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Project Title
Consultancy Agreement No. NOL/ERL-300
Environmental Impact Assessment of Hong Kong Section of
Guangzhou-Shenzhen-Hong Kong Express Rail Link
MTR Corporation Limited Marine Archaeological Impact Assessment Report

English abstract

The Hong Kong Section of Guangzhou-Shenzhen-Hong Kong Express Rail Link (the Project) is approximately 26 km long, in a dedicated underground railway from the boundary at Huanggang to West Kowloon Terminus.

Dredging works will be required to construct the berthing area for Lung Kwu Sheung Tan barging point. In order to evaluate the archaeological potential of the dredging area, a Marine Archaeological Impact Assessment (MIA) was conducted by ENSR Asia (HK) Ltd.

A desktop review of archaeological potential and field investigation (including geophysical survey and underwater inspection) were conducted. Review of archaeological potential and field evaluation identified that the dredging area have no archaeological potential.

A Marine Archaeological Investigation was conducted at the seabed area which will be affected by the dredging works. The marine geophysical survey located nine sonar targets on the seabed. Each sonar contact was identified as modern debris, and therefore it is concluded that there are no submerbed cultural resources within the study area and further investigation or mitigation measures are not required.

中文摘要

「廣深港高速鐵路香港段」(以下簡稱“項目”)長約 26 公里，爲一條連接皇崗邊境，與西九龍高鐵總站的鐵路。

爲興建龍鼓上灘躉船轉運站，將要浚疏該區。故此，爲評估該浚疏區內之考古潛質，安社亞洲(香港)有限公司在該區進行了水下考古影響評估。

是次評估包括桌上考古潛質研究和水下考古調查(包括遙感物探和水下考古勘察)。據考古潛質研究結果，確定了浚疏區內沒有考古潛質。

水下考古調查在浚疏區內進行。遙感物探確定浚疏區內有九個聲納反射點，經水下考古勘察確定此九個反射點均爲現代廢物。是次水下考古調查已確定浚疏區內並無考古遺存，故不需後續考古調查或緩解措施。

1 INTRODUCTION

1.1 Background of the Project

1.1.1 The Express Rail Link (XRL) aims at providing a fast and convenient railway service linking the three cities of Guangzhou-Shenzhen-Hong Kong. The Hong Kong Section of Guangzhou-Shenzhen-Hong Kong Express Rail Link (the Project) is approximately 26 km long, in a dedicated underground railway from the boundary at Huanggang to West Kowloon Terminus (WKT).

1.1.2 As required under the Environmental Impact Assessment Study Brief No. ESB-197/2008 (ESB), a Marine Archaeological Impact Assessment (MIA) was conducted for the EIA Study of the Project.

1.2 Duration of Field Survey and the Application of License

1.2.1 The field archaeological survey was conducted between March to May 2009 to establish and evaluate the archaeological potential of the dredging area of Lung Kwu Sheung Tan Barging Point.

1.2.2 A License to Excavate and Search for Antiquities (License number 278) from the Secretary of Development was obtained by Ms. Sarah heaver on behalf of ENSR Asia (HK) Ltd prior to the commencement of field survey.

1.3 Report Structure

1.3.1 The structure of the MIA Report is set out below:

- Section 2 describes the relevant legislation and guidelines;
- Section 3 sets out the objectives and methodology;
- Section 4 provides the baseline review, archaeological potential, related geological, historic and archaeological background to the study area;
- Section 5 presents the result of the geophysical study;
- Section 6 presents the result of underwater inspection;
- Section 7 presents the conclusions of recommendation the MIA; and
- Section 8 presents bibliography.

2 LEGISLATION AND GUIDELINES

2.1 Environmental Legislation and Standards

2.1.1 Legislation, Standards, Guidelines relevant to the consideration of MAI under this EIA study include the following:

- *Environmental Impact Assessment Ordinance* (EIAO);
- *Technical Memorandum on Environmental Impact Assessment Process* (EIA-TM);
- *Antiquities and Monuments Ordinance* (AM&O); and
- *Guidelines for Marine Archaeological Investigation* (GMAI).

Environmental Impact Assessment Ordinance (Cap.499)

2.1.2 Schedule 1 Interpretation of the EIAO defines “Sites of Cultural Heritage” as “an antiquity or monument, whether being a place, building, site or structure or a relic, as defined in the AM&O and any place, building, site, or structure or a relic identified by Antiquities and Monument Office (AMO) to be of archaeological, historical or palaeontological significance”.

