



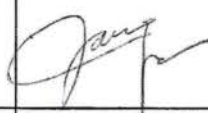
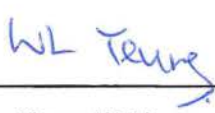

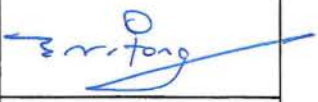




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ACC Reference Number:	1701	W	000	CSC	760	000190

METHOD STATEMENT TITLE	Rev. A
Method Statement for Initial Hydrographic Survey	

	Prepared by:	Checked by:	Reviewed by:	Reviewed by:
Signature:				
Name:	Andrew Lo	C F Chan	Leung Kwok Fung / Hui Wai Kwan	MH Isa / WH Lam
Position:	Graduate Engineer	Construction Manager	SM/SO	QM/QE
Date:	3/5/2024	7/5/2024	7/5/2024	7/5/2024
	Reviewed by:	Reviewed by:	Reviewed by:	Approved by:
Signature:				
Name:	James Ma / Iris Ho	Yeung Wai Lun	Paul Freeman / Mark McGleenon	Eric Fong
Position:	EM/EO	A. Project Director	Sr. Project Director / A. Project Director	Project Director
Date:	7/5/2024	7/5/2024	07/05/2024	7/5/24



## CONTENT

1. Introduction
2. Reference Documents
3. Details of Sub-Contractor/Specialist Sub-Contractor
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7. Construction Methods / Construction Sequence
8. Safety
9. Environmental
10. Quality Control
11. Appendices

