH8-MC332	1961739.61	4479769.75	3.1	Debris
ALC-WH8-MC333	1961744.47	4479824.83	5.2	IS ADC
ALC-WH8-MC334	1961686.81	4479796.67	117	Debris
ALC-WH8-MC335	1961826.98	4479724.87	19.1	Debris
ALC-WH8-MC336	1961806.98	4479719.45	6.2	Unknown
ALC-WH8-MC337	1961789.08	4479714.07	3.2	Debris
ALC-WH8-MC338	1961757.00	4479706.58	7	IS T&T seg 1
ALC-WH8-MC339	1961759.36	4479702.63	8.1	IS T&T seg 1
ALC-WH8-MC340	1961610.50	4479654.20	10	IS H2HE and IS OLUHO
ALC-WH8-MC341	1961530.56	4479636.79	13.3	Unknown
ALC-WH8-MC342	1961612.20	4479652.11	9.8	IS H2HE and IS OLUHO
ALC-WH8-MC343	1961521.86	4479621.75	151.1	Possible IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC344	1961524.38	4479621.27	203.4	Possible IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC345	1961531.07	4479620.06	92	Possible IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC346	1961534.49	4479618.80	206.4	Possible IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC347	1961463.76	4479600.76	112.8	Debris
ALC-WH8-MC348	1961438.90	4479592.60	6.5	Unknown
ALC-WH8-MC349	1961465.74	4479598.14	24.5	Debris
ALC-WH8-MC350	1961365.15	4479567.06	5.8	Unknown

Contact Number	Easting (m)	Northing (m)	Amplitude (nT)	Description
ALC-WH8-MC351	1961277.27	4479531.71	1.2	IS PLCN seg 1.4
ALC-WH8-MC352	1961200.35	4479508.50	2.9	OOS Hong Kong-Manilla
ALC-WH8-MC353	1961536.35	4479575.53	8.3	Unknown
ALC-WH8-MC354	1961542.28	4479566.41	20.5	Unknown
ALC-WH8-MC355	1961335.46	4479521.88	1.9	Possible IS PLCN seg 1.4
ALC-WH8-MC356	1961538.49	4479563.88	31.9	Unknown
ALC-WH8-MC357	1961339.92	4479513.47	4.3	IS PLCN seg 1.4
ALC-WH8-MC358	1961339.76	4479502.04	2.8	Debris
ALC-WH8-MC359	1961666.21	4479565.75	170.3	IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC360	1961714.97	4479562.87	141.3	IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC361	1961718.63	4479561.88	168.4	IS SEA-ME-WE 3 seg 1.10
ALC-WH8-MC362	1961338.12	4479471.99	15.3	Unknown
ALC-WH8-MC363	1961658.51	4479486.39	5.8	Unknown
ALC-WH8-MC364	1961656.27	4479469.34	7.5	Possible IS PLCN seg 1.4
ALC-WH8-MC365	1961370.19	4479397.52	5.3	Unknown
ALC-WH8-MC366	1961412.39	4479394.72	3.3	IS T&T seg 2
ALC-WH8-MC367	1961259.55	4479359.76	26.9	Possible IS SJC2
ALC-WH8-MC368	1961652.45	4479440.19	3.5	Debris
ALC-WH8-MC369	1961449.12	4479389.82	8	Unknown
ALC-WH8-MC370	1961651.26	4479430.83	31.7	IS H2HE
ALC-WH8-MC371	1961650.10	4479419.55	15.7	IS H2HE
ALC-WH8-MC372	1961496.47	4479383.25	7.6	Unknown
ALC-WH8-MC373	1961367.50	4479346.08	3.1	OOS Hong Kong-Manilla
ALC-WH8-MC374	1961391.04	4479339.34	5.3	Unknown
ALC-WH8-MC375	1961574.50	4479375.65	14.8	Unknown
ALC-WH8-MC376	1961407.94	4479339.32	2.5	IS T&T seg 2
ALC-WH8-MC377	1961572.21	4479374.28	10.8	Unknown
ALC-WH8-MC378	1961659.22	4479361.01	4.6	IS H2HE
ALC-WH8-MC379	1961669.99	4479309.93	2.8	IS H2HE
ALC-WH8-MC380	1961670.80	4479306.23	6.4	IS H2HE
ALC-WH8-MC381	1961508.22	4479189.00	28.6	OOS Hong Kong-Manilla
ALC-WH8-MC382	1961510.55	4479187.45	12.1	OOS Hong Kong-Manilla
ALC-WH8-MC383	1961496.52	4479166.74	5.2	Unknown
ALC-WH8-MC384	1961498.06	4479165.97	6.1	Unknown
ALC-WH8-MC385	1961719.17	4479156.85	11.8	Unknown
ALC-WH8-MC386	1961718.15	4479156.47	10.9	Unknown
ALC-WH8-MC387	1961694.40	4479121.23	20.2	Possible IS H2HE
ALC-WH8-MC388	1961694.30	4479120.43	11.6	Possible IS H2HE
ALC-WH8-MC389	1961799.52	4479102.45	13.7	Unknown
ALC-WH8-MC390	1961659.79	4479088.45	11.6	Unknown
ALC-WH8-MC391	1961717.13	4479082.60	3	IS H2HE
ALC-WH8-MC392	1961721.36	4479081.62	2.4	IS H2HE
ALC-WH8-MC393	1961819.10	4479071.99	13.3	Unknown
ALC-WH8-MC394	1961658.10	4479072.22	11.9	Unknown
ALC-WH8-MC395	1961646.78	4479056.60	8.8	Unknown
ALC-WH8-MC396	1961661.04	4479037.74	6.3	Unknown
ALC-WH8-MC397	1961753.86	4479029.35	8.8	IS H2HE
ALC-WH8-MC398	1961755.85	4479028.32	8.1	IS H2HE
ALC-WH8-MC399	1961623.84	4479028.28	3.3	IS SJC2
ALC-WH8-MC400	1961626.04	4479027.26	6.7	IS SJC2
ALC-WH8-MC401	1961756.65	4479024.88	11.9	IS H2HE
ALC-WH8-MC402	1961853.34	4479012.05	154.1	IS T&T seg 1
ALC-WH8-MC403	1961407.35	4479017.66	10.3	Unknown
ALC-WH8-MC404	1961399.89	4478999.72	5.1	Unknown
ALC-WH8-MC405	1961721.14	4478970.04	2.2	OOS Hong Kong-Manilla
ALC-WH8-MC406	1961587.29	4478972.62	156	Unknown
ALC-WH8-MC407	1961585.46	4478971.53	114.8	Unknown
ALC-WH8-MC408	1961376.87	4478967.41	15.8	IS Intra Asia seg 9
ALC-WH8-MC409	1961378.62	4478965.59	10.5	IS Intra Asia seg 9
ALC-WH8-MC410	1961711.15	4478952.29	6.8	Possible IS SJC2
ALC-WH8-MC411	1961710.65	4478950.90	6.2	Possible IS SJC2
ALC-WH8-MC412	1961573.36	4478953.50	12.8	Debris
ALC-WH8-MC413	1961573.08	4478953.76	27.7	Debris
ALC-WH8-MC414	1961371.91	4478953.78	6.1	Unknown
ALC-WH8-MC415	1961355.28	4478920.27	3	Unknown
ALC-WH8-MC416	1961516.92	4478870.91	10.3	IS Intra Asia seg 9
ALC-WH8-MC417	1961514.64	4478869.27	11.4	IS Intra Asia seg 9
ALC-WH8-MC418	1961659.78	4478859.46	118.4	Unknown
ALC-WH8-MC419	1961660.89	4478859.48	132.7	Unknown
ALC-WH8-MC420	1961908.16	4478840.12	11.7	IS H2HE
ALC-WH8-MC421	1961911.30	4478837.78	7.8	IS H2HE
ALC-WH8-MC422	1961625.39	4478801.23	17.1	IS Intra Asia seg 9
ALC-WH8-MC423	1961625.07	4478800.64	18.4	IS Intra Asia seg 9
ALC-WH8-MC424	1961463.79	4478791.04	6.2	Debris
ALC-WH8-MC425	1961594.07	4478745.35	10	Unknown
ALC-WH8-MC426	1961821.94	4478739.97	11.8	Unknown
ALC-WH8-MC427	1961833.18	4478733.27	13.6	Unknown
ALC-WH8-MC428	1961692.16	4478603.70	25.4	Possible IS T&T seg 1
ALC-WH8-MC429	1961689.93	4478602.60	61.6	Possible IS T&T seg 1
ALC-WH8-MC430	1961877.87	4478751.10	2.4	Possible IS SJC2
ALC-WH8-MC431	1961853.82	4478721.70	5.9	Unknown
ALC-WH8-MC432	1961868.11	4478725.68	5.7	Unknown
ALC-WH8-MC433	1961868.37	4478725.15	9.9	Unknown
ALC-WH8-MC434	1961724.59	4478582.25	5.9	Unknown
ALC-WH8-MC435	1961839.22	4478652.80	5.7	IS Intra Asia seg 9
ALC-WH8-MC436	1961843.39	4478652.44	5.2	IS Intra Asia seg 9
ALC-WH8-MC437	1961897.91	4478691.43	2.9	Possible IS SJC2
ALC-WH8-MC438	1961904.02	4478691.27	4	IS SJC2
ALC-WH8-MC439	1961828.74	4478622.15	16.8	Unknown
ALC-WH8-MC440	1961764.47	4478560.67	34.3	Unknown
ALC-WH8-MC441	1961765.19	4478561.48	23.7	Unknown
ALC-WH8-MC442	1961810.75	4478572.55	18.3	Unknown
ALC-WH8-MC443	1961509.03	4478299.62	11.1	Unknown
ALC-WH8-MC444	1961532.87	4478305.11	5.6	Unknown
ALC-WH8-MC445	1961816.30	4478533.73	9.4	Unknown
ALC-WH8-MC446	1961862.61	4478504.56	38.3	Unknown
ALC-WH8-MC447	1961897.76	4478530.71	20.9	IS SJC2
ALC-WH8-MC448	1961702.98	4478354.72	29.1	Unknown
ALC-WH8-MC449	1961703.87	4478352.61	156.2	Unknown
ALC-WH8-MC450	1961751.64	4478368.90	179.7	Unknown
ALC-WH8-MC451	1961983.41	4478552.20	2.5	IS Intra Asia seg 9
ALC-WH8-MC452	1961753.64	4478365.48	65.5	Unknown
ALC-WH8-MC453	1961799.44	4478382.79	45.2	OOS HJK seg B1
ALC-WH8-MC454	1961802.92	4478381.26	235	OOS HJK seg B1
ALC-WH8-MC455	1962075.88	4478568.25	3.4	IS H2HE
ALC-WH8-MC456	1961921.87	4478418.78	8.5	IS SJC2
ALC-WH8-MC457	1961924.03	4478416.70	19.5	IS SJC2
ALC-WH8-MC458	1961855.91	4478341.33	32.6	OOS HJK seg B1
ALC-WH8-MC459	1962008.19	4478441.09	5.8	Unknown
ALC-WH8-MC460	1962009.31	4478442.17	6.6	Unknown