Technical Memorandum on Environmental Impact Assessment Process

2.1.3 The criteria and guidelines for evaluating and assessing impacts are listed in Annexes 10 and 19 of the EIA-TM respectively. The criteria for evaluating impact on sites of cultural heritage include:

- The general presumption in favour of the protection and conservation of all sites of cultural heritage because they provide an essential, finite and irreplaceable link between the past and the future and are points of reference and identity for culture and tradition; and
- Adverse impacts on sites of cultural heritage shall be kept to an absolute minimum.

Antiquities and Monuments Ordinance (Cap.53)

2.1.4 The AM&O provides the statutory framework for the preservation of objects of historical, archaeological and palaeontological interest.

2.1.5 The Ordinance contains the statutory procedures for the Declaration of Monuments. Under the Ordinance, monument means a place, building, site or structure which is declared to be a monument, historical building, archaeological or palaeontological site or structure because of its historical, archaeological or palaeontological significance under section 3 of the Ordinance.

2.1.6 Under section 6 and subject to subsection (4) of the Ordinance, the following acts are prohibited in relation to certain monuments, except under permit:

- *To excavate, carry on building works, plant or fell trees or deposit earth or refuse on or in a proposed monument or monument; or*
- *To demolish, remove, obstruct, deface or interfere with a proposed monument or monument.*

2.1.7 The discovery of an Antiquity, as defined in the Ordinance, must be reported to the Antiquities Authority, or a designated person. The Ordinance also provides that, the ownership of every relic discovered in Hong Kong after the commencement of this ordinance shall vest in the Government from the moment of discovery. The Authority on behalf of the Government may disclaim ownership of the relic.

2.1.8 No archaeological excavation or investigation can be carried out by any person, other than the Authority and the designated person, without a licence issued by the Authority. A licence will only be issued if the Authority is satisfied that the applicant has sufficient scientific training or

experience to enable him to carry out the excavation and search satisfactorily, is able to conduct, or arrange for, a proper scientific study of any antiquities discovered as a result of the excavation and search, and has sufficient staff and financial support.

Guidelines for Cultural Heritage Impact Assessment

2.1.9 The GCHIA is attached in Appendix C-1 of the EIA Study Brief No. ESB-197/2008 (ESB) including a baseline study, field evaluation and impact assessment.

Guidelines for Marine Archaeological Investigation (GMAI)

2.1.10 The GMIA is attached in Appendix C-2 of the EIA Study Brief No. ESB-197/2008 (ESB) including a baseline study, field evaluation and impact assessment.

3 ASSESSMENT METHODOLOGY

3.1 Objectives of the Marine Archaeological Investigation

3.1.1 The MAI follows the methodology set out in the GMIA issued by the AMO and the relevant requirements in the Annexes 10 and 19 of EIAO-TM. This report presents the results of all study phases.

- Phase 1 - Assess the archaeological potential of the study area based on results of a baseline review;
- Phase 2 - Conduct a marine Geophysical Survey to obtain detailed data about the seabed and sub-surface sediments;
- Phase 3 - Identify and assess the location and significance of any seabed features requiring further investigation and evaluation;
- Phase 4 - Carry out a diver inspection of seabed features; and
- Phase 5 - Assess the impact of the dredging on the archaeological resources, if present, and recommend a mitigation strategy, if necessary.

3.2 Study Scope

3.2.1 The MAI covers the dredging area in Lung Kwu Sheung Tan. The location of the study area and adjacent shoreline are marked in **Figures 1 and 2**. The dredging area is approximately 6,600m^2 (i.e. 60m x 110m) as shown on **Figure 2**. Baseline review, marine geophysical survey and dive survey was conducted at this dredging area.

3.3 Baseline Review

3.3.1 A baseline review was undertaken to compile a comprehensive inventory of cultural heritage resources of the dredging area. The aim of the baseline review is to compile the most significant information to establish the archaeological potential of the seabed within the study area. It is not an exhaustive chronological history of the area. The Review established the historical profile and potential for cultural heritage sites and included:

- Marine charts records held in the UK Hydrographic Office, and National Maritime Museum Library in London;
- Publications on local historical, architectural, anthropological, archaeological and other cultural studies; and
- Unpublished papers, records, archival and historical documents held in local libraries and other government departments.

3.4 Marine Geophysical Survey

Survey Objectives

3.4.1 The geophysical survey was carried out from 17th to 18th March, 2009, survey objectives are:

- To map features on the sea bed such as shipwrecks, isolated objects;
- To map rock outcrops and debris;
- To map the geological succession; and
- To map sea bed levels in detail.

