

Agreement No CE2/2018 (CE) Study of Pier Improvement at Lai Chi Wo and Tung Ping Chau - Investigation

Marine Geophysical Summary Report - Tung Ping Chau

Summary

In October 2018, a marine geophysical survey comprising Side Scan Sonar, Sub-bottom Profiler and Magnetometer was completed at Tung Ping Chau.

The results were analysed in detail by a marine archaeologist and there was no indication of any object or seabed area with archaeological potential. There is therefore no need for any further action or mitigation.

Introduction

The marine geophysical survey was completed by Gammon Construction Ltd. under a works order from CEDD (Works Order No. GE/2016/03.25). The survey was commissioned to study the seabed features and shallow geology at Tung Ping Chau to facilitate construction and upgrading work of the pier. The data was also used to look for any seabed features with marine archaeological potential. The comprehensive results of the survey are set out in the Final Report under Works Order No. GE/2016/03.25. Only data relevant to the Marine Archaeological Investigation (MAI) are included here.



Figure 1 Survey area extracted from Google Earth

Methodology

The geophysical survey methods set out in the table below were utilized to achieve specific survey objectives:

SURVEY TYPE	OBJECTIVE
Single beam echo sounder (SBES)	To provide seabed levels
Side Scan Sonar (SSS)	To map sediment types and locate anomalous features on the seabed which may have archaeological potential.
Sub-bottom Profiling (SBP)	To provide the levels and thicknesses of geological interfaces to establish if the seabed is a good preservation environment for underwater cultural heritage.
Marine Magnetometer (MAG)	To identify metallic objects and any archaeological remains on, or just beneath the seabed.
C-Nav computerized navigation suite	To achieve location control accuracy of +/- 1m or better.

The survey was completed on 25th October 2018 using a small speed boat launched from a larger survey vessel, due to the shallow water depths. High tide periods were utilized to maximise the survey coverage. The survey traverse intervals were as set out in the table below:

SURVEY TYPE	SURVEY SPACING
SBES	5m x 30m grid
SBP	10m x30m grid
SSS	10m
MAG	5m

Site Description

The rectangle site measures approximately 190m from north-east to south-west and 160m from north-west to southeast in the shallow water. The water depth ranges from 1m-8m. Tung Ping Chau is an isolated remote island located in the north-eastern end of Hong Kong near to the border with China. It is well known for its complex geological features.

Results

Seabed Features

Over 60% of the survey area is characterized by boulders and rock which were observed along the coastline. Soft sediments are located in the north-eastern part of the survey area. The survey area was classified as follows:

- Silty clay area
- Areas with gravely sand with scattered boulders
- Boulders with rocks and sand patches
- Low to medium relief rock
- 1 Side Scan Sonar contact

The location of the side scan sonar contact is set out in the table below and a copy of the data in the Figure below:

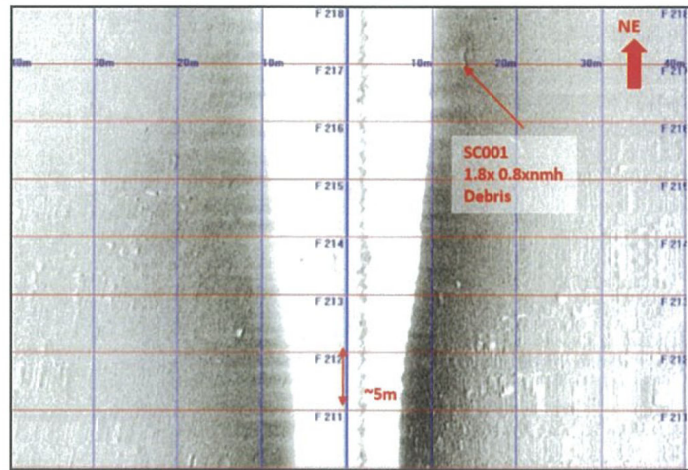


Figure 2 Side Scan Sonar data showing SC001

Contact number	Latitude Longitude	Easting Northing	Dimensions (m)	Description
SC001	22° 32.840' N 114° 25.877' E	862691.7E 845137.8N	1.8x0.8xnmh	Debris

nmh = non-measurable height

The location of SC001 is shown in the Seabed Features Drawing which is **Figure 3**. It is located sufficient distance from the pier and will not be impacted by the construction works. The images below present the other seabed features across the study area.