Contact Number	Easting (m)	Northing (m)	Amplitude (nT)	Description
ALC-WH8-MC461	1961968.83	4478376.61	3.9	IS SJC2
ALC-WH8-MC462	1962001.08	4478382.25	20.8	Unknown
ALC-WH8-MC463	1962036.23	4478408.13	6.2	Unknown
ALC-WH8-MC464	1962086.13	4478463.24	17.5	IS Intra Asia seg 9
ALC-WH8-MC465	1962039.44	4478404.74	5	Unknown
ALC-WH8-MC466	1962093.51	4478465.77	13.3	IS H2HE
ALC-WH8-MC467	1962104.17	4478468.09	5.9	Unknown
ALC-WH8-MC468	1962089.79	4478408.85	13	IS H2HE
ALC-WH8-MC469	1962130.61	4478430.05	10.4	IS Intra Asia seg 9
ALC-WH8-MC470	1962089.97	4478378.04	2.9	IS H2HE
ALC-WH8-MC471	1962091.01	4478375.93	3.1	IS H2HE
ALC-WH8-MC472	1962254.98	4478514.57	18.2	IS SJC seg 10
ALC-WH8-MC473	1962033.52	4478186.00	77.9	Unknown
ALC-WH8-MC474	1962050.01	4478189.23	27.3	OOS HJK seg B1
ALC-WH8-MC475	1962045.38	4478179.95	210	Unknown
ALC-WH8-MC476	1962068.57	4478190.10	12.3	Possible OOS HJK seg B2 and possible IS H2HE
ALC-WH8-MC477	1962103.57	4478204.80	14	Unknown
ALC-WH8-MC478	1962159.27	4478227.10	11.1	IS SJC2
ALC-WH8-MC479	1962159.95	4478225.51	4.5	IS SJC2
ALC-WH8-MC480	1962307.97	4478285.61	11.1	IS Intra Asia seg 9
ALC-WH8-MC481	1962308.17	4478282.43	14.3	IS Intra Asia seg 9
ALC-WH8-MC482	1962129.63	4478037.15	29	Unknown
ALC-WH8-MC483	1962145.06	4478045.93	11.8	IS H2HE
ALC-WH8-MC484	1962148.64	4478043.87	13.5	IS H2HE
ALC-WH8-MC485	1962197.87	4478070.54	184.1	OOS HJK seg B1
ALC-WH8-MC486	1962198.71	4478066.31	223.3	OOS HJK seg B1
ALC-WH8-MC487	1962433.10	4478185.10	15.1	IS Intra Asia seg 9
ALC-WH8-MC488	1962464.15	4478199.22	0.9	OOS Hong Kong-Manilla
ALC-WH8-MC489	1962504.50	4478221.21	19.9	IS SJC seg 10
ALC-WH8-MC490	1962582.50	4477502.23	5.7	Unknown
ALC-WH8-MC491	1962622.06	4477539.35	12.6	IS H2HE
ALC-WH8-MC492	1962674.20	4477592.63	10.4	Unknown
ALC-WH8-MC493	1962747.71	4477661.45	18.4	OOS HJK seg B1
ALC-WH8-MC494	1962781.92	4477693.56	5.2	OOS Hong Kong-Manilla
ALC-WH8-MC495	1962831.59	4477737.10	1.7	OOS Hong Kong-Manilla
ALC-WH8-MC496	1962905.35	4477807.25	1.3	IS Intra Asia seg 9
ALC-WH8-MC497	1962947.88	4477850.00	24.4	IS SJC seg 10
ALC-WH8-MC498	1963223.98	4476873.01	36.1	Unknown
ALC-WH8-MC499	1963237.48	4476886.54	15.4	IS H2HE
ALC-WH8-MC500	1963270.60	4476918.75	5.2	Unknown
ALC-WH8-MC501	1963239.45	4476884.98	12.9	IS H2HE
ALC-WH8-MC502	1963226.40	4476871.20	10	Unknown
ALC-WH8-MC503	1963421.43	4477073.45	9.9	Unknown
ALC-WH8-MC504	1963464.67	4477113.29	177.1	Possible OOS HJK seg B1
ALC-WH8-MC505	1963465.06	4477111.70	311.4	Possible OOS HJK seg B1
ALC-WH8-MC506	1963429.36	4477074.66	7.3	Unknown
ALC-WH8-MC507	1963422.25	4477065.23	80.8	Unknown
ALC-WH8-MC508	1963595.19	4477247.95	3.1	IS Intra Asia seg 9
ALC-WH8-MC509	1963634.60	4477287.40	10.8	Unknown
ALC-WH8-MC510	1963646.00	4477298.02	25.5	IS SJC seg 10
ALC-WH8-MC511	1963636.62	4477286.16	6.6	Unknown
ALC-WH8-MC512	1963646.37	4477296.97	22.4	IS SJC seg 10
ALC-WH8-MC513	1963597.58	4477243.75	3.3	IS Intra Asia seg 9
ALC-WH8-MC516	1964127.82	4476786.45	2	IS Intra Asia seg 9
ALC-WH8-MC517	1964129.53	4476781.44	3.9	IS Intra Asia seg 9
ALC-WH8-MC518	1964215.58	4476852.33	18.6	IS SJC seg 10
ALC-WH8-MC519	1964218.76	4476847.08	22.6	IS SJC seg 10

Contact Number	Easting (m)	Northing (m)	Dimensions	Description
ALC-WH8-SC055	1960933.75	4480496.27	3x<1x<1	Debris
ALC-WH8-SC058	1961035.18	4480265.55	11x3x<1	Debris
ALC-WH8-SC059	1961042.18	4480264.76	2.3x1.2x<1	Debris
ALC-WH8-SC062	1961170.15	4479711.16	2.6x<1xnmh	Debris
ALC-WH8-SC063	1961240.51	4479589.72	3x2x<1	Debris
ALC-WH8-SC065	1961475.82	4479788.39	2x<1xnmh	Debris
ALC-WH8-SC066	1961484.43	4479784.64	1.5x<1x<1	Debris
ALC-WH8-SC067	1961655.99	4479876.47	2x<1x<1	Debris
ALC-WH8-SC070	1961719.71	4479799.73	1.6x<1x<1	Debris
ALC-WH8-SC071	1961272.31	4479582.13	3x2x<1	Debris
ALC-WH8-SC072	1961462.16	4479602.46	1.5x1.1xnmh	Debris
ALC-WH8-SC073	1961275.12	4479471.42	2x1.3x<1	Debris
ALC-WH8-SC076	1961841.95	4479327.39	9.5x<1x<1	Debris
ALC-WH8-SC077	1961507.68	4479255.92	4.6x2.4x<1	Debris
ALC-WH8-SC081	1961952.36	4478106.00	5.8x1.9x<1	Debris
ALC-WH8-SC082	1962042.27	4477881.11	1.3x<1x<1	Debris

ALC-WH8-GC002 Penetration: 1.50m Recovery: 1.44m

Depth	Seabed	kPa	kg/cm²	Description
0.00m		1		Very soft, gray, CLAY
0.50m		3		Very soft, gray, gravelly, sandy CLAY, GRAVEL fraction comprises 100% shell fragments up to 10mm diameter
1.00m		5		

ALC-WH8-GC003 Penetration: 1.30m Recovery: 1.16m

Depth	Seabed	kPa	kg/cm²	Description
0.00m		2		Very soft, gray, gravelly, sandy CLAY, GRAVEL fraction comprises 100% shell fragments up to 15mm diameter
0.50m		4		
1.00m				

CARTOGRAPHIC SYMBOLS

KP / KPR — Post survey route with kilometre post and reverse kilometre post
Adjacent route
BMH/AC/BU — Beach manhole / Alter course / Branching Unit
POL/CX/PX — Point on line / Cable crossing / Pipeline crossing
Coastline (from Admiralty charts)
Chart matchline
Submerged wreck / Exposed wreck / Obstruction / Well / Platform / Explosives dumping ground and symbol or line feature in grey, plotted from desk top study (as-found in magenta). (for general symbols and abbreviations refer to British Admiralty Chart)
Telecommunications cable position, In-service/Out of service/Planned (as-found in magenta)
Pipeline position, In-service/Out of service/Planned (as-found in magenta)
Power cable position, In-service/Out of service/Planned (as-found in magenta)
Maritime boundaries
Restricted zones and special areas
Concession block

BATHYMETRY

30 — Bathymetric contours in metres. Contour interval may be reduced to aid in clarity.
Approximate limit of swath bathymetry coverage (shown only in areas of flat seabed)
6° — Downslope gradient in degrees (°) as measured over the shortest significant distance

SEABED FEATURES AND SHALLOW GEOLOGY

cor — Coral
fs — Fine sediment (predominantly CLAY/SILT)
cs — Coarse sediment (SAND and GRAVEL)
vcs — Very coarse sediment (COBBLES and BOULDERS)
fs/cs/vcs — Very dense/Very stiff sediment
fs/cs/vcs — Subcropping ROCK with predominant sediment classification (sediment thickness < target burial depth)
r — ROCK outcrop
Sediment or feature boundary
Inferred sediment or feature boundary
Approximate limit of side scan sonar coverage and survey swath
Seabed scar (trawl or anchor)
MC001 5.0 — Unidentified magnetic anomaly with reference number and amplitude (in nano-Tesla)
MC002 5.0 — Cable/Pipeline position, as determined by magnetometer, with reference number and amplitude (in nano-Tesla)
SC001 5x5x1 — Isolated sonar contact with reference number (length x width x height in metres where measurable; nmh = no measurable height)
50x0.5x1 — Linear sonar contact, dashed where partially buried
SC001 20x10x7 — Located wreck with reference no, (length x width x height in metres where measurable)
SEI001 -2.5 — Seimic contact with reference number (level at the top of contact is stated in metres, +/- equivalent to above or below ambient seabed)
GC001 — Gravity core (GC); Grab sample (GS) location with reference number
CP001 — MiniCPT (CP) location with reference number
0.5 — Small outcrop of rock with height in metres if discernible
d/D — Seabed depression or pockmark with diameter (d) and depth (D) in metres, where discernible
50/3 — Orientation of sandwave crest (with wavelength and height in metres)
4/0.8 — Orientation of megaripple crest (with wavelength and height in metres)
Orientation of sediment ribbon
-25 — Fault with depth below seafloor (Hachures on down side)
BP001 / BS001 — Beach probe (BP); Beach sample (BS) location with reference number
DP001 / DS001 — Diver probe (DP); Diver sample (DS) location with reference number

Note: Contours and slope notations in this chart were derived from the optimized grid of bathymetry as per the actual data density. Seabed morphological analysis based on side-scan sonar images gives a complementary presentation for localized terrain features. Due to physical and operational limitations, resolution of this chart degrades with increasing water depths and some localized seabed features are not expected to be fully resolved. This chart serves the general purposes of route engineering and cable installation. Closer inspections are recommended for operations sensitive to small terrain features in deep waters.

CHART COMMENT:

BATHYMETRY	Along Final Route	Within Survey Corridor
Minimum depth (m)	22.4	21.8
Maximum depth (m)	29.2	29.5
Maximum gradient (°)	<5	17

The route first heads to southeast and then makes a lazy dog-leg turn to the south. Finally it curves to the southeast again.
The seabed gradients are always gentle except some localized moderate to very steep slopes associated with rocky areas and depressions.

SEABED FEATURES
Few patches of dumped materials were mapped in the middle part of the chart.
Scattered debris/patches of debris, depressions (diameter: <5m, depth: <1m) and scars are present.
Sonar Contacts: ALC-WH8-SC055 to SC082.
Magnetometer Contacts: ALC-WH8-MC226, ALC-WH8-MC228, ALC-WH8-MC230 to MC231, ALC-WH8-MC248 to MC487.
Seismic Contacts: Nil.

SHALLOW GEOLOGY
Rocky areas and subcropping areas were mapped in the northwestern part of the chart.
The seabed mainly features >5m of very soft to soft CLAY in the northwestern part of the chart, then it becomes 3-5m of very soft to soft gravelly sandy CLAY over firm to stiff CLAY/SILT in the middle part of the chart. Further southwards, >5m of very soft to soft gravelly sandy CLAY is present.
Sediment Samples: ALC-CHK-GC002 to GC003.
CPT: Nil.

ADDITIONAL INFORMATION
The route crosses 8 IS cables and 5 OOS cables.
The route exits Inshore Traffic Zone.
The route runs inside Hong Kong waters and Guangzhou VTS.

GENERAL NOTES

Shallow Water

Survey vessel	MV Wing Hung 8
Surface positioning system	NovAtel GNSS Position System Qinsy Navigation System
Underwater positioning System	Kongsberg microPAP 200 USBL System
Bathymetry	Kongsberg EA440 Singlebeam Echo Sounder System R2Sonic Sonic 2024 MBES System
Morphology and stratigraphy	EdgeTech 4205 SSS System Innomar SES-2000 medium-100 SBP System C-Boom Low Voltage Boomer System
Magnetometer survey	Geometrics G-882 Marine Magnetometer

Target burial depth: 5m within Hong Kong Waters
Descriptive terms and definitions: The criteria used for interpretations and descriptions are presented in survey reports

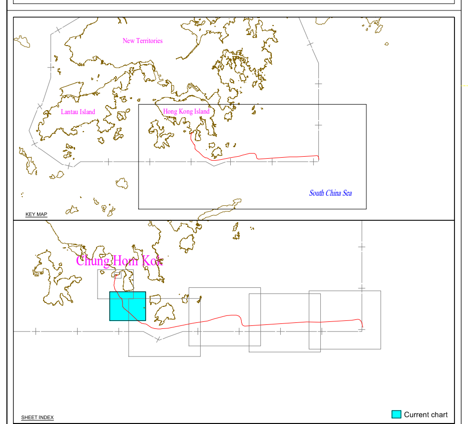
GEODETIC PARAMETERS

Ellipsoidal parameters
Ellipsoid : WGS84
Semi-major axis (a) (m) : 6378137.000
Inverse flattening (1/f) : 298.257223563

Projection parameters
Projection : Mercator
Longitude of origin : 110°E
Standard parallel : 10°N
Scale factor : 1
False easting : 1 500 000
False northing : 2 000 000

VERTICAL DATUM

In Inshore and Shallow Water Survey charts: Bathymetry data has been reduced to Low Astronomical Tide (LAT) using the relationship between LAT and MSL at Quarry Bay (7110) as stated in Admiralty Tide Tables, Volume 6, 2023 and tidal measurements at the tide gauge installed at Tai Miu Wan.