3.4.2 The survey area of 60m x 110m (6,600m ^{2}) was surveyed in long lines and cross lines with a couple of additional runs parallel to the coastline. The survey plan ensured 100% coverage of the dredging area.

3.4.3 The main items of survey equipment to acquire geophysical and hydrographic data were: high resolution sub-bottom profiler (C-Boom low voltage boomer system); side scan sonar (Edge-tech 272) and single beam echo sounder (SBES). A comprehensive list of survey equipment mobilized for this project is provided below.

- Single-Beam Echo Sounder:

Item	*Qty*
Echotrac MKIII survey echo sounder	1
Motion sensor	1
Bar Check	1

- Navigation & Positioning:

Item	*Qty*
C-Nav GcGPS	1
EGS computerised navigation package v1.2 and PC	1
Gyro	1

- Sub bottom Profiler:

Item	*Qty*
C-Boom low voltage boomer system	1
C-Phone hydrophone system	1

- Side Scan Sonar System:

Item	*Qty*
Edge-tech 272 TD side scan sonar system with digital tow fish	1

- Other Computer facilities:

Item	*Qty*
C-View Logging Systems and monitors	2
C-View Int. Systems	2
UPS for computer system	1

3.5 Location Control

Horizontal

3.5.1 The survey vessel was located with a Global Positioning System (GcGPS) unit called C-Nav, for which no shore based differential correction transmitter is required. The system provides corrected positions to an accuracy of +/- 0.3m without the need for a shore-based transmitting system.

Computerised Navigation

3.5.2 The computerized navigation system was added to the positioning system to control the steering of the boat along the traverses specified, and to log all horizontal and vertical control data. This system provides the user with a dynamic analogue and digital screen display on which the following are continuously updated: skewed grid set parallel to the desired line direction; boat position; water depth; date and time and GcGPS diagnostics enabling quality control

3.5.3 Other information displayed for the assistance of the hydrographic surveyor includes, course, speed, fixing status, and co-ordinates on the Hong Kong National Grid, as well as a number of other user-defined options for marine surveying.

Calibration, Accuracy and Quality Assurance

3.5.4 The positioning system was calibrated by checking the co-ordinates displayed by the navigation system at a previously co-ordinated point located at Tuen Mun. Carrying out the above quality assurance checking procedure ensured an accuracy of +/-1m or better.

Vertical

3.5.5 Depths were referenced to Hong Kong Principal Datum (HKPD), using tide levels measured around the survey areas during the survey. In this part of Hong Kong, Chart Datum is 0.15m below HKPD and as referred to on charts HK1503 (October 2005) and HK1504 (February 2007) published by the Hydrographic Office of the Marine Department, Government of the Hong Kong Special Administrative Region.

Operating System on Board the Survey Vessels and in the Office

3.5.6 The survey team has developed the C-View operating and interpretation software package. This system was installed on survey vessels and in the office. The system provided screen displays on up to three monitors for seismic profiling and side scan sonar systems. All raw data was logged digitally.

3.6 Side Scan Sonar Interpretation

3.6.1 This was carried out in the office by marine archaeologist; interpretation on the screen was then directed straight to Autocad without the need for further re-digitizing.

3.6.2 The influence of wave action was corrected in real time by the motion compensator. The smoothed sounding data was used to reduce the sounding data to Principal Datum (mPD) using the measured tidal data.

3.6.3 The interpretation of the side scan sonar records in this area has sought to quantify the following features on the seabed:

- Shipwrecks
- Unidentified Objects

- Areas of disturbed seabed attributed to anchoring or trawling
- Higher reflectivity areas attributed to coarse sediments
- Lower reflectivity areas attributed to relatively undisturbed fine sediments
- Rock outcrops
- Debris or dumped material

4 BASELINE REVIEW AND ARCHAEOLOGICAL POTENTIAL

4.1.1 Practically nothing is known about the archaeological potential of the seabed deposits in Hong Kong. The only marine archaeological discovery is that of a late Sung/early Ming Dynasty boat uncovered during construction of the High Island Reservoir, near Sai Kung[1]. Since then, no other historic shipwreck has been found.

4.1.2 The aim of the Baseline Review is to establish the maritime history within and around the study area to predict the archaeological potential of the seabed.

4.2 Archive Search

4.2.1 The UK Hydrographic Office (UKHO), Taunton holds a database of surveyed shipwrecks in Hong Kong, including many not shown on Admiralty Charts. The database does not contain any records of shipwrecks within the study area. However, the Hydrographic Office only charts wrecks which are a potential hazard to navigation. It is therefore possible that there are other wrecks within the study area which are partially or totally buried and thus not recorded. The Hydrographic Office also holds unpublished historical charts of the Hong Kong SAR's waters presented as **Figures 4** to **6**.