<b>1.</b>	<b>Introduction</b> (Overview of the operation/works)																																
	<p>This method statement outlines the general method for hydrographic survey. The content mainly describes the procedure of the abovementioned survey works, as well as instrumentation and equipment required for carrying out the survey works. Risk and safety precautions are also considered.</p> <p>The objective(s) of this survey is/are:</p> <ul style="list-style-type: none"> <li>To verify and map the level of seabed in detail along the site.</li> </ul>																																
<b>2.</b>	<b>Reference Documents</b> (Identify relevant documents by name and reference number)																																
	<ul style="list-style-type: none"> <li>General Specification for Civil Engineering Works (NEC4) (MTR Corporation Limited - 2022)</li> <li>Scope for Contract 1701.</li> <li>Materials and Workmanship Specification for Civil Engineering Works.</li> </ul>																																
<b>3.</b>	<b>Details of Sub-Contractor/Specialist Sub-Contractor</b>																																
	<p>CSHK has invited the following sub-contractors / specialist sub-contractor to provide the hydrographic survey service:</p> <ol style="list-style-type: none"> <li>Concordance Engineering &amp; Surveying Service Company Limited</li> </ol>																																
<b>4.</b>	<b>Responsibilities for Activities described within Method Statement</b>																																
	<p>CSHK is responsible to inspect and carry out the construction works. The following persons, as listed in the table below, will attend the specific tool-box talk and be responsible for the activities:</p> <table border="1"> <thead> <tr> <th>Name</th><th>Position</th></tr> </thead> <tbody> <tr> <td>Yeung Wai Lun</td><td>Assistant Project Director</td></tr> <tr> <td>CF Chan</td><td>Construction Manager</td></tr> <tr> <td>Anthony He</td><td>Assistant Construction Manager</td></tr> <tr> <td>Nick Wang</td><td>Site Agent</td></tr> <tr> <td>Tim Cai</td><td>Engineer</td></tr> <tr> <td>Andrew Mak</td><td>Engineer</td></tr> <tr> <td>Charles Xu</td><td>Graduate Engineer</td></tr> <tr> <td>Andrew Lo</td><td>Graduate Engineer</td></tr> <tr> <td>Leung Kwok Fung</td><td>Safety Manager</td></tr> <tr> <td>Ernest Young</td><td>Assistant Safety Officer</td></tr> <tr> <td>Shek Hau Kim</td><td>Survey Manager</td></tr> <tr> <td>Lau Yu Tat</td><td>Senior Surveyor</td></tr> <tr> <td>Cheung Siu Kei</td><td>Superintendent</td></tr> <tr> <td>Ng Ho Lun</td><td>Senior Foreman / WPIC</td></tr> <tr> <td>Singh Nirdeep</td><td>Foreman / WPIC</td></tr> </tbody> </table> <p>(a) Assistant Project Director / Construction Manager / Assistant Construction Manager Responsible for overall administration, monitoring, controlling progress and quality of works in a safe manner.</p> <p>(b) Site Agent / Senior Engineer / Engineer Responsible for developing works procedures, controlling progress and quality of works</p>	Name	Position	Yeung Wai Lun	Assistant Project Director	CF Chan	Construction Manager	Anthony He	Assistant Construction Manager	Nick Wang	Site Agent	Tim Cai	Engineer	Andrew Mak	Engineer	Charles Xu	Graduate Engineer	Andrew Lo	Graduate Engineer	Leung Kwok Fung	Safety Manager	Ernest Young	Assistant Safety Officer	Shek Hau Kim	Survey Manager	Lau Yu Tat	Senior Surveyor	Cheung Siu Kei	Superintendent	Ng Ho Lun	Senior Foreman / WPIC	Singh Nirdeep	Foreman / WPIC
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	<p>in a safe manner. They also have to implement safety at works area for workers via guidance from safety officers.</p> <p>(c) Safety Manager/ Safety Officer Responsible for assessing working conditions of work areas in safety means. To prepare risk assessment before works, enforce safety works practice and environment in the workplace and work site.</p> <p>(d) Worksite Person In Charge (WPIC) WPIC is in charge of the work in the works areas, which are located at various positions of site. Site Supervisor is also responsible in implementing works control checklist.</p> <p>(e) Workers Workers who have completed RSI training and received a valid qualification.</p> <p>(f) Competent Person (CP(T)/CP(NT)) CP shall provide pre-work briefing to all workers and anyone work within the Railway Operation Area (Siu Ho Wan Depot). Briefing attendance records shall be kept on site for inspection. CP shall report to depot before works could commence.</p>
<b>5.</b>	<b>Programme and Working Hours</b> (Start & finish date of operation/works)
	<p>The tentative work commencement is scheduled in May 2024. The general working hours will be from 08:00 – 19:00 daily, from Monday to Saturday. CSHK would check internally to fulfil the Construction Noise Permit Requirement.</p> <p>As the hydrographic survey are mainly to be carried out outside depot, therefore no CP(T)/CP(NT) is needed during the approved working period.</p>
<b>5.</b>	<b>Controls &amp; GPS Check</b>
	<p>The horizontal position refers to the Hong Kong 1980 Grid System. The transformation parameters from geodetic section and Survey and Mapping Office are applied to transform the WGS84 datum into HK1980 datum. The GPS receives differential signal broadcasted from differential transmission station at Kau Yi Chau. Known and agreed control station can also be used for checking GPS.</p> <p>Government tide information would be used for tide reading which is relative to Chart Datum.</p> <p>Hong Kong Principal Datum (HKPD) which is the height datum generally used in Hong Kong and referred through the benchmarks of Lands Department.</p> <p>Chart Datum (CD) which is 0.15m below HKPD.</p>
<b>6.</b>	<b>Plant, Equipment &amp; Material</b> (Identify type, model and specification of MAJOR plant & equipment)
	<p>All plants and equipment will be inspected prior to the mobilization on site to ensure that they are in good working condition and comply with the current regulations.</p> <p>The major plants and equipment will be deployed to carry out the works are as follow: -</p> <p><b>6.1 Survey Vessel</b> A survey vessel will be equipped with a single-beam echo sounder and computer with</p>

logging software. The transducer will be mounted on a side of the vessel. An electric-power-generator/uninterruptible power source (UPS battery) is required in order to provide the power to the above hardware

## **6.2 Differential Global Positioning System (DGPS)**

Device Name: Trimble DGPS Receiver SPS356

Differential Global Positioning System (DGPS) is recommended for positioning of the sailing vessel. The differential signal broadcasts at Kau Yi Chau will be integrated with the GPS data in the device to provide a real-time positioning coordinates, and the coordinates will be transformed into the Hong Kong 1980 Coordinates System. With reference to the brochure of the DGPS, the differential position accuracy is about 1m.