Survey date: August 2023

Scale : NATURAL SCALE 1 : 5,000 at 10°N
(At mid-latitude of chart) TRUE SCALE 1 : 4703.30
0 100 200 300 400 500 m

Landing Party : 中国电信 CHINA TELECOM
Contractor : HMNTECH
Surveyor : EGS EARTH SCIENCES & SURVEYING
EGS JOB NO.: HK268923

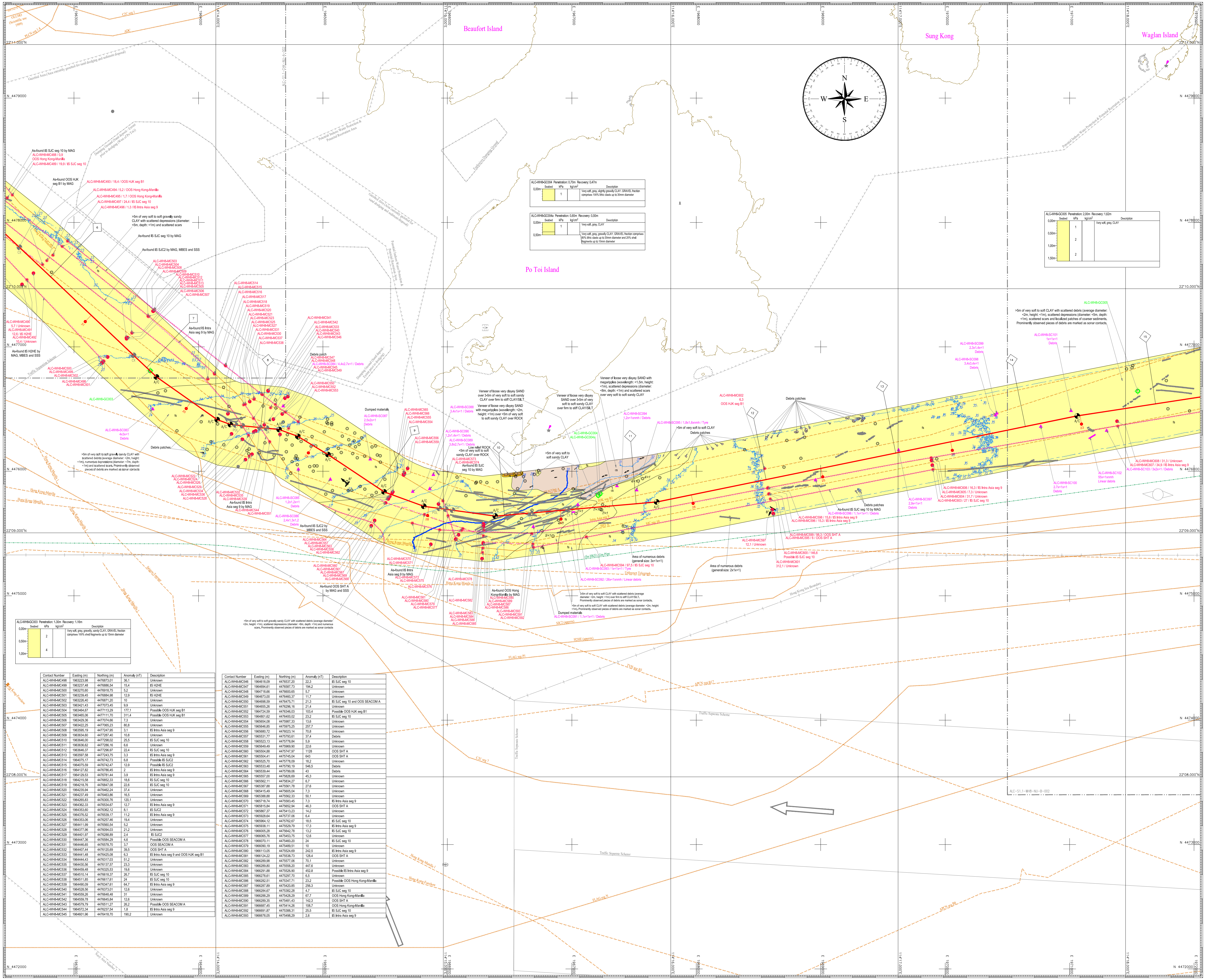
Project name: Asia Link Cable System (ALC)
CHK(Hongkong) to HKSAR Boundary
Marine Route Survey

Document title: CHK(Hongkong) to HKSAR Boundary
NORTH UP CHART
CHART NO. 002 OF 002
(KP 2.36 - KP 7.12)

Rev	Date	Prepared by	Checked by	Approved by
1.2	Jul 2024	Chester Quek	Howard Wang	Even Mak
1.1	Dec 2023	Chester Quek	Jacky Lee	Even Mak
1	Dec 2023	Chester Quek	Jacky Lee	Even Mak

Draft Final

Route based upon: ALC S1.1 CHK(Hong Kong) to HKSAR Boundary RPL 2-04 240718.xls
File name: ALC-S1.1-CHK-NU-A-002



ALC-WH8-GC003 Penetration: 1.30m Recovery: 1.16m

Depth	Seabed	kPa	kg/cm²	Description
0.00m–1.00m		2 / 4		Very soft, gray, gravelly, sandy CLAY. GRAVEL fraction comprises 100% shell fragments up to 15mm diameter

>5m of very soft to soft gravelly sandy CLAY with scattered debris (average diameter: <2m, height: <1m), scattered depressions (diameter: <8m, depth: <1m) and numerous scars. Prominently observed pieces of debris are marked as sonar contacts

Contact Number	Easting (m)	Northing (m)	Anomaly (nT)	Description
ALC-WH8-MC498	1963223.98	4476873.01	36.1	Unknown
ALC-WH8-MC499	1963237.48	4476886.54	15.4	IS H2HE
ALC-WH8-MC500	1963270.60	4476918.75	5.2	Unknown
ALC-WH8-MC501	1963239.45	4476884.98	12.9	IS H2HE
ALC-WH8-MC502	1963226.40	4476871.20	10	Unknown
ALC-WH8-MC503	1963421.43	4477073.45	9.9	Unknown
ALC-WH8-MC504	1963464.67	4477113.29	177.1	Possible OOS HJK seg B1
ALC-WH8-MC505	1963465.06	4477111.70	311.4	Possible OOS HJK seg B1
ALC-WH8-MC506	1963429.36	4477074.66	7.3	Unknown
ALC-WH8-MC507	1963422.25	4477065.23	80.8	Unknown
ALC-WH8-MC508	1963595.19	4477247.95	3.1	IS Intra Asia seg 9
ALC-WH8-MC509	1963634.60	4477287.40	10.8	Unknown
ALC-WH8-MC510	1963646.00	4477298.02	25.5	IS SJC seg 10
ALC-WH8-MC511	1963636.62	4477286.16	6.6	Unknown
ALC-WH8-MC512	1963646.37	4477296.97	22.4	IS SJC seg 10
ALC-WH8-MC513	1963597.58	4477243.75	3.3	IS Intra Asia seg 9
ALC-WH8-MC514	1964075.17	4476742.73	6.8	Possible IS SJC2
ALC-WH8-MC515	1964075.59	4476742.47	12.9	Possible IS SJC2
ALC-WH8-MC516	1964127.82	4476786.45	2	IS Intra Asia seg 9
ALC-WH8-MC517	1964129.53	4476781.44	3.9	IS Intra Asia seg 9
ALC-WH8-MC518	1964215.58	4476852.33	18.6	IS SJC seg 10
ALC-WH8-MC519	1964218.76	4476847.08	22.6	IS SJC seg 10
ALC-WH8-MC520	1964235.94	4476462.24	37.4	Unknown
ALC-WH8-MC521	1964237.49	4476463.86	16.5	Unknown
ALC-WH8-MC522	1964265.83	4476300.76	120.1	Unknown
ALC-WH8-MC523	1964362.33	4476534.67	12.7	IS Intra Asia seg 9
ALC-WH8-MC524	1964353.60	4476362.12	8.1	IS SJC2
ALC-WH8-MC525	1964376.52	4476539.17	11.2	IS Intra Asia seg 9
ALC-WH8-MC526	1964353.06	4476257.46	19.4	Unknown
ALC-WH8-MC527	1964411.99	4476560.54	5.2	Unknown
ALC-WH8-MC528	1964377.96	4476094.03	21.2	Unknown
ALC-WH8-MC529	1964401.97	4476288.89	2.4	IS SJC2
ALC-WH8-MC530	1964447.36	4476584.29	4.6	Possible OOS SEACOM A
ALC-WH8-MC531	1964446.65	4476578.70	3.7	OOS SEACOM A
ALC-WH8-MC532	1964407.44	4476120.69	39.5	OOS SHT A
ALC-WH8-MC533	1964441.48	4476425.08	6.3	IS Intra Asia seg 9 and OOS HJK seg B1
ALC-WH8-MC534	1964444.43	4476317.03	51.2	Unknown
ALC-WH8-MC535	1964430.56	4476137.57	23.3	Unknown
ALC-WH8-MC536	1964459.48	4476325.53	19.6	Unknown
ALC-WH8-MC537	1964510.14	4476618.37	26.7	IS SJC seg 10
ALC-WH8-MC538	1964511.85	4476617.61	24	IS SJC seg 10
ALC-WH8-MC539	1964490.09	4476347.61	64.7	IS Intra Asia seg 9
ALC-WH8-MC540	1964528.56	4476373.01	12.6	Unknown
ALC-WH8-MC541	1964559.26	4476648.48	31	Unknown
ALC-WH8-MC542	1964559.78	4476645.84	12.6	Unknown
ALC-WH8-MC543	1964579.79	4476511.27	26.2	Possible OOS SEACOM A
ALC-WH8-MC544	1964572.34	4476237.54	1.8	IS Intra Asia seg 9
ALC-WH8-MC545	1964601.96	4476418.70	190.2	Unknown