4.2.2 This is the earliest published chart based on scientific measurement and it is important to note that it indicates the main route around Lantau towards Canton is adjacent to the current study area.

4.3 Historical Background to Lung Kwu Sheung Tan

4.3.1 Lung Kwu Sheung Tan is located in a geographically significant headland that separates the northern extreme of a Castle Peak Bay from the entrance to the Deep Bay. Its location makes it immediately relevant to the early history of local shipping and to later international trade due to its position adjacent to the only safe winter trade route into the Pearl River Delta and close to a rare safe anchorage from north-easterly gales.

4.3.2 During the Tang (618-907) and Song (960-1279) Dynasties, Canton had grown into the largest commercial port in China. It was the first Chinese city to have a government office to administer foreign trade. The importance of this centre and the volume of foreign shipping was always a concern to the Imperial Government. As early as 411 a pirate band was established on Lantau and harassed shipping in the area. To safeguard the seaward approaches and minimise piracy the Chinese government established war junk patrols and forts at suitable anchorages. The initial base for the war junk patrols was Tuen Mun which was established prior to the mid eighth century[2].

4.3.3 Junks anchored in the roadstead between Tuen Mun and Lung Kwu Chau, in the shelter of Castle Peak; those from Malacca anchored off Tuen Mun, while those from Siam stopped off the islands round the coast presumably Lung Kwu Chau[3] . The principal item of trade from China exchanged in this area was raw white silk in large quantities, loose coloured silks, satins of all colours, damask, taffetas and other thin silk cloths known as xaas (thin turban-material), locally-produced seed-pearls in various shapes, mostly irregular, apothecaries camphor, alum, saltpetre, sulphur, copper, iron, rhubarb, cast-iron kettles, bowls, basins, boxes, needles, and copper bracelets[4].

[1] Frost, R.J. 1974. Sha Tsui, High Island, *Journal of the Hong Kong Archaeological Society*, 5: 23-30.
[2] 蕭國健 1997 《關城與炮台》，香港，市政局。
[3] Brage, J.M., 1965. *China Landfall 1513, Jorge Alvares Voyage to China*. Macau Imprensa Nacional.
[4] Brage, J.M., 1965. *China Landfall 1513, Jorge Alvares Voyage to China*. Macau Imprensa Nacional.

4.4 Archaeological Background of Lung Kwu Sheung Tan

4.4.1 While the focus of this study is marine archaeology, it is also important to establish the land use and occupation adjacent to the study area to establish the marine archaeological potential of the study area.

4.4.2 In 1990, the Hong Kong Archaeological Society conducted a testing and salvage excavation at Lung Kwu Sheung Tan. The site had been known since the 1930s and it was only the threat of destructive engineering works that led to the excavation. At the time of the excavation in 1990 the valley at Lung Kwu Sheung Tan did not have any permanent residents. Some of the land on the main sand bar was cultivated by villagers from Lung Kwu Tan. The last indigenous resident, Mr Lau Koon Fat, moved back to Lung Kwu Chau in the early 1980s. In the 1950s and 60s it was known as a thriving rice farming community. According to local tradition and genealogy, the valley at Lung Kwu Sheung Tan was first settled by Laus in the 18th century.

4.4.3 The excavation exposed an abundance of Song pottery as nearly every test pit yielded huge quantities of Song village ware and fragments of finer celadon bowls. The amount of pottery was massive. For example, one square 6 x 15m yielded 91kg. Nearly all the pieces of dateable historical ceramics were assigned to the Northern Song period (960-1127). One coin and two burial jars from the Northern Song were also found[5].

4.4.4 The Tang period was represented by a considerable amount of lime kiln debris and green glazed pottery. There was very little evidence for the Han period with just jar fragments and a rim fragment. Similarly, there was little evidence for the Bronze Age. However, the late Neolithic was well represented with typical soft geometric pottery and some polished stone tools, along with the common coarse corded ware and pebble tools. A small hearth and pieces of charcoal were uncovered. In all areas excavated and searched there was no evidence for Middle Neolithic occupation.