## **6.3 Echo-sounder**

Device Name: Echotrac MK III

Bathymetric data will be collected by the echo sounder with a narrow beam transducer. The depth range of applied frequency (200kHz) had been 0.2m to 200m. The accuracy performance had been maintained at 0.01m +/-0.1% of depth @200kHz total depth of which depends on the accuracy of sound velocity input. The output of echo sounder had been the depth of seabed. Depth had been logged to the computer devices.

## **6.4. Software**

HYPACK will be used for integrating survey equipments, capturing survey data and data reduction.

## **6.5 Computer**

A desktop/laptop computer with recommended specification of the software will be used to run the software during the survey.

## **6.6 Government Tide Database**

Government closest tide station's data would be used for tide reading. The closest tide station is at Chek Lap Kok.



*Fig. 1 Closest Tide Station at Chek Lap Kok*

### 6.7 Bar Check Plate and Chain

The Bar Check plate is around 600mm in diameter and 3-5 mm thick with 5x100mm diameter hole evenly distributed on the plate. The bar check should be around 5kg in weight. The interval starts from the top of the plate. Every one meter there would be a marker on the chain.

7.	<b>Preparation of Survey</b>
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## 7.1 Survey Area

The hydrographic survey boundary is provided from client's information. Below is the approximated survey boundary.