Contact Number	Easting (m)	Northing (m)	Anomaly (nT)	Description
ALC-WH8-MC546	1964618.09	4476537.20	22.3	IS SJC seg 10
ALC-WH8-MC547	1964694.61	4476587.73	194.2	Unknown
ALC-WH8-MC548	1964718.66	4476600.65	5.7	Unknown
ALC-WH8-MC549	1964673.00	4476460.37	11.7	Unknown
ALC-WH8-MC550	1964698.59	4476475.71	21.3	IS SJC seg 10 and OOS SEACOM A
ALC-WH8-MC551	1964655.26	4476296.16	21.4	Unknown
ALC-WH8-MC552	1964724.59	4476346.03	103.4	Possible OOS HJK seg B1
ALC-WH8-MC553	1964801.62	4476400.02	23.2	IS SJC seg 10
ALC-WH8-MC554	1965654.08	4475987.33	13.6	Unknown
ALC-WH8-MC555	1965646.85	4475975.25	257.7	Unknown
ALC-WH8-MC556	1965680.72	4476023.14	70.8	Unknown
ALC-WH8-MC557	1965531.77	4475793.61	37.4	Debris
ALC-WH8-MC558	1965523.13	4475778.84	5.9	Unknown
ALC-WH8-MC559	1965649.49	4475969.90	22.6	Unknown
ALC-WH8-MC560	1965504.88	4475747.97	1128	OOS SHT A
ALC-WH8-MC561	1965504.41	4475745.04	643	OOS SHT A
ALC-WH8-MC562	1965525.70	4475778.09	18.2	Unknown
ALC-WH8-MC563	1965533.48	4475790.19	546.5	Debris
ALC-WH8-MC564	1965539.44	4475799.06	43	Debris
ALC-WH8-MC565	1965557.00	4475826.69	45.3	Unknown
ALC-WH8-MC566	1965562.11	4475834.27	6.7	Unknown
ALC-WH8-MC567	1965387.88	4475561.78	27.6	Unknown
ALC-WH8-MC568	1965415.49	4475605.04	7.3	Unknown
ALC-WH8-MC569	1965388.88	4475562.33	50.1	Unknown
ALC-WH8-MC570	1965718.74	4475583.45	7.3	IS Intra Asia seg 9
ALC-WH8-MC571	1965815.84	4475652.94	46.3	OOS SHT A
ALC-WH8-MC572	1965867.37	4475413.23	14.2	Unknown
ALC-WH8-MC573	1965928.64	4475737.06	6.4	Unknown
ALC-WH8-MC574	1965964.12	4475762.67	18.5	IS SJC seg 10
ALC-WH8-MC575	1965938.11	4475529.79	17.3	IS Intra Asia seg 9
ALC-WH8-MC576	1966005.28	4475642.78	13.2	IS SJC seg 10
ALC-WH8-MC577	1966065.76	4475453.75	12.6	Unknown
ALC-WH8-MC578	1966070.11	4475460.20	24	IS SJC seg 10
ALC-WH8-MC579	1966090.19	4475489.51	10	Unknown
ALC-WH8-MC580	1966113.05	4475524.69	242.5	IS Intra Asia seg 9
ALC-WH8-MC581	1966124.22	4475538.73	128.4	OOS SHT A
ALC-WH8-MC582	1966289.98	4475577.06	70.1	Unknown
ALC-WH8-MC583	1966289.80	4475558.20	447.6	Unknown
ALC-WH8-MC584	1966291.88	4475526.90	452.8	Possible IS Intra Asia seg 9
ALC-WH8-MC585	1966278.61	4475297.70	6.5	Unknown
ALC-WH8-MC586	1966282.51	4475347.71	23.2	Possible OOS Hong Kong-Manilla
ALC-WH8-MC587	1966287.89	4475420.85	256.3	Unknown
ALC-WH8-MC588	1966284.67	4475382.28	4.7	IS SJC seg 10
ALC-WH8-MC589	1966288.29	4475428.29	67.7	OOS Hong Kong-Manilla
ALC-WH8-MC590	1966289.35	4475481.43	142.3	OOS SHT A
ALC-WH8-MC591	1966687.45	4475414.26	108.7	OOS Hong Kong-Manilla
ALC-WH8-MC592	1966691.87	4475388.31	25.5	IS SJC seg 10
ALC-WH8-MC593	1966678.05	4475498.29	2.6	IS Intra Asia seg 9

CARTOGRAPHIC SYMBOLS

BATHYMETRY

SEABED FEATURES AND SHALLOW GEOLOGY

Note: Contours and slope notations in this chart were derived from the optimized grid of bathymetry as per the actual data density. Seabed morphological analysis based on side-scan sonar images gives a complementary presentation for localized terrain features. Due to physical and operational limitations, resolution of this chart degrades with increasing water depths and some localized seabed features are not expected to be fully resolved. This chart serves the general purposes of route engineering and cable installation. Closer inspections are recommended for operations sensitive to small terrain features in deep waters.

CHART COMMENT:

BATHYMETRY	Along Final Route	Within Survey Corridor
Minimum depth (m)	22.4	21.8
Maximum depth (m)	35.3	35.6
Maximum gradient (°)	<5	8

The route initially heads to southeast with a reverse curve in the midway and then it curves gradually to northeast.

The seabed gradients are always gentle except some localized moderate to steep slopes associated with depressions.

SEABED FEATURES

Scattered debris/patches of debris, depressions (diameter: <8m, depth: <1m) and scars are present. The depressions and scars are more abundant in the western part of the chart.

Sonar Contacts: ALC-WH8-SC083 to SC103.

Magnetometer Contacts: ALC-WH8-MC488 to MC608.

Seismic Contacts: Nil.

SHALLOW GEOLOGY

Rocky areas and subcropping areas were mapped in the middle part of the chart.

The seabed mainly features >5m of very soft to soft gravelly sandy CLAY in the west, then it becomes >5m of very soft to soft CLAY in the east.

Covers of veneer of loose very clayey SAND and areas of underlain firm to stiff CLAY/SILT were mapped in the middle part of the chart.

Sediment Samples: ALC-CHK-GC003 to GC005 and ALC-CHK-GC004a.

CPT: Nil.

ADDITIONAL INFORMATION

The route crosses 3 IS cables and 4 OOS cables.

The route runs inside Hong Kong waters and Guangzhou VTS.

GENERAL NOTES

Shallow Water

Survey vessel	MV Wing Hung 8
Surface positioning system	NovAtel GNSS Position System Qinsy Navigation System
Underwater positioning System	Kongsberg microPAP 200 USBL System
Bathymetry	Kongsberg EA440 Singlebeam Echo Sounder System R2Sonic Sonic 2024 MBES System
Morphology and stratigraphy	EdgeTech 4205 SSS System Innomar SES-2000 medium-100 SBP System C-Boom Low Voltage Boomer System
Magnetometer survey	Geometrics G-882 Marine Magnetometer

Target burial depth: 5m within Hong Kong Waters

Descriptive terms and definitions: The criteria used for interpretations and descriptions are presented in survey reports

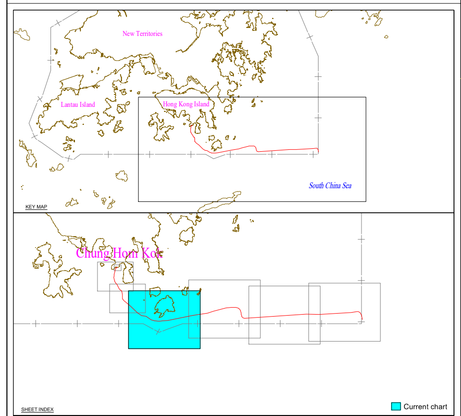
GEODETIC PARAMETERS

Ellipsoidal parameters
Ellipsoid : WGS84
Semi-major axis (a) (m) : 6378137.000
Inverse flattening (1/f) : 298.257223563

Projection parameters
Projection : Mercator
Longitude of origin : 110°E
Standard parallel : 10°N
Scale factor : 1
False easting : 1 500 000
False northing : 2 000 000

VERTICAL DATUM

In Inshore and Shallow Water Survey charts: Bathymetry data has been reduced to Low Astronomical Tide (LAT) using the relationship between LAT and MSL at Quarry Bay (7110) as stated in Admiralty Tide Tables, Volume 6, 2023 and tidal measurements at the tide gauge installed at Tai Miu Wan.



Survey date: August 2023

Scale : NATURAL SCALE 1 : 10,000 at 10°N

(At mid-latitude of chart) TRUE SCALE 1 : 9408.21

0.0 0.2 0.4 0.6 0.8 1.0 km

Landing Party : China Telecom
Contractor : HMNTECH
Surveyor : EGS Earth Sciences & Surveying

EGS JOB NO.: HK268923

Project name: Asia Link Cable System (ALC)
CHK(Hongkong) to HKSAR Boundary
Marine Route Survey

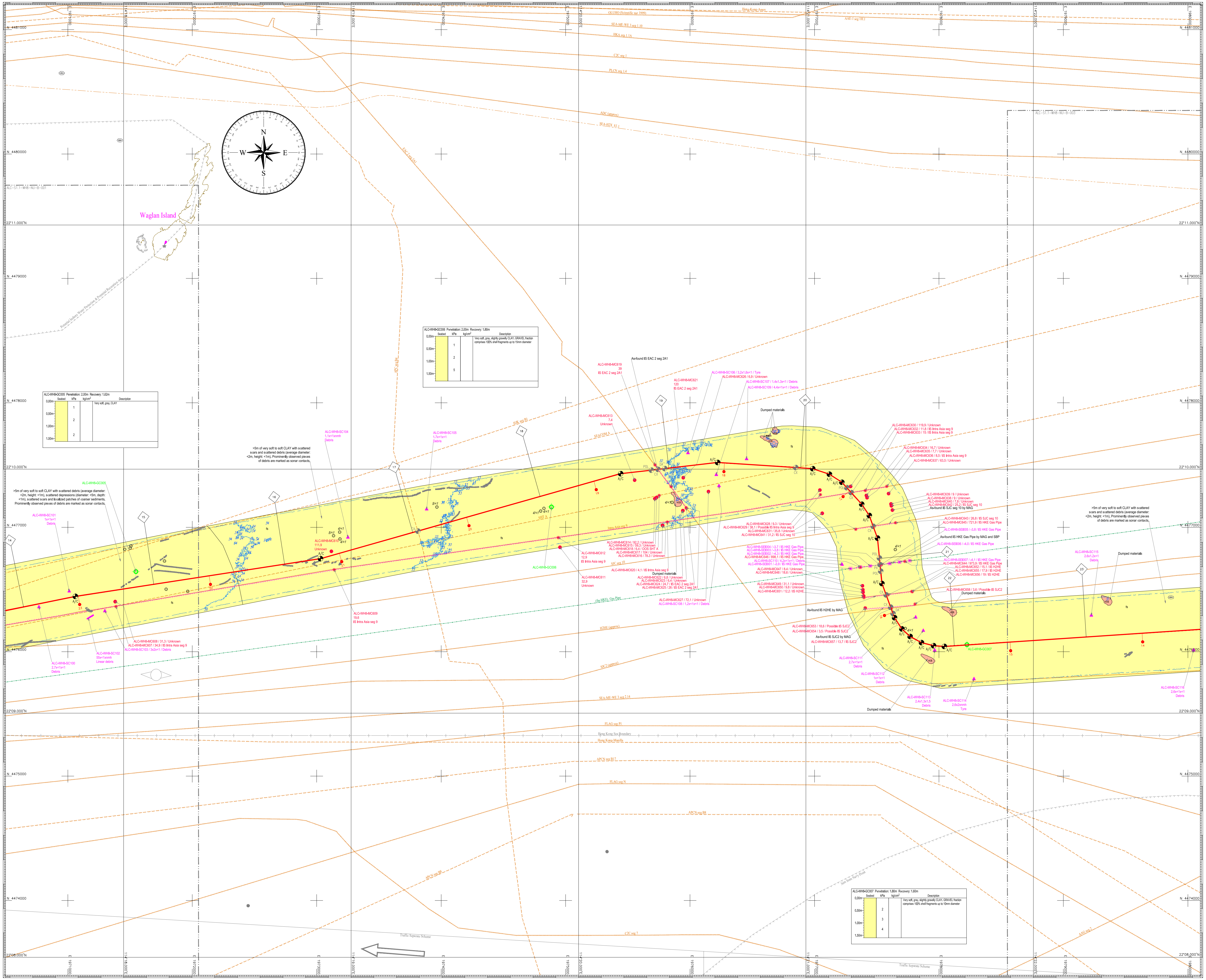
Document title: CHK(Hongkong) to HKSAR Boundary
NORTH UP CHART
CHART NO. 001 OF 004
(KP 5.53 - KP 15.34)

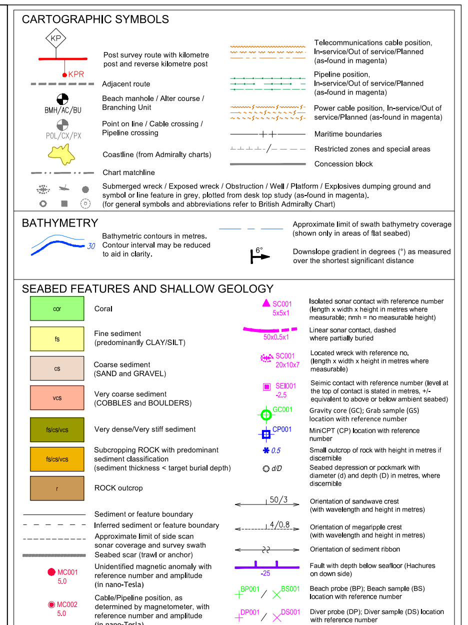
Rev	Date	Prepared by	Checked by	Approved by
1.2	Jul 2024	Chester Quek	Howard Wang	Even Mak
1.1	Dec 2023	Chester Quek	Jacky Lee	Even Mak
1	Dec 2023	Chester Quek	Jacky Lee	Even Mak

Draft Final

Route based upon: ALC S1.1 CHK(Hong Kong) to HKSAR Boundary RPL 2-04 240718.xls

File name: ALC-S1.1-WH8-NU-B-001





Note: Contours and slope notations in this chart were derived from the optimized grid of bathymetry as per the actual data density. Seabed morphological analysis based on side-scan sonar images gives a complementary presentation for localized terrain features. Due to physical and operational limitations, resolution of this chart degrades with increasing water depths and some localized seabed features are not expected to be fully resolved. This chart serves the general purposes of route engineering and cable installation. Closer inspections are recommended for operations sensitive to small terrain features in deep waters.