4.4.5 The results of the land excavation are significant as it gives an indication of the occupation history of the site. It is clear that the site was only sparsely occupied if at all during the Southern Song, Ming and early Qing. In comparison, the Northern Song occupation was intense and it is suggested that forest clearance for cultivation, timber and fuel took place at this time. There is evidence for erosion which may have been a consequence of the forest clearance. It is therefore possible that originally land based archaeological resources were relocated into the sea during such erosion. The soft seabed sediments in the area would mean that they are probably buried but their presence cannot be excluded.

4.5 Historical Background to Urmston's Harbour

4.5.1 Directly south of Lung Kwu Sheung Tan, is the important historic harbour of Tung Koo or Urmston Roads (**Figure 5**). The centre of this widely documented anchorage is approximately 2 nautical miles to the south of the study area in 20m of water and in the lee of Castle Peak. The anchorage incorporates the shallow bay directly south of the study area.

4.5.2 While this area has always been important for international trade with China, from the 16th century onwards as European trade with China increased, shipping movement intensified in the Pearl River Delta and the area latterly known as the Urmston Roads formed the main thoroughfare for all ships approaching from the east, on passage north via the Pearl River Delta to Canton.

4.5.3 The Pearl River delta was a notoriously difficult area for navigation, at least until the first shallow draft steamship, *The Forbes* successfully navigated to Canton in 1830. Up until this time, sailing ships were restricted by their drafts, the predominant monsoon winds, strong tides and the availability of local pilots. "Strong currents, frequent storms and the many hidden perils beneath the pearl River made it a hazardous passage for all deep running vessels".

4.5.4 Foreign traders were only permitted to stay in Canton itself for the length of defined trading 'season', while their ships were either loading or off loading at Whampoa, its deepwater port, 19km down river east of Canton. The season was a period defined by the monsoon months and by the times at which fresh crops of tea arrived from the interior of China. It became fixed as the seven or so cooler months following September when the monsoon winds were predominantly from the north-east. By the early 19th century it would be common for 100 sailing ships to be lying at Whampoa for three months or more. Once the ships had discharged and reloaded they were encouraged to depart as quickly as possible. This created a need for alternative safe anchorages further south and Lintin Island (內伶仃) and Urmston Roads became alternative anchorages for the larger vessels from England, America, the Netherlands and other parts of Asia.

4.5.5 Urmston's Harbour, sometimes referred to as Urmston Bay or Toon-Koo (Tung Koo 銅鼓) Harbour, is the passage of water bounded to the east by the coast of Castle Peak Bay, and the small islands of Lung Kwu Chau and Sha Chau to the west. Urmston Roads was named after Sir James Baboon Urmston, who was the British East India Company's China chief from 1819 to 1826. The passage received its English name in 1823; prior to that it was referred to as Toon-Koo Bay.

4.5.6 Coastal waters in the vicinity were extensively surveyed by Captain James Horsburgh, hydrographer to the East India Company in 1806-19. In his report to the Foreign Office he enumerates, among the abundant safe harbours near Canton, "*Toong Kwu Bay, as well as Cap Sing Mun*" [6]. By early 1836, the area was in regular use as an anchorage. In December 1836, a party of Americans and Englishmen *"[passed] through the safe anchorage known as Urmston's Harbour, or Toon Kwu. Till two or three years past, the opium-laden vessels used to anchor here from July till October for shelter against typhoons"*[7].

4.5.7 Horsburgh's Directions for sailing in the East Indies[8] provides detailed guidance for ships captains approaching Urmston Roads and describes it:

> *"the anchorage was found secure, with smooth water with it blew a gale from eastward, Fresh water was also procured in abundance".*

4.5.8 The key to its appeal as an anchorage was Castle Peak 580m above the bay which provided an ideal shelter from easterly and north easterly gales.

4.5.9 On 18th January 1830 the entire crew of a ship's cutter, returning to the East India Company ship *Atlas* was lost in a violent squall at Urmston's harbour. The body of one was recovered and taken to Macao for burial, but nothing else was found but, *"a few hats of the crew, and the stretchers of the boat"*[9].

4.5.10 The Canton Recorder of 1835 recounts the details of a particularly bad typhoon that struck the area and the vessel *Governor Findlay*, the British brig *Watkins*, the naval sloop *Raleigh* and the Portuguese brig *Santa Anna* were all dismasted. Eleven other vessels including British, Danish, Portuguese, Spanish, and American were all forced to cut away their masts or were driven ashore or foundered at anchor, all with great loss of life and armament.

[5] Meacham, W. 1992 Report on Salvage Excavations at Lung Kwu Sheung Tan, 1990, *Journal of The Hong Kong Archaeological Society*, Vo. XII.

[6] Sayer, G. R. 1980. *Hong Kong 1841-1862. Birth, Adolescence and Coming of Age*, Hong Kong University Press.