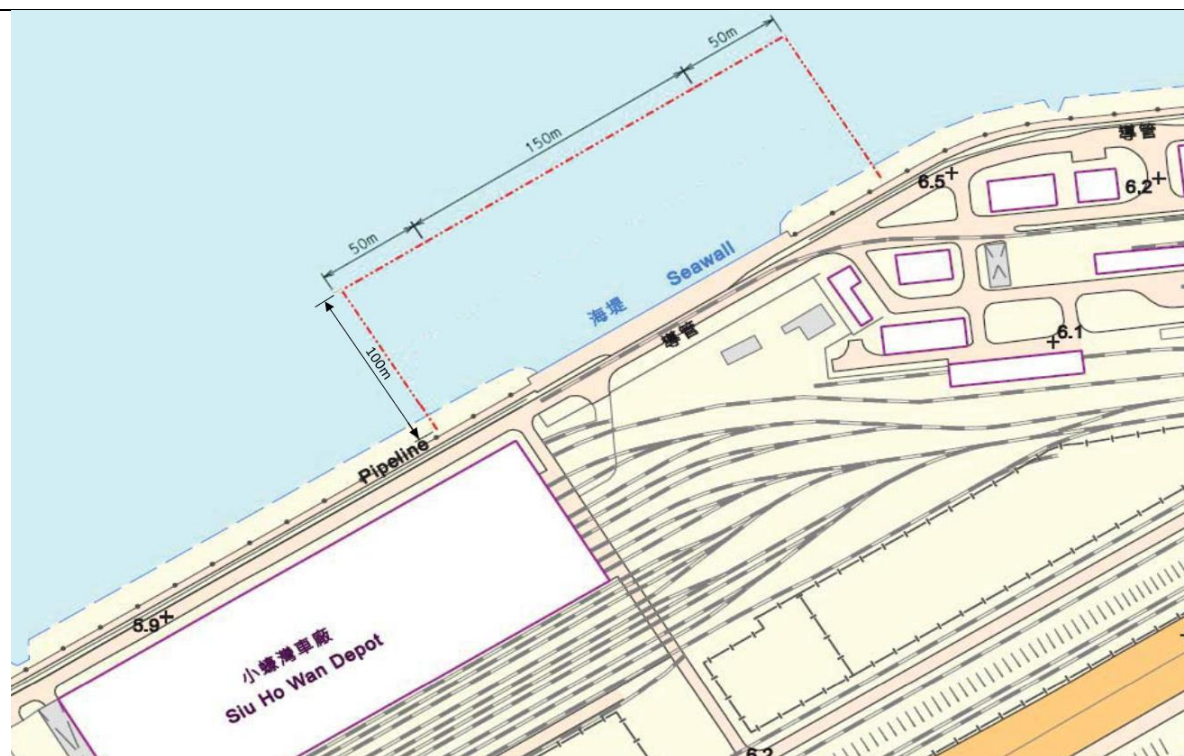


Fig. 2 Survey Layout

## 7.2 Proposed schedule of record survey

The field survey is proposed to be last for 1 working day. The subject site should be clear without blocking during the field survey. The working Permit will be also applied from Marine Department before survey if it is needed. CSHK will liaise and seek approval from HKTS / depot / C7. CSHK will check the exact date of survey works with HKTS and depot to ensure that no operations need of the barging point on that date.

## 8. Survey Methods

### 8.1 Calibration of Equipment

#### 8.1.1 Instruments

All instruments shall be calibrated by equipment certificating company once a year. Certificate will then be issued after calibration to ensure all instrument are in good condition, Instrument without calibration certificate or with expired certificate are not allowed to use within the site area and will be labelled. Calibration certificate is attached.

#### 8.1.2 DGPS

DGPS will be calibrated by setting it on known control station prior and after the sounding operation. The DGPS receiver will be mounted well. Satellite signal will be logged and computed for positioning comparison. If the position logged by the DGPS is within tolerance ( $\pm 1$  m) of the coordinates of control station, the calibration is acceptable.

#### 8.1.3 Bar Check Method

Bar check test will be followed to determine the correctness for the echo sounding equipment. A steel plate will be lowered underneath the transducer. The chain linked to the steel plate shall be marked with 1m interval. At the beginning, the plate will be lowered to 2m depth, to calibrate the draft of the transducer. The steel plate then will be lowered to the deepest section to be surveyed. Before the bar check, the sound velocity will be adjusted to eliminate the difference between reading and the depth of steel plate. After that, the steel

plate will be raised meter by meter and the reading recorded on echo roll paper will also be checked for any discrepancy. Re-adjustment of sound velocity and calibration is necessary if the reading is different from the pre-determined depth.

#### 8.1.4 HDOP of Satellites

The value of HDOP, horizontal dilution of precision, is indicating the positional precision. The meaning of HDOP value is as shown below:

HDOP Value	Rating	Description
<1	Ideal	Highest possible confidence level to be used for applications demanding the highest possible precision at all times.
1-2	Excellent	At this confidence level, positional measurements are considered accurate enough to meet all but the most sensitive applications.
2-5	Good	Represents a level that marks the minimum appropriate for making business decisions. Positional measurements could be used to make reliable in-route navigation suggestions to the user.
5-10	Moderate	Positional measurements could be used for calculations, but the fix quality could still be improved. A more open view of the sky is recommended.
10-20	Fair	Represents a low confidence level. Positional measurements should be discarded or used only to indicate a very rough estimate of the current location
>20	Poor	At this level, measurements are inaccurate by as much as 300 meters with a 6-meter accurate device ( $50 \text{ DOP} \times 6 \text{ meters}$ ) and should be discarded.

The value of HDOP of satellites received during the survey will be monitored and recorded.

#### 8.2 Preparation of Plan lines

Pre-assigned survey lines will be allocated to cover the entire sounding portion. The principle of designing the survey lines would either be 5m section intervals normal to the base line or 5m fixed intervals. In addition, reasonable check lines shall be performed normal to the survey line. The interval of check line usually adopted as 40m or minimal of 2-3 check lines to be adopted.

#### 8.3 Field Survey

Survey vessel speed will be kept in a constant speed, generally 3-5 knots will be applied which causing no intolerable distortion to the sounding records. The software will be set to mark on the data file and sounding paper in every 5m. The interval will be set in distance instead of time because the sampling rate by time had been affected by speed of the boat. The marks would be evenly distributed along the cross section if marks were taken by distance intervals. The sounding will be recorded in the computer by 0.1s intervals; it means 0.15m intervals at speed of 3 knot. A minimum of 2-3 check lines should be run for ensure the quality of the sounding data.