CHART COMMENT:

BATHYMETRY	Along Final Route	Within Survey Corridor
Minimum depth (m)	31.3	30.9
Maximum depth (m)	34.9	35.0
Maximum gradient (°)	<5	<5

The route proceeds to the northeast and makes a dog-leg turn to the east on the gentle seabed.

SEABED FEATURES

Few patches of dumped materials were mapped in the eastern portion of the chart.

Scattered debris, depressions (diameter: <5m, depth: <1m) and scars are present.

Sonar Contacts: ALC-WH8-SC100 to SC116.

Magnetometer Contacts: ALC-WH8-MC607 to MC658.

Seismic Contacts: ALC-WH8-SEI001 to SEI007.

SHALLOW GEOLOGY

The seabed features >5m of very soft to soft CLAY.

Sediment Samples: ALC-CHK-GC005 to GC007.

CPT: Nil.

ADDITIONAL INFORMATION

The route crosses 1 IS pipeline, 5 IS cables and 2 OOS cables.

The route runs inside Hong Kong waters and Guangzhou VTS.

GENERAL NOTES

Shallow Water

Survey vessel	MV Wing Hung 8
Surface positioning system	NovAtel GNSS Position System Qinsy Navigation System
Underwater positioning System	Kongsberg microPAP 200 USBL System
Bathymetry	Kongsberg EA440 Singlebeam Echo Sounder System R2Sonic Sonic 2024 MBES System
Morphology and stratigraphy	EdgeTech 4205 SSS System Innomar SES-2000 medium-100 SBP System C-Boom Low Voltage Boomer System
Magnetometer survey	Geometrics G-882 Marine Magnetometer

Target burial depth: 5m within Hong Kong Waters

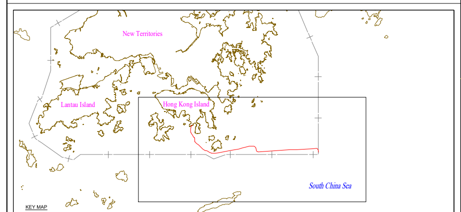
Descriptive terms and definitions: The criteria used for interpretations and descriptions are presented in survey reports

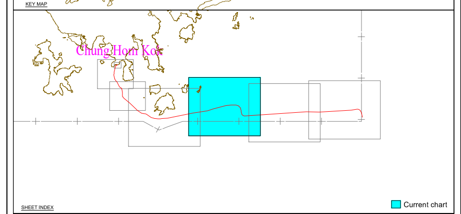
GEODETIC PARAMETERS

Ellipsoidal parameters	Projection parameters	
Ellipsoid : WGS84	Projection : Mercator	Scale factor : 1
Semi-major axis (a) (m) : 6378137.000	Longitude of origin : 110°E	False easting : 1 500 000
Inverse flattening (1/f) : 298.257223563	Standard parallel : 10°N	False northing : 2 000 000

VERTICAL DATUM

In Inshore and Shallow Water Survey charts: Bathymetry data has been reduced to Low Astronomical Tide (LAT) using the relationship between LAT and MSL at Quarry Bay (7110) as stated in Admiralty Tide Tables, Volume 6, 2023 and tidal measurements at the tide gauge installed at Tai Miu Wan.





Survey date: August 2023

Scale : NATURAL SCALE 1 : 10,000 at 10°N

(At mid-latitude of chart)
TRUE SCALE 1 : 9407.40

0.0 0.2 0.4 0.6 0.8 1.0 km

Landing Party : CHINA TELECOM

Contractor : HMNTECH

Surveyor : EGS EARTH SCIENCES & SURVEYING

EGS JOB NO.: HK268923

Project name:
Asia Link Cable System (ALC)
CHK(Hongkong) to HKSAR Boundary
Marine Route Survey

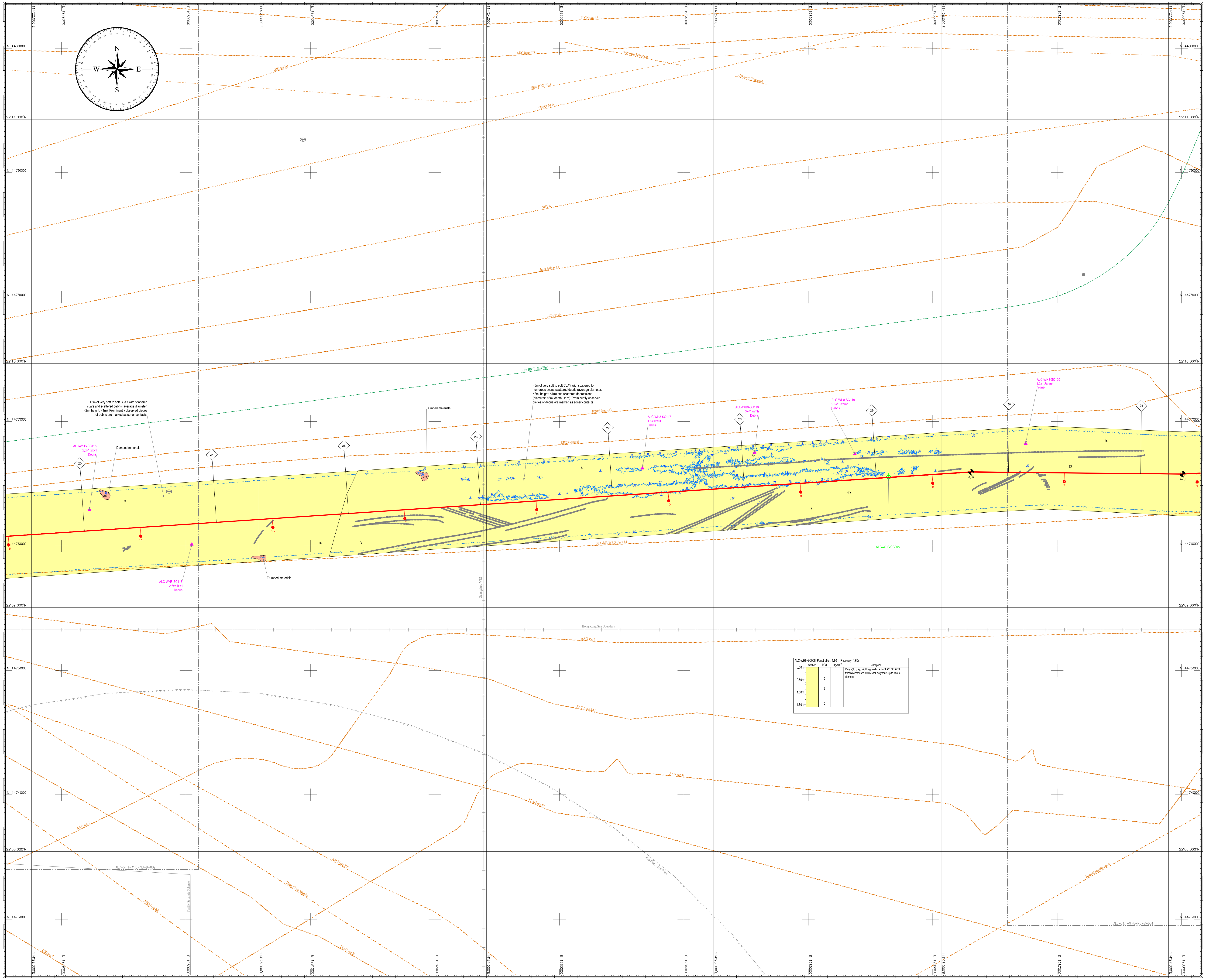
Document title:
CHK(Hongkong) to HKSAR Boundary
NORTH UP CHART
CHART NO. 002 OF 004
(KP 13.86 - KP 23.86)

Rev	Date	Prepared by	Checked by	Approved by
1.2	Jul 2024	Chester Quek	Howard Wang	Even Mak
1.1	Dec 2023	Chester Quek	Jacky Lee	Even Mak
1	Dec 2023	Chester Quek	Jacky Lee	Even Mak

Draft Final

Route based upon: ALC S1.1 CHK(Hong Kong) to HKSAR Boundary RPL 2-04 240718.xls

File name: ALC-S1.1-WH8-NU-B-002



CARTOGRAPHIC SYMBOLS

- KP / KPR — Post survey route with kilometre post and reverse kilometre post
- Adjacent route
- BMH/AC/BU — Beach manhole / Alter course / Branching Unit
- POL/CX/PX — Point on line / Cable crossing / Pipeline crossing
- Coastline (from Admiralty charts)
- Chart matchline
- Submerged wreck / Exposed wreck / Obstruction / Well / Platform / Explosives dumping ground and symbol or line feature in grey, plotted from desk top study (as-found in magenta). (for general symbols and abbreviations refer to British Admiralty Chart)
- Telecommunications cable position, In-service/Out of service/Planned (as-found in magenta)
- Pipeline position, In-service/Out of service/Planned (as-found in magenta)
- Power cable position, In-service/Out of service/Planned (as-found in magenta)
- Maritime boundaries
- Restricted zones and special areas
- Concession block

BATHYMETRY

- 30 — Bathymetric contours in metres. Contour interval may be reduced to aid in clarity.
- Approximate limit of swath bathymetry coverage (shown only in areas of flat seabed)
- 6° — Downslope gradient in degrees (°) as measured over the shortest significant distance

SEABED FEATURES AND SHALLOW GEOLOGY

- cor — Coral
- fs — Fine sediment (predominantly CLAY/SILT)
- cs — Coarse sediment (SAND and GRAVEL)
- vcs — Very coarse sediment (COBBLES and BOULDERS)
- fs/cs/vcs — Very dense/Very stiff sediment
- fs/cs/vcs — Subcropping ROCK with predominant sediment classification (sediment thickness < target burial depth)
- r — ROCK outcrop
- Sediment or feature boundary
- Inferred sediment or feature boundary
- Approximate limit of side scan sonar coverage and survey swath
- Seabed scar (trawl or anchor)
- MC001 5.0 — Unidentified magnetic anomaly with reference number and amplitude (in nano-Tesla)
- MC002 5.0 — Cable/Pipeline position, as determined by magnetometer, with reference number and amplitude (in nano-Tesla)
- SC001 5x5x1 — Isolated sonar contact with reference number (length x width x height in metres where measurable; nmh = no measurable height)
- 50x0.5x1 — Linear sonar contact, dashed where partially buried
- SC001 20x10x7 — Located wreck with reference no. (length x width x height in metres where measurable)
- SEI001 -2.5 — Seimic contact with reference number (level at the top of contact is stated in metres, +/- equivalent to above or below ambient seabed)
- GC001 — Gravity core (GC); Grab sample (GS) location with reference number
- CP001 — MiniCPT (CP) location with reference number
- 0.5 — Small outcrop of rock with height in metres if discernible
- d/D — Seabed depression or pockmark with diameter (d) and depth (D) in metres, where discernible
- 50/3 — Orientation of sandwave crest (with wavelength and height in metres)
- 4/0.8 — Orientation of megaripple crest (with wavelength and height in metres)
- Orientation of sediment ribbon
- -25 — Fault with depth below seafloor (Hachures on down side)
- BP001 / BS001 — Beach probe (BP); Beach sample (BS) location with reference number
- DP001 / DS001 — Diver probe (DP); Diver sample (DS) location with reference number

Note: Contours and slope notations in this chart were derived from the optimized grid of bathymetry as per the actual data density. Seabed morphological analysis based on side-scan sonar images gives a complementary presentation for localized terrain features. Due to physical and operational limitations, resolution of this chart degrades with increasing water depths and some localized seabed features are not expected to be fully resolved. This chart serves the general purposes of route engineering and cable installation. Closer inspections are recommended for operations sensitive to small terrain features in deep waters.

CHART COMMENT:

BATHYMETRY	Along Final Route	Within Survey Corridor
Minimum depth (m)	31.0	30.8
Maximum depth (m)	31.5	31.8
Maximum gradient (°)	<5	<5

The route proceeds to the east on the gentle seabed.

SEABED FEATURES

Few patches of dumped materials were mapped in the western portion of the chart.
Scattered debris, depressions (diameter: <6m, depth: <1m) and numerous scars are present.

Sonar Contacts: ALC-WH8-SC115 to SC120.
Magnetometer Contacts: Nil.
Seismic Contacts: Nil.