[7] Sayer, G. R. 1980. *Hong Kong 1841-1862. Birth, Adolescence and Coming of Age*, Hong Kong University Press.

[8] Horsburgh 1852 *Horsburgh's Directions for Sailing.*

[9] Brage, J.M., 1965. *China Landfall 1513, Jorge Alvares Voyage to China.* Macau Imprensa Nacional.

4.5.11 During the 1840 Anglo-Chinese hostilities, the area was used extensively by British merchant and naval vessels as they were no longer welcome in the vicinity of Macao and in June 1840, H.M.S. *Druid* successfully survived an attack by ten fire-rafts. In the words of an eye-witness, Captain Bingham "*the boats of the men-of-war quickly hooking onto these formidable-looking fire-ships towed them ashore on The Brothers*"[10].

4.5.12 Lun Kwu Chau (Dragon Drum Island) is a small island located just 3 nautical miles west of the study area separated by the main shipping channel and features prominently in the early accounts of the Hong Kong's maritime history. On many early charts, Lung Kwu Chau is transliterated variously as Tung Koo, Tung Koo, Toon Oo or Toon-quoo. The small island to the south is known as Sha Chau (Sandy Island), and frequently appears on early charts as Saw-Chow, is narrow and about one mile long.

4.5.13 It is clearly marked in O Livro de Francisco Rodrigues, (translated by Armando Cortesão as *The Suma Oriental of Tomé Pires* and *The Book of Francisco Rodrigues*, written in 1514). Rodrigues was a very early Portuguese pilot, cartographer and captain who sailed in these waters in the early sixteenth century. Rodrigues was one of the commanders of Alvares' flotilla during the voyage from Malacca to China in 1517-18[11]. His book contains the earliest European-drawn maps of the region. Their chief quality is that they are based on actual observation by men who were familiar with the places depicted, rather than approximations drawn from the oral accounts of (usually Malay or Arab) professional pilots [12].

4.5.14 There are important archaeological sites on Lung Kwu Chau. This indicates that boats would have been used to move between the different settlement sites. On Lung Kwu Chau, the earliest cultural remains can be dated to the middle phase of the Neolithic (ca. 4000-2000 B.C.), representing the beginning of cultural history in the Hong Kong area. Its archaeological discovery dates from 1925, when Dr. Henley and Prof. Shellshear collected artefacts from the site. They noted the collection of sand from the island and the coarse cord-marked pottery commonly found on its beaches. Subsequent investigation was conducted by W. Schofield (1969a), W.J. Kelly (1974 and 1975), W. Meacham (1975b) focusing on the low southern isthmus. They found archaeological remains including coarse corded pottery, polished adzes, polishing stones, soft and hard geometric pottery, plain and incised chalky pottery, and human burials. The deposits on the site belong to several major cultural periods of Hong Kong history, including geometric pottery of the Bronze Age, celadon of the Tang and Song dynasties, and blue-and-white porcelain wares of the Qing dynasty, and glazed Han/Six dynasties pottery.[13]

4.6 Evaluation of Archaeological Potential

4.6.1 The Baseline Review did not provide detailed site specific data about shipwrecks in or near the LKST barging point. However, the intense maritime activity in this region due to its strategic location on the main route to Canton gives it some archaeological potential but far away from the dredging area of LKST. It is therefore considered that the dredging area has no marine archaeological potential.

[10] Sayer, G. R. 1980. *Hong Kong 1841-1862. Birth, Adolescence and Coming of Age*, Hong Kong University Press.
[11] Brage, J.M., 1965. *China Landfall 1513, Jorge Alvares Voyage to China*. Macau Imprensa Nacional.
[12] Brage, J.M., 1965. *China Landfall 1513, Jorge Alvares Voyage to China*. Macau Imprensa Nacional.
[13] *Journal of The Hong Kong Archaeological Society*, vol.8, 1975.

5 RESULT OF GEOPHYSICAL SURVEY

5.1 Site Description

5.1.1 The dredging site is located at Lung Kwu Sheung Tan and close to the Black Point Power station. A high volume of marine traffic was observed during the survey (**Figures 7 to 9**). A number of boats were anchored nearby and there were regular cargo ships crossing. A discharge outfall running parallel to the surveying corridor was located south of it and was visible at the sea surface.

5.2 Seismic Data

Interpretation of the Geological Succession

5.2.1 The quality of the seismic records was generally good for interpretation. The interpretation of the seismic records sought to quantify the following four elements of the offshore geological succession.