#### 8.4 Tide Reading

The closest government tide gauge Chek Lap Kok will be constantly booked during the period of the survey with readings being taken in 10 minutes interval throughout that period.

#### 8.5 Data reduction

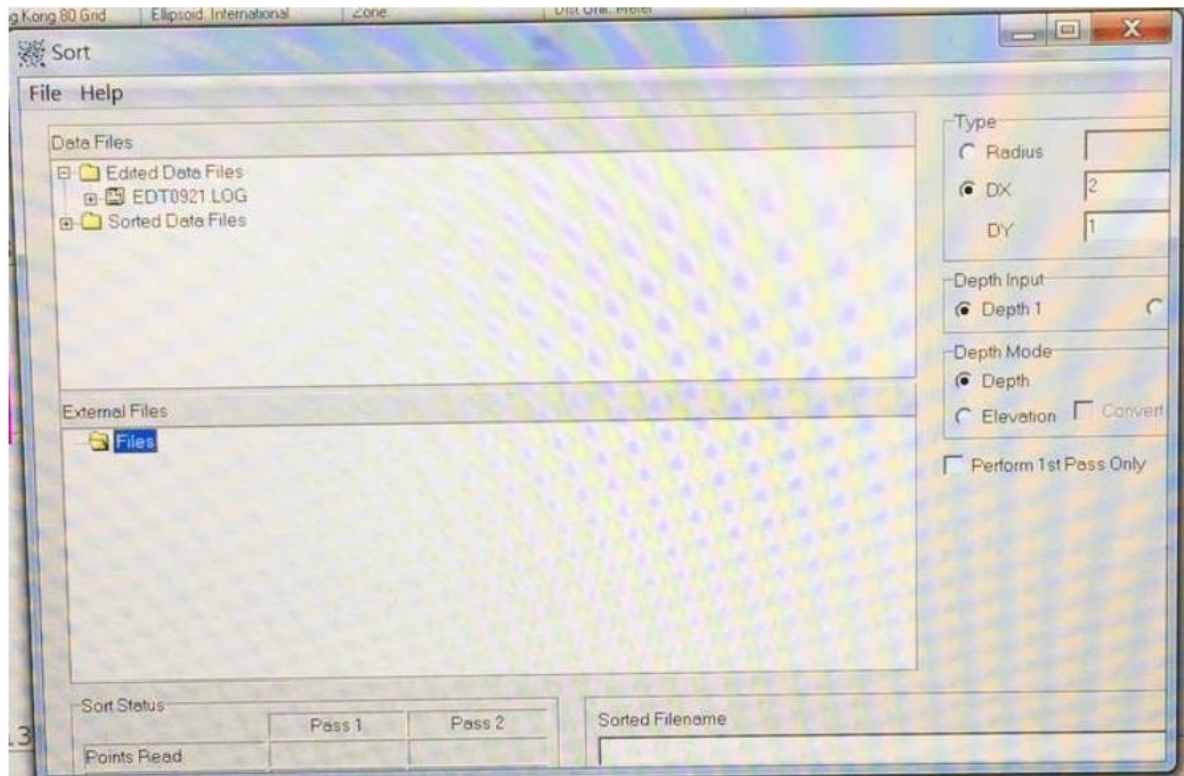
##### 8.5.1 Data reduction and Editing



A software Hypack will be used for reducing the raw data. The corrections, such as tide, will be applied to the raw data and reduced to Hong Kong Principal Datum (H.K.P.D.). After applying the corrections, the noise, such as bubbles, fishes, unpredictable errors, will be removed. Then, the data will be reduced into point-form and the outliers will be removed by comparing the data in different survey-lines.

### 8.5.2 Sorting

After the data editing, the shallowest depth points will be selected, for the scale of 1:500 using A2 paper, in their true position soundings' cell size would be DX=2 DY=1. The processing data sign should be positive within Hypack program.





### 8.5.3 Deliverables

List of common deliverables of sounding surveys for charting and engineering purposes-

- (a) Sounding data (i.e. Northing, Easting and Depth) in ASCII format;
- (b) Raw sounding data of time, position and depth in format readable by the common hydrographic survey packages;
- (c) Hard copy and softcopy of sounding plan, cross-section plan and track plot of actual runlines; and
- (d) Survey report detailing the assessment of horizontal and vertical positioning accuracies.