SHALLOW GEOLOGY

The seabed features >5m of very soft to soft CLAY.
Sediment Samples: ALC-CHK-GC008.
CPT: Nil.

ADDITIONAL INFORMATION

The route exits Guangzhou VTS and runs inside Hong Kong waters.

GENERAL NOTES

Shallow Water

Survey vessel	MV Wing Hung 8
Surface positioning system	NovAtel GNSS Position System Qinsy Navigation System
Underwater positioning System	Kongsberg microPAP 200 USBL System
Bathymetry	Kongsberg EA440 Singlebeam Echo Sounder System R2Sonic Sonic 2024 MBES System
Morphology and stratigraphy	EdgeTech 4205 SSS System Innomar SES-2000 medium-100 SBP System C-Boom Low Voltage Boomer System
Magnetometer survey	Geometrics G-882 Marine Magnetometer

Target burial depth: 5m within Hong Kong Waters
Descriptive terms and definitions: The criteria used for interpretations and descriptions are presented in survey reports

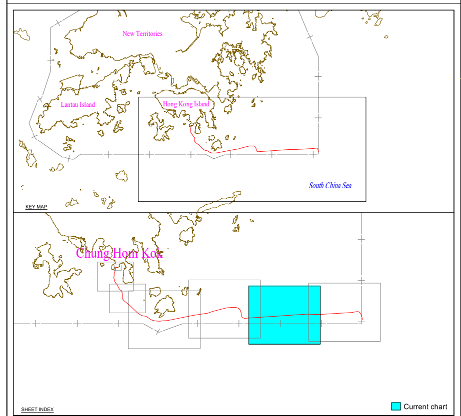
GEODETIC PARAMETERS

Ellipsoidal parameters
Ellipsoid : WGS84
Semi-major axis (a) (m) : 6378137.000
Inverse flattening (1/f) : 298.257223563

Projection parameters
Projection : Mercator
Longitude of origin : 110°E
Standard parallel : 10°N
Scale factor : 1
False easting : 1 500 000
False northing : 2 000 000

VERTICAL DATUM

In Inshore and Shallow Water Survey charts: Bathymetry data has been reduced to Low Astronomical Tide (LAT) using the relationship between LAT and MSL at Quarry Bay (7110) as stated in Admiralty Tide Tables, Volume 6, 2023 and tidal measurements at the tide gauge installed at Tai Miu Wan.



Survey date: August 2023

Scale : NATURAL SCALE 1 : 10,000 at 10°N
(At mid-latitude of chart)
TRUE SCALE 1 : 9407.88
0.0 0.2 0.4 0.6 0.8 1.0 km

Landing Party : CHINA TELECOM
Contractor : HMNTECH
Surveyor : EGS EARTH SCIENCES & SURVEYING
EGS JOB NO.: HK268923

Project name:
Asia Link Cable System (ALC)
CHK(Hongkong) to HKSAR Boundary
Marine Route Survey

Document title:
CHK(Hongkong) to HKSAR Boundary
NORTH UP CHART
CHART NO. 003 OF 004
(KP 22.40 - KP 31.45)

Rev	Date	Prepared by	Checked by	Approved by
1.2	Jul 2024	Chester Quek	Howard Wang	Even Mak
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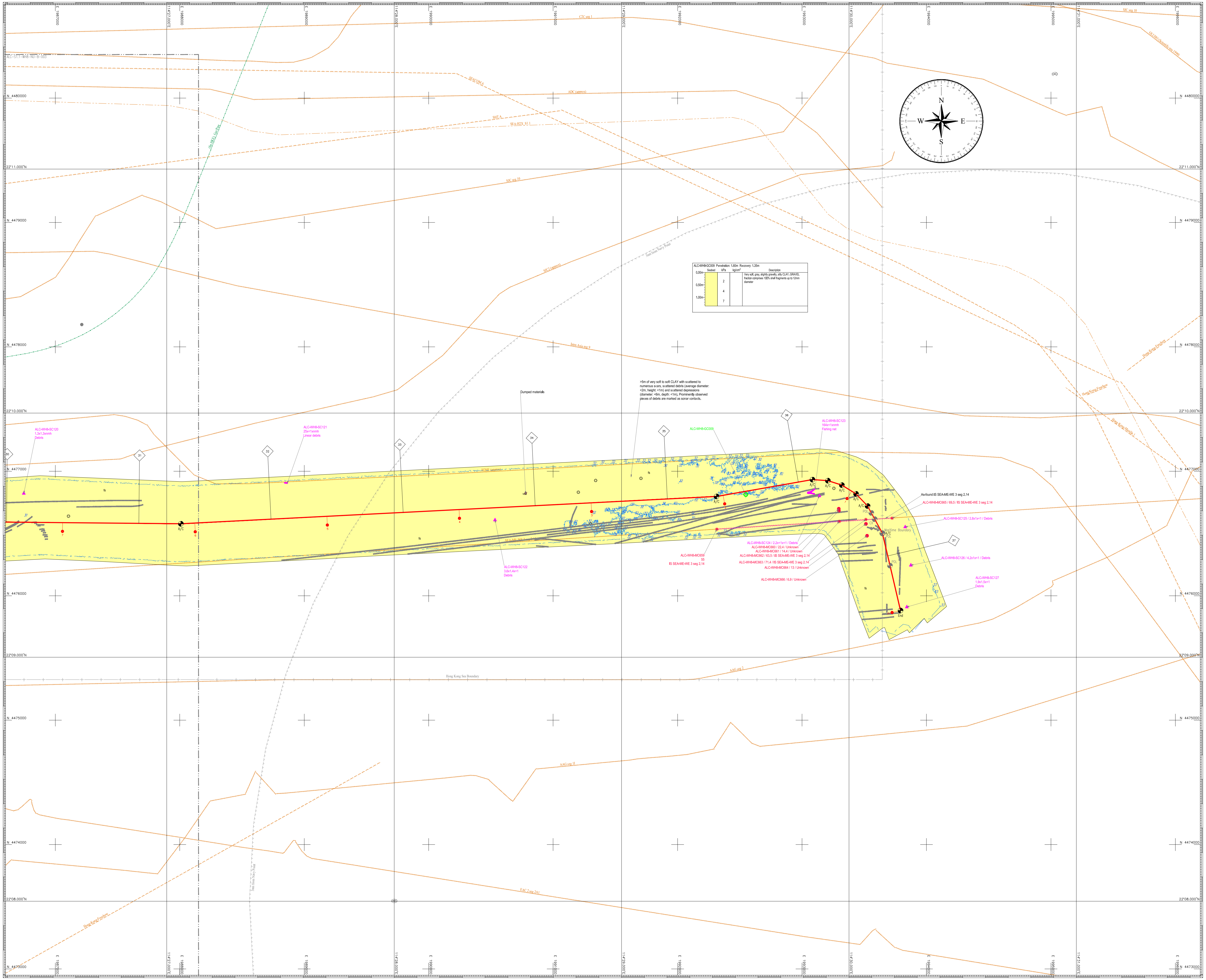
File name: ALC-S1.1-WH8-NU-B-003



CARTOGRAPHIC SYMBOLS

- Post survey route with kilometre post and reverse kilometre post (KP / KPR)
- Adjacent route
- Beach manhole / Alter course / Branching Unit (BMH/AC/BU)
- Point on line / Cable crossing / Pipeline crossing (POL/CX/PX)
- Coastline (from Admiralty charts)
- Chart matchline
- Submerged wreck / Exposed wreck / Obstruction / Well / Platform / Explosives dumping ground and symbol or line feature in grey, plotted from desk top study (as-found in magenta). (for general symbols and abbreviations refer to British Admiralty Chart)
- Telecommunications cable position, In-service/Out of service/Planned (as-found in magenta)
- Pipeline position, In-service/Out of service/Planned (as-found in magenta)
- Power cable position, In-service/Out of service/Planned (as-found in magenta)
- Maritime boundaries
- Restricted zones and special areas
- Concession block

BATHYMETRY

- Bathymetric contours in metres. Contour interval may be reduced to aid in clarity.
- Approximate limit of swath bathymetry coverage (shown only in areas of flat seabed)
- Downslope gradient in degrees (°) as measured over the shortest significant distance

SEABED FEATURES AND SHALLOW GEOLOGY

- cor — Coral
- fs — Fine sediment (predominantly CLAY/SILT)
- cs — Coarse sediment (SAND and GRAVEL)
- vcs — Very coarse sediment (COBBLES and BOULDERS)
- fs/cs/vcs — Very dense/Very stiff sediment
- fs/cs/vcs — Subcropping ROCK with predominant sediment classification (sediment thickness < target burial depth)
- r — ROCK outcrop
- Sediment or feature boundary
- Inferred sediment or feature boundary
- Approximate limit of side scan sonar coverage and survey swath
- Seabed scar (trawl or anchor)
- MC001 5.0 — Unidentified magnetic anomaly with reference number and amplitude (in nano-Tesla)
- MC002 5.0 — Cable/Pipeline position, as determined by magnetometer, with reference number and amplitude (in nano-Tesla)
- SC001 5x5x1 — Isolated sonar contact with reference number (length x width x height in metres where measurable; nmh = no measurable height)
- 50x0.5x1 — Linear sonar contact, dashed where partially buried
- SC001 20x10x7 — Located wreck with reference no. (length x width x height in metres where measurable)
- SEI001 -2.5 — Seimic contact with reference number (level at the top of contact is stated in metres, +/- equivalent to above or below ambient seabed)
- GC001 — Gravity core (GC); Grab sample (GS) location with reference number
- CP001 — MiniCPT (CP) location with reference number
- 0.5 — Small outcrop of rock with height in metres if discernible
- d/D — Seabed depression or pockmark with diameter (d) and depth (D) in metres, where discernible
- 50/3 — Orientation of sandwave crest (with wavelength and height in metres)
- 4/0.8 — Orientation of megaripple crest (with wavelength and height in metres)
- Orientation of sediment ribbon
- -25 — Fault with depth below seafloor (Hachures on down side)
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CHART COMMENT:

BATHYMETRY	Along Final Route	Within Survey Corridor
Minimum depth (m)	31.0	31.0
Maximum depth (m)	32.7	33.1
Maximum gradient (°)	<5	<5

The route runs on a gentle seabed with easterly heading and turns to south southeast just before reaching the Hong Kong boundary.

SEABED FEATURES

A patch of dumped materials was observed in the middle of the chart.
Scattered debris, depressions (diameter: <6m, depth: <1m) and numerous scars are present.
Sonar Contacts: ALC-WH8-SC120 to SC127.
Magnetometer Contacts: ALC-WH8-MC659 to MC666.
Seismic Contacts: Nil.

SHALLOW GEOLOGY

The seabed features >5m of very soft to soft CLAY.
Sediment Samples: ALC-CHK-GC009.
CPT: Nil.

ADDITIONAL INFORMATION

The route crosses 1 IS cable.
The route exits Hong Kong waters and enters the boundary of 3nm from Navy Point.

GENERAL NOTES

Shallow Water

Survey vessel	MV Wing Hung 8
Surface positioning system	NovAtel GNSS Position System Qinsy Navigation System
Underwater positioning System	Kongsberg microPAP 200 USBL System
Bathymetry	Kongsberg EA440 Singlebeam Echo Sounder System R2Sonic Sonic 2024 MBES System
Morphology and stratigraphy	EdgeTech 4205 SSS System Innomar SES-2000 medium-100 SBP System C-Boom Low Voltage Boomer System
Magnetometer survey	Geometrics G-882 Marine Magnetometer

Target burial depth: 5m within Hong Kong Waters
Descriptive terms and definitions: The criteria used for interpretations and descriptions are presented in survey reports

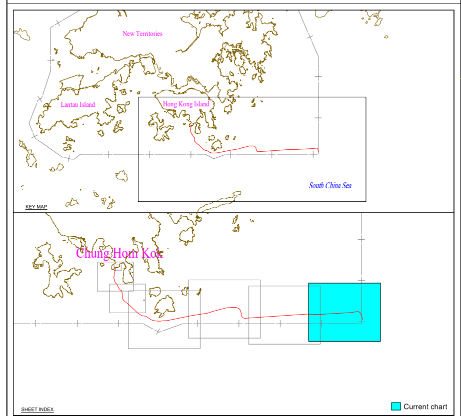
GEODETIC PARAMETERS

Ellipsoidal parameters
Ellipsoid : WGS84
Semi-major axis (a) (m) : 6378137.000
Inverse flattening (1/f) : 298.257223563

Projection parameters
Projection : Mercator
Longitude of origin : 110°E
Standard parallel : 10°N
Scale factor : 1
False easting : 1 500 000
False northing : 2 000 000

VERTICAL DATUM

In Inshore and Shallow Water Survey charts: Bathymetry data has been reduced to Low Astronomical Tide (LAT) using the relationship between LAT and MSL at Quarry Bay (7110) as stated in Admiralty Tide Tables, Volume 6, 2023 and tidal measurements at the tide gauge installed at Tai Miu Wan.