5.2.2 Interpretation was carried out as follows: the seismic horizons were selected for interpretation in accordance with the list above and drawn on copies of the seismic records during preliminary interpretation. All traverse crossing points were then calculated, and marked on the seismic records. The records were then physically correlated at all of these points; finally, the correlated horizons were digitized, plotted and contoured.

5.2.3 In places, one or more of the main geological units may be missing, for example, where marine deposits pinch out against the underlying Alluvium and rock, close to the shorelines.

5.2.4 The shallow geology within the HKSAR is well documented, charted and understood. Within the survey area the shallow geology comprises an upper unit of marine deposits known as the Hang Hau Formation, which in turn overlies estuarine and alluvial deposits of the Chek Lap Kok Formations.

5.2.5 From an archaeological perspective, the Hang Hau Formation has the greatest archaeological potential. The formation consists of relatively homogenous very soft to soft, greenish grey silty clay and has high moisture content. Therefore, the Hang Hau Formation sediments potentially provide an excellent substrate for the preservation of archaeological material.

5.2.6 Additionally, the soft nature of the sediments would make it possible for archaeological material to be buried within the formation, where it would have greater protection than if it were exposed on the seabed. The contoured level at the base of marine deposits is presented in **Figure 10**. Below this unit lies Grade IV/V weathered rock in any state of decomposition and Grade III presumed moderately decomposed rock. There are two areas where masking is observed and no interpretation could be done.

5.2.7 The pre-Holocene sedimentary formations beneath the Hang Hau Formation in the study area are considered to offer limited to negligible archaeological potential. The original land surface that would have existed at the top of these deposits would have been planed-off during the Holocene marine transgression. Thus, any evidence of late Pleistocene human land activity in the study area would almost certainly have been removed.

5.3 Sea Bed Features

5.3.1 Processing and interpretation of side scan sonar data was carried out using the C-View interpretation and processing software. All features were individually marked or grouped into regions using on screen digitising. All offsets and laybacks are automatically calculated by the

C-View system. The subsequently generated interpretation files were then imported to the Auto CAD environment on a line by line basis where the interpretation was reconciled and a detailed check was performed.

5.3.2 The Marine Geophysical Survey data provided 100% coverage of the seabed with side scan sonar data and approximately 80% with seismic profiler data. The data quality was high with the exception of the masked areas which were probably caused by discharges from the nearby sewage outfall.

5.3.3 Interpretation of the scan sonar data revealed the following features on the seabed:

- Unidentified objects
- Dumped materials
- Seabed comprising coarse/fine sediments
- Rocks associated with the rubble mound seawall
- Debris
- Anchored scars and trawl marks

5.3.4 The data did not identify any large objects such as shipwrecks but a total of nine sonar contacts are distributed across the original study area from the shallow zone in the north-east to the 7m contour at the south west limit.

5.3.5 It should be noted that the interpretation of some less obvious features is, to some extent, subjective. In addition, some features had diffuse or gradual boundaries (for example, the boundary between high and low reflectivity seabed materials in some places or the difference between high reflectivity seabed and degraded dumped materials). In these cases, the position of the boundary should be considered approximate on drawing.

5.3.6 A total number of nine sonar contacts were identified. A sonar contact list and a copy of the data showing each contact are included below. The location and distribution of each sonar contact is shown on **Figures 11 and 12**. The nine sonar contacts were distributed across the whole dredging area.

Table 1 Results of Sonar Contact Points

Contact number	Easting Northing	Water depth (m)	Dimensions (m)	Description
SC01	808809.7E 829335.3N	2.7	0.9x0.2x0.1	Unknown object
SC02	808810.3E 829338.5N	2.7	0.6x0.3x0.1	Unknown object
SC03	808765.8E 829345.5N	5.2	0.5x0.4x0.5	Unknown object
SC04	808776.3E 829354.3N	4.6	1.1x0.7xnmh	Unknown object
SC05	808779.1E 829356.0N	4.3	2.2x0.8x0.6	Unknown object
SC06	808780.7E 829358.3N	4.3	0.6x0.4xnmh	Unknown object
SC07	808780.3E 829361.4N	4.2	0.5x0.3xnmh	Unknown object
SC08	808842.0E 829339.0N	0.6	2.1x0.4xnmh	Unknown object
SC09	808841.7E 829342.6N	0.6	1.9x0.3xnmh	Unknown object

Project Title
Consultancy Agreement No. NOL/ERL-300
Environmental Impact Assessment of Hong Kong Section of
Guangzhou-Shenzhen-Hong Kong Express Rail Link
MTR Corporation Limited Marine Archaeological Impact Assessment Report

6 UNDERWATER INSPECTION

6.1 Existing Conditions

6.1.1 There has been extensive reclamation on the shore adjacent to the study area. The disturbance caused by the engineering works may already have damaged submerged archaeological resources.