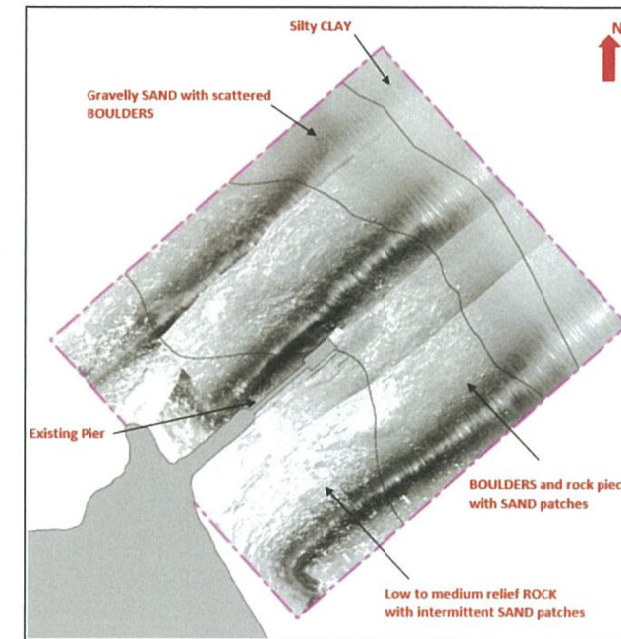


Figure 3 Side Scan Sonar mosaic showing seabed features



Figure 4 Side Scan Sonar data showing rocks and boulders in the south-western survey area



Figure 5 Side Scan Sonar data in the middle of the survey area

Marine Deposits

The upper-most geological unit is the “Marine Deposits” of the Holocene Hang Hau Formation. This comprises very soft to soft homogenous sediments deposited shortly after the rise in sea level at the end of the last ice age, 10,000 to 6,000 years ago. It typically consists of greenish grey silty clay that has a variable thickness up to 30m. Undrained shear strengths vary from <3kPa to 20kPa. The sediment generally becomes coarser to the base of the formation. Sediment of this kind provide an excellent preservation environment for archaeological remains.

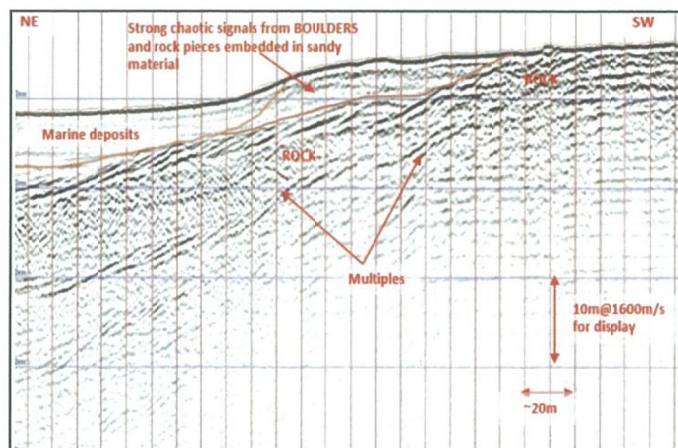


Figure 6 Sub-bottom Profiler data showing the geological succession

The Sub-bottom Profiler data indicates the general regime at the base level of the marine deposits. The marine deposits are missing in the coastal rocky area and dips from -3mPD in near shore area to over -14mPD in the offshore area. The thickness of the marine deposit was generally thin near the coastal area and increased offshore to 6m. Borehole data from a previous pier reconstruction in 2002 was used to correlate the seismic data and proved that it was accurate.

Results of the Magnetometer Survey

A plan derived from the processed magnetic data is presented below. The area has a quiet ambient field as the marine traffic was relatively scarce. The magnetic variations which were recorded were believed to mostly correspond with to the scattered boulders and rocks at the existing pier structure.

A prominent magnetic change can be seen at the existing pier where there are also rocks and boulders around it.

There were no isolated features that indicated any archaeological potential.

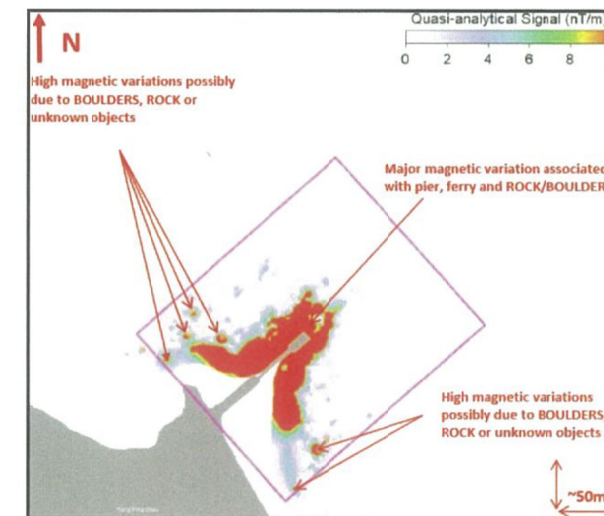


Figure 7 Image of processed magnetic intensity over the survey area

Conclusion

The survey achieved its objectives of providing detailed information about the seabed and surface and sub sediments. It is a rocky coastline and over 60% of the survey area is characterized by rocks and boulders. The sediment layer is thin and very coarse near the shore end and thicker and finer towards the offshore. These factors combine to make it a poor preservation environment for archaeological remains therefore giving it low archaeological potential.

There was no object or feature located which might have archaeological potential. There is therefore no need for further action or any mitigation measures.