Survey date: August 2023

Scale : NATURAL SCALE 1 : 10,000 at 10°N
(At mid-latitude of chart) TRUE SCALE 1 : 9407.65
0.0 0.2 0.4 0.6 0.8 1.0 km

Landing Party : CHINA TELECOM
Contractor : HMNTECH
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EGS JOB NO.: HK268923

Project name: Asia Link Cable System (ALC) CHK(Hongkong) to HKSAR Boundary Marine Route Survey

Document title: CHK(Hongkong) to HKSAR Boundary NORTH UP CHART CHART NO. 004 OF 004 (KP 29.99 - KP 37.42)

Rev	Date	Prepared by	Checked by	Approved by
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1.1	Dec 2023	Chester Quek	Jacky Lee	Even Mak
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Appendix E Environmental Monitoring & Audit

CONTENTS

FIGURES

TABLES

E ENVIRONMENTAL MONITORING AND AUDIT

E.1 Introduction

E.1.1 This appendix details the requirements of the EM&A programme for the installation works of the ALC-HK Cable Bundle with the objectives of:

- Confirming the conclusion from the Water Quality Appraisal (**Appendix A**) that the adverse impacts on water quality as well as on ecological resources and fisheries resources are not anticipated during the installation works.
- Establishing a marine mammal exclusion zone with a radius of 250m around the cable installation barge along the entire cable bundle alignment in Hong Kong waters during daytime.
- Ensuring that the installation works is carried out appropriately and proper measures are taken if any impacts on sensitive receivers are identified to be contributed by the installation works.

E.1.2 Regardless the impacts from any future cable repairing works are expected to be smaller than those from the original cable installation, the Project Proponent shall review if monitoring and mitigation measures are required in the circumstance that repairing works are required. Project Proponent shall appoint an Environmental Team ("ET") and Independent Environmental Checker ("IEC") to recommend the necessary scope of work for the EM&A programme for EPD's approval and to audit the implementation of the programme for the required repairing works.

E.2 Environmental Team ("ET")

E.2.1 An ET shall be appointed by the Project Proponent before commencement of the Project. The ET shall not be in any way an associated body of the Project Proponent, the Contractor or the IEC of the Project. The ET shall be led by an ET Leader with at least 7 years of experience in EM&A or environmental management.

E.2.2 The ET and the ET Leader shall be responsible for the implementation of the EM&A programme and perform the followings:

- Carry out sampling, analysis, and statistical evaluation of monitoring parameters
- Audit compliance with environmental protection, and pollution prevention and control regulations
- Monitor the implementation of environmental mitigation measures
- Monitor compliance with Conditions in the Environmental Permit
- Review and comment the cable installation programme, if necessary
- Review and comment the construction methodology, if necessary
- Prepare and update the EM&A works schedule based on the latest cable installation programme
- Investigate non-compliant events, evaluate and identify corrective measures
- Liaise with IEC on all environmental performance matters
- Advise the Project Proponent and its contractors on environment improvement, awareness, enhancement matters, etc

- Timely submit the EM&A report to the IEC for verification and thereafter to the EIAO Register Office, as required

E.3 Independent Environmental Checker ("IEC")

E.3.1 An IEC shall be appointed by the Project Proponent before commencement of construction of the Project. The IEC shall not be in any way an associated body of the Project Proponent, the Contractor or the ET for the Project and with at least 7 years of experience in EM&A or environmental management.

E.3.2 The IEC shall audit the overall EM&A performance including the implementation of all environmental mitigation measures, required submissions and perform the followings:

- Review and audit all aspects of the EM&A programme
- Validate and confirm the accuracy of any marine mammal monitoring carried out
- Audit the recommendations and requirements in Project Profile against the status of implementation of environmental protection measures on site
- Review the effectiveness of environmental mitigation measures and Project environmental performance
- Audit the construction methodology of the Project Proponent and its contractor and agree the least impact alternative, if necessary
- Investigate complaint cases and check the effectiveness of corrective measures
- Prepare a monthly report for the Authority (in letter format) summarising the above

E.4 Water Quality Monitoring

Parameters

E.4.1 The following parameters shall be measured:

<u>in situ</u>
- Dissolved oxygen (DO) (% saturation and mg/L)
- Temperature (°C)
- Turbidity (NTU)

<u>in the laboratory</u>
- Suspended Solids (SS) (mg/L)

E.4.2 Other than the above-listed parameters, relevant data shall also be measured and recorded in field logs, including the location of the sampling stations, location of cable burial tool at the time of sampling, water depth, time, weather conditions, sea conditions, tidal state, special phenomena and any other activities undertaken in the vicinity of sampling works that may influence the monitoring results.

Equipment

E.4.3 The following equipment shall be provided and used by the ET:

- **Dissolved Oxygen and Temperature Measurement Equipment.** The instrument shall be a portable, weatherproof dissolved oxygen measuring instrument complete with cables, sensors, comprehensive operation manuals, and shall be operable from a DC power source. It shall be capable of measuring: dissolved oxygen levels in the range of 0 – 20mg/L and 0-200% saturation; and a temperature of 0-45°C. It shall have a

membrane electrode with automatic temperature compensation complete with a cable of not less than 35m in length. Spare electrodes and cables shall be available as standby for use when needed.

- **Turbidimeter.** Turbidity should be measured from a split water sample from the SS sample. A turbidimeter should be capable of measuring the turbidity level in Nephelometric Turbidity Units ("NTUs").
- **Water Depth Gauge.** No specific equipment is recommended for measuring the water depth. However, water depth gauge attached to the bottom of water quality monitoring vessel is preferred.
- **Positioning Device.** A Global Positioning System ("GPS") shall be used to accurately record the position of the monitoring vessel prior to measurements. The use of GPS is preferred for positioning device, which should be well calibrated at appropriate checkpoint (e.g. Quarry Bay Survey Nail).
- **Water Sampling Equipment.** A water sampler, consisting of a transparent PVC or glass cylinder of not less than 2L, which can be effectively sealed with cups at both ends, shall be used (Kahlsico Water Sampler 13SWB203 or an approved similar instrument). The water sampler with positive latching system shall be used for keeping it open to avoid premature closure until released by a messenger when the sampler is at the selected water depth.

Sampling/Testing Protocols

E.4.4 All in situ monitoring instruments shall be checked, calibrated and certified by a laboratory accredited under the Hong Kong Laboratory Accreditation Scheme ("HOKLAS") or other international accreditation schemes before use. They shall be subsequently re-calibrated monthly during the monitoring. Responses of sensors and electrodes shall be checked with certified standard solutions before each time of use.

E.4.5 The *BS 1427: 1993, Guide to Field and On-Site Test Methods for the Analysis of Waters* shall be followed for the on-site calibration of field equipment. Sufficient stocks of spare parts shall be maintained for replacements when necessary. Backup monitoring should be in place to ensure monitoring can continue uninterrupted during maintenance, calibration, etc.

E.4.6 Water samples for SS measurements shall be stored in high-density polythene bottles, packed in ice (cooled to 4^{o}C without being frozen), and delivered to a HOKLAS laboratory as soon as possible after collection. At least two replicate samples should be collected from each monitoring event for in situ measurement and laboratory analysis.

Laboratory Analysis

E.4.7 All laboratory works shall be carried out in a HOKLAS-accredited laboratory. Water samples of about 1L shall be collected at the monitoring and control stations for carrying out the laboratory determinations. The determination work shall start within the next working day after collection of the water samples. The laboratory measurements shall be provided within two days of the sampling event (48 hours).

E.4.8 The analyses shall follow the standard methods as described in *APHA Standard Methods for the Examination of Water and Wastewater, 19th Edition*, unless otherwise specified (APHA 2540D for SS). The submitted information should include pre-treatment procedures, instrument use, Quality Assurance/Quality Control (QA/QC) details (such as blank, spike

recovery, number of duplicate samples per-batch, etc.), detection limits and accuracy. The QA/QC details shall be in accordance with requirements of HOKLAS.

Monitoring Locations

E.4.9 With reference to the water quality Appraisal in **Appendix A**, four monitoring locations are proposed. Water quality sampling in these locations will be carried out prior to cable laying (Baseline Monitoring), during cable laying (Impact Monitoring) and, if needed, after cable laying (Post-Project Monitoring) to verify any impact of the installation works on the WSRs.

E.4.10 The proposed sampling locations are as follows and shown on **Figure E-1** (following the WSR IDs in **Appendix A**):

- **C4/F1** is a monitoring station to identify the impact of cable installation works on the coral communities along the coast of Po Toi Island and Po Toi FCZ (representative location within 500m of the cable bundle alignment).
- **GS1** is a gradient station for C4/F1 approximately 133m from the proposed cable bundle alignment.
- **F2** is the monitoring station to identify the impact of cable installation works on the spawning grounds of commercial fisheries resources (representative location)
- **CS1** is a Control Station approximately 2.3 km from the proposed cable bundle alignment for monitoring at Zone A, discussed in **Section E.4.15**.

E.4.11 Exact coordinates of monitoring stations shall be determined prior to the Baseline Monitoring and their indicative coordinates are listed in **Table E-1**.

Table E-1 Coordinates of the Water Quality Monitoring Stations (HK 1980 Grid)

STATION	LOCATION	EASTING	NORTHING	CLOSEST DISTANCE FROM CABLE BUNDLE ALIGNMENT (m)
C4/F1	Coral Communities along coast of Po Toi Island and Po Toi FCZ	844352	801662	232
GS1	Gradient Station for Coral Communities along coast of Po Toi Island and Po Toi FCZ	844213	801548	133
F2	Spawning Grounds of Commercial Fisheries Resources	841511	803093	403
CS1	Control Station 1	847073	804195	2,324

Frequency and Duration

Baseline Monitoring

E.4.12 No later than six weeks before the start of cable installation works, baseline monitoring shall be commenced and carried out for four weeks. Two weeks prior to commencement of baseline monitoring, the ET shall propose a monitoring schedule to the IEC for agreement and then shall submit the agreed schedule to EPD at least one week before commencement of baseline monitoring works.

E.4.13 Monitoring shall be carried out three times per week and the interval between any two sets of monitoring shall not be less than 36 hours. For each set, monitoring shall be undertaken within a 4-hour window of 2 hours before and 2 hours after mid-flood and mid-ebb tides.

E.4.14 At each tide at each location, in situ measurement and samples shall be taken as follows:

Stations with a water depth of 6m or greater:	Stations with a water depth of between 3m and 6m:	Stations with a water depth of less than 3m:
• 1m below sea surface • mid-depth • 1m above the seabed	• 1m below sea surface • 1m above the seabed	• Mid-depth

Impact Monitoring

E.4.15 Considering the relative locations of WSRs and ALC-HK Cable Bundle alignment, the impact monitoring stations shall be conducted when the cable laying work is carried out within **Zone A** only, as shown in **Figure E-1**.

E.4.16 Two weeks prior to the commencement of impact monitoring, the ET shall propose a monitoring schedule to the IEC for agreement and then shall submit the agreed schedule to EPD at least one week before impact monitoring starts.

E.4.17 Monitoring shall be carried out three times per week and the interval between any two sets of monitoring shall not be less than 36 hours. For each set, monitoring shall be undertaken within a 4-hour window of 2 hours before and 2 hours after mid-flood and mid-ebb tides.

E.4.18 At each tide at each location, in situ measurement and samples shall be taken as the following:

Stations with a water depth of 6m or greater:	Stations with a water depth of between 3m and 6m:	Stations with a water depth of less than 3m:
• 1m below sea surface • mid-depth • 1m above the seabed	• 1m below sea surface • 1m above the seabed	• Mid-depth

Post-Project Monitoring

E.4.19 The requirement for post-project monitoring shall be proposed by the ET Leader and be agreed by the IEC. The requirement for post-project monitoring shall depend upon the results of the impact monitoring: Only if the results indicate exceedances of Action and/or Limit Levels attributable to the Project shall post-project monitoring be carried out to demonstrate that environmental conditions have returned to pre-project (i.e. baseline) values.