### 8.5.4 Presentation

A sounding plan with contour will be plotted in scale 1:500(A2) unless A2 paper is not a suitable option. A text file will be exported in order of Easting, Northing, and Depth. Soundings shown on the drawings are displayed with one place of decimal. Soundings above datum (HKPD or CD) should be shown with their values underlined. The sounding

	plotted on the sounding plan would be without negative sign. Digital copy of the sounding plan should be in format of CADD file (DGN) and PDF.
<b>9.</b>	<b>Safety</b> (Risk Assessments)
	<p><b>9.1 General Safety</b></p> <ul style="list-style-type: none"> <li>● All workers shall be equipped with life jackets and safety helmets during operation. All workers must go through a briefing by the Construction Manager / Safety Officer / Safety Supervisor before commencement of any works. All workers on site shall obtain an approved "Mandatory Basic Safety Training Certificate".</li> <li>● Toolbox talk training with reference to the recommended safety and environmental control measures after Construction Risk Assessment will be provided to the site personnel prior to commencing works.</li> <li>● A pre-meeting will be arranged before commencement of the work among Foreman / Engineer / Construction Manager, MTR's representatives and Safety Department to brief the nature of works, the safety aspects and the requirements.</li> <li>● Safety helmets fitted with chin straps, high visibility jackets / sashes, will be provided to all staff working for hydrographic survey.</li> <li>● Any emergency situation shall be reported to Subcontractor and Contractor (i.e. Construction Manager / Engineer / Foreman and Safety Department, etc.) for prompt response. The emergency contact list is shown in <b>Appendix</b>.</li> </ul> <p><b>9.2 Safety for Working in Sea</b></p> <ul style="list-style-type: none"> <li>● All workers shall be equipped with qualified life jackets during the works.</li> <li>● Workers working on a vessel shall have the qualification of the "Shipboard Cargo Handling Basic Training Course"/ "Blue Card".</li> </ul> <p><b>9.3 Risk Assessment</b></p> <p>The risk for the works shall be assessed and the Risk Assessment Analysis is shown in <b>Appendix</b>.</p>
<b>10.</b>	<b>Environmental</b> (Environmental aspect & impact identification as well as mitigation measures)
	The works shall follow relevant mitigation measures as required under the Environmental Permit (EP) / EP submission and <i>Contractor's</i> Environmental Management Plan (EMP).
<b>11.</b>	<b>Quality Control</b> (Inspection and Test Plan including hold points)
	<p>Refer to Appendix E for Inspection and Test Plan.</p> <p>To ensure the attainment of the required standard of works, the methods of working and the required works standards / acceptance criteria are defined in the method statement, inspection &amp; test plans, and are communicated to relevant staff and workers carrying out the works. Day to day routine inspections of the works will be carried out by the Construction Team Leader, Site Engineers and Foreman as appropriate, to ensure that all works are performed following the requirements of these documents.</p>

	<p>Specific quality checks shall be carried out in accordance with the approved Inspection &amp; Test Plan with “Hold Points” at critical elements for confirmation of compliance before proceeding further.</p> <p>Request for Inspection and Survey Check (RISC) shall be issued to the RSS following inspection of the works by the CSHK’s project team. The Inspection &amp; Test Plan for the works (Appendix E) will identify all Hold Points and Witness Points.</p> <p>Following the Inspection &amp; Test carried out, inspection and / or test records are to be prepared to indicate whether the specified requirements have been met. Records of Inspection and testing will be maintained and kept available for inspection and final handover as appropriate.</p>
<b>11.</b>	<b>Appendices</b> (Identify and include additional information in the submission package)
	<p>Appendix A - Specification of the Trimble DGPS Receiver SPS356</p> <p>Appendix B - Specification of Echotrac MK III</p> <p>Appendix C – Calibration Certificate</p> <p>Appendix D – Emergency Contact List</p> <p>Appendix E – Risk Assessment</p> <p>Appendix F – Inspection and Test plan (ITP)</p>