E.4.20 If needed, post-project monitoring at each of the four monitoring stations shall commence no later than three weeks after the end of cable installation works. The duration of post-project monitoring shall be two weeks. Two weeks prior to the commencement of post-project monitoring, the ET shall propose a monitoring schedule to the IEC for agreement and then shall submit the agreed schedule to EPD at least one week before post-project monitoring starts.

E.4.21 Monitoring shall be carried out three times per week and the interval between any two sets of monitoring shall not be less than 36 hours. For each set, monitoring shall be undertaken within a 4-hour window of 2 hours before and 2 hours after mid-flood and mid-ebb tides.

E.4.22 At each tide at each location, in situ measurement and samples shall be taken as the following:

Stations with a water depth of 6m or greater:
- 1m below sea surface
- mid-depth
- 1m above the seabed

Stations with a water depth of between 3m and 6m:
- 1m below sea surface
- 1m above the seabed

Stations with a water depth of less than 3m:
- Mid-depth

Action and Limit Levels and Event/Action Plan for Impact Monitoring

E.4.23 Impact monitoring results shall be evaluated against Action and Limit levels indicated in **Table E-2**, below, with action being taken in accordance to the Event/Action Plan shown in **Table E-3**. The Event/Action Plan relates only to exceedances that are directly attributable to the cable installation works, over which the installation contractor has control. In case of any concerns, advice of the IEC shall be sought.

Table E-2 Action and Limit Levels for Water Quality

PARAMETER	ACTION LEVEL	LIMIT LEVEL
DO in mg/L	SURFACE AND MIDDLE	
	5th percentile of baseline data for surface and middle layers	5mg/L or 1st percentile of baseline for surface and middle layers
	BOTTOM	
	5th percentile of baseline data for bottom layer	2mg/L or 1st percentile of baseline data for bottom layer
SS in mg/L (Depth-averaged)	95th percentile of baseline data, or 20% exceedance of value at any impact station compared with the control station	99th percentile of baseline data, or 30% exceedance of value at any impact station compared with the control station
Turbidity in NTU (Depth-averaged)	95th percentile of baseline data, or 20% exceedance of value at any impact station compared with corresponding data from the control station	99th percentile of baseline data, or 30% exceedance of value at any impact station compared with corresponding data from the control station

Table E-3 Event / Action Plan for Water Quality

EVENT	CONTRACTOR / ET
Action Level Exceedance	1. Repeat sampling event. 2. Inform EPD and AFCD and confirm notification of the non-compliance in writing. 3. Discuss with cable installation contractor and the IEC the most appropriate method of reducing suspended solids during cable installation and repair (e.g. reduce cable laying speed/pressure in jetting water) and agree with EPD. 4. Repeat measurements after implementation of mitigation for confirmation of compliance.

EVENT	CONTRACTOR / ET
	5. If non-compliance continues, increase measures in Step 3 and repeat measurement in Step 4. If non-compliance occurs a third time, suspend cable laying operations and continue sampling until normal water quality resumes.
Limit Level Exceedance	Suspend cable laying work and undertake Steps 1-4 immediately. Cable laying work should only continue when the water quality complies to the requirement again.

E.5 Marine Mammal Observation

E.5.1 Noise generated from cable installation is unlikely to cause adverse impact on marine mammals. As evaluated in **Appendix B**, the frequency of noise generated by the jetting works does not fall within the hearing range of most marine mammals present in Hong Kong Waters. Nevertheless, as a precautionary measure, a marine mammal exclusion zone will be set up during installation works for mitigating any potential impacts on finless porpoises.

E.5.2 The marine mammal exclusion zone with a radius of 250m from the cable installation barge will be set up along the whole cable bundle alignment during cable installation in daytime, as shown in **Figure E-1**.

E.5.3 Marine mammal observation within the exclusion zone shall be undertaken by a qualified observer, to be engaged by the Project Proponent or Contractor, who shall be suitably trained to conduct the observation works, and whose curriculum vitae shall be provided to AFCD for their approval prior to the commencement of the observation.

E.5.4 Before the installation work starts, the Qualified Observer will stand on the open upper decks of the barge and scan the 250m exclusion zone for at least 30 minutes. 250m as the radius of the exclusion zone is typically adopted on other recent underwater cable laying projects, including ADC-HK, BtoBE-HK, SJC2-HK, HKA-HK Cable, PLCN Cable, AAE-1 Cable, etc.

E.5.5 If cetaceans are observed in the exclusion zone, cable installation works shall be halted and will not resume until the observer confirms that the zone has been continuously clear of marine mammals for a period of 30 minutes. This ensures the area in the vicinity of the cable bundle alignment route is clear of marine mammals before the cable laying works start and thus could reduce potential disturbance to marine mammals.

E.6 Reporting

ET's Baseline Monitoring Report

E.6.1 A *Baseline Monitoring Report* shall be prepared by the ET within two weeks from completion of baseline monitoring. This report shall be certified by the ET and verified by the IEC, and thereafter submitted to the EIAO Register Office at least two weeks before commencement of cable installation. The Baseline Monitoring Report shall include the following:

- Brief project background information
- Drawings showing locations of the baseline monitoring stations
- An updated cable installation programme
- Monitoring results together with the information including monitoring methodology, parameters monitored, monitoring locations, monitoring date, time, frequency and

duration

- Details on influencing factors, including major activities concerning the Project, if any, being carried out during the period, weather conditions during the period and other factors which might affect the results
- Determination of Action and Limit Levels for each monitoring parameter and statistical analysis of baseline data to determine if there is any significant difference between control and impact stations for the parameters monitored
- Conclusion

ET's Monthly Impact Monitoring Report

E.6.2 During cable installation works, a *Monthly Impact Monitoring Report* shall be prepared by the ET detailing the EM&A carried out during that month. The *Monthly Impact Monitoring Report* shall be certified by the ET and verified by the IEC, and thereafter submitted to the EIAO Register Office within the first ten working days of the following month. The *Monthly Impact Monitoring Report* shall include the information as follows:

- Basic project information
- Summary of EM&A requirements
- Operating practices of the cable burial tool during sampling and interpretation of monitoring results
- Implementation status
- Monitoring results together with the information including monitoring methodology, parameters monitored, monitoring locations, monitoring date, time, frequency and duration
- Report on non-compliance, complaints, notifications of summons and successful prosecutions
- Conclusion

ET's Post-Project Monitoring Report (if required)

E.6.3 The requirement for post-project monitoring shall be proposed by the ET Leader and agreed by the IEC depending upon the results of the impact monitoring. Only if the results show exceedances of Action and/or Limit Levels attributable to the Project shall post-project monitoring be carried out to demonstrate that environmental conditions have returned to pre-Project (i.e. baseline) values after the completion of works.

E.6.4 In case post-project monitoring is required, a *Post-Project Monitoring Report* shall be prepared by the ET within two weeks upon completion of post-project monitoring. The purpose of the *Post-Project Monitoring Report* is to review the environmental status after cable installation and compare with the results presented in the *Baseline Monitoring Report*. The *Post Project Monitoring Report* shall be certified by the ET and verified by the IEC, and thereafter submitted to the EIAO Register Office. The *Post Project Monitoring Report* shall include the following:

- Basic project background information
- Drawings showing locations of the monitoring stations
- The actual cable installation programme

- Monitoring results together with the information including monitoring methodology, parameters monitored, monitoring locations, monitoring date, time, frequency and duration
- Review of environmental status upon completion of installation by comparison to the baseline monitoring
- Conclusion

IEC's Monthly Report

E.6.5 When each ET's *Monthly Impact Monitoring Report* (and *Post-Project Monitoring Report*, if required) is submitted, the IEC shall submit a short report (in letter format) to the Authority summarising the results of the IEC's audit and any other observations on the environmental performance of the Project during the concerned period.

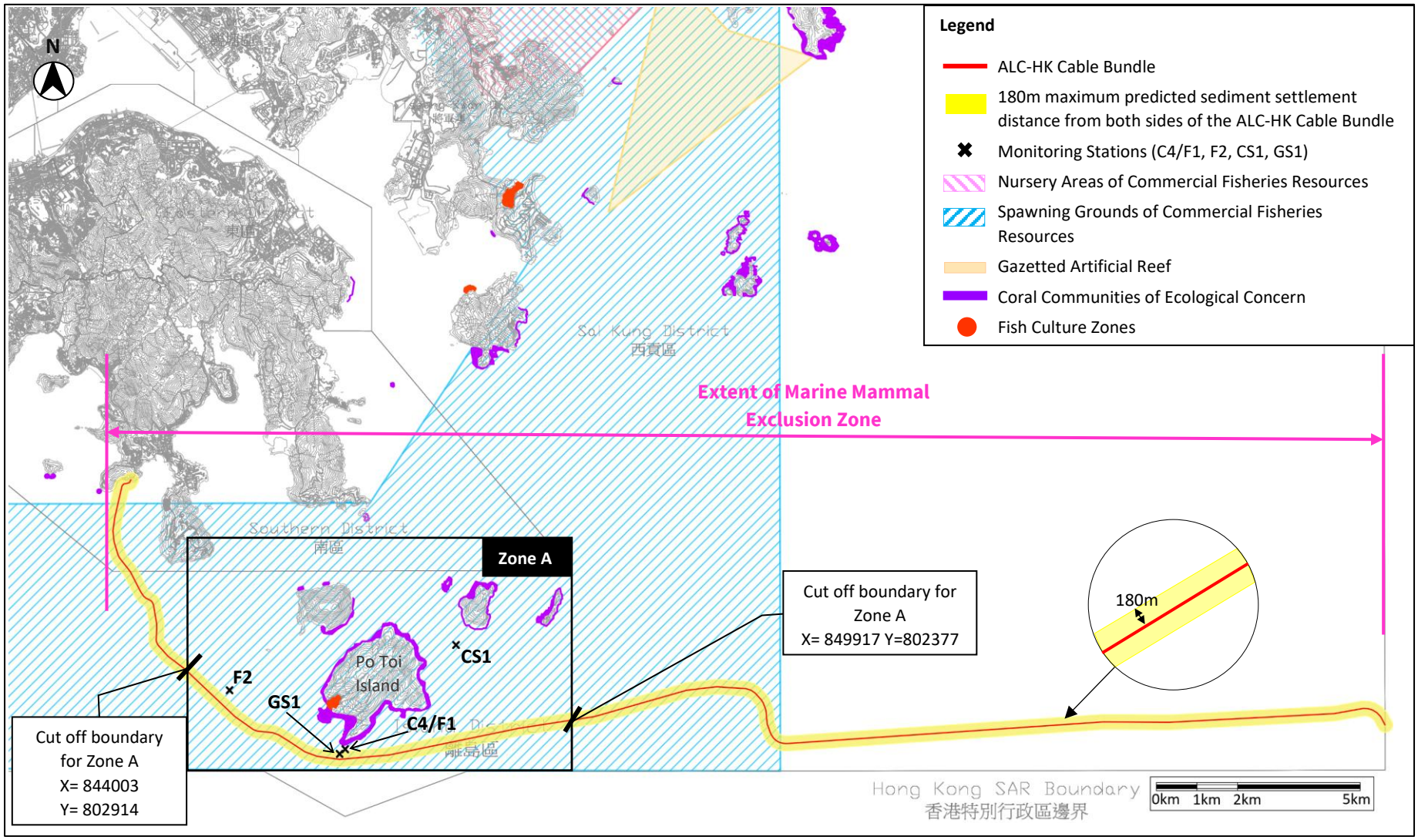
Weekly Marine Mammal Observation Report

E.6.6 If marine mammal observation is carried out, the Qualified Observer shall keep a daily log of all sightings of marine mammals in an appropriate format, including the following:

- Sighting Number
- Mammal Group Size
- Beaufort Sea State
- Perpendicular Distance (in metres) from observation position (on boat) to mammal
- Latitude and Longitude of mammal sighted (WGS84 in Decimal)
- Boat Name
- Photographs of all mammals in each sighting

E.6.7 A *Weekly Marine Mammal Observation Report* shall be compiled from daily observations and submitted to the IEC for verification before the end of the following week.

Figure E-1 Water Quality Monitoring Stations and Monitoring Zones



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EnviroSolutions & Consulting Ltd
16/F & 17/F
700 Nathan Road
Mong Kok
Kowloon
Hong Kong

Email: enquiries@envirosc.com
Website: www.envirosc.com | www.simplyehs.com