6.1.2 Construction of the sewage outfall pipe which is clearly visible would have also had a negative impact on the seabed at this location. During the diving inspection, there were frequent movement of ships to and from the quarry which is adjacent to the study area.

6.2 Diver Survey Method and Controlling

6.2.1 The underwater inspection was carried out between 7th and 11th May 2009 under supervision of marine archaeologist Ms. Sarah Heaver. A team of four divers hold HSE qualifications and all divings were conducted with strict safety considerations.

6.2.2 Each diver used surface supplied air and through water communications thereby enabling verbal contact with the dive supervisor at all times. A video recording of all time spent underwater was achieved by a helmet mounted video camera using the BP-DVIS Diver Video Inspection Unit. The supervisor and marine archaeologist Sarah Heaver were able to monitor the progress of the diver at all times and view his activity on the on the surface television monitor.

6.2.3 A hand held GPS was used to relocate the position of the sonar contacts. Once on location, a 25-kg metal sinker was placed on the seabed at the fix point and a 5m, 15m and 20m radius sector seabed inspection completed by the diver. The principle of the search is that the diver extends the line to the set length and searches radically about the centre point. If any objects are present, the line will snag anything within the circumference of the search area. As the through water visibility is so limited, it could not be assumed that the diver would be able to identify the targets visually.

6.2.4 In addition to the circular searches around the nine sonar contacts, a series of straight line searches were run across the study area using ropes as guidelines as shown in **Figure 9**. This was to ensure 100% seabed coverage as the seismic data was masked in some sections and there was no geophysical survey data for the very shallow areas adjacent to the coastline. The divers also inspected another sonar contacts as a precautionary measure as they are less than 10m from the study area.

6.2.5 This approach confirmed 100% seabed coverage even through water visibility was restricted. In addition, the diver used a hand held metal rod of 1.5m length to probe the seabed every 2m. The aim of the probe was to locate buried objects and establish the density of the seabed sediments.

6.3 Result of Diver Survey

6.3.1 The diver survey successfully located and indentified all nine sonar contacts. Each of them was easily identified as modern debris. The seabed at this location is extremely disturbed, probably as a result of the existing reclamation and construction of the outfall pipe. The hand held probe used by the divers did not locate any buried objects (**Figure 13**).

6.3.2 **Table 2** below presents the results of the diver survey. A still of the video film showing each of the nine sonar contacts is presented in **Figures 14 to 22**.

Table 2 Results of the Underwater Inspection

Contact number	Location	Depth	Dimensions	Description
SC01	808809.7E 829335.3N	2.7	0.9x0.2x0.1	Modern Debris
SC02	808810.3E 829338.5N	2.7	0.6x0.3x0.1	Plastic sheet and pipe
SC03	808765.8E 829345.5N	5.2	0.5x0.4x0.5	Metal wire and rope
SC04	808776.3E 829354.3N	4.6	1.1x0.7xnmh	Blue plastic and rubble
SC05	808779.1E 829356.0N	4.3	2.2x0.8x0.6	Broken metal anchor cable
SC06	808780.7E 829358.3N	4.3	0.6x0.4xnmh	Scrap metal pieces
SC07	808780.3E 829361.4N	4.2	0.5x0.3xnmh	Modern debris
SC08	808842.0E 829339.0N	0.6	2.1x0.4xnmh	Modern building material
SC09	808841.7E 829342.6N	0.6	1.9x0.3xnmh	Broken concrete

7 CONCLUSION AND RECOMMENDATION

7.1.1 The baseline review did not provide detailed site specific data about shipwrecks in or near the LKST barging point. However, the intense maritime activity in this region due to its strategic location on the main route to Canton gives it some archaeological potential but far away from the dredging area of LKST. It is therefore considered the dredging area has no marine archaeological potential.

7.1.2 The marine archaeological investigation was conducted at the seabed area that will be dredged. There were no objects on the seabed that indicated submerged archaeological material. It is therefore concluded that there is no archaeological resource on the seabed within the study area.

7.1.3 As there are no underwater cultural resources at the proposed dredging area, there would be no marine archaeological impact at this area, and therefore mitigation measures or further investigation are not required.

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Figures

Figure 1: Aerial photograph of the study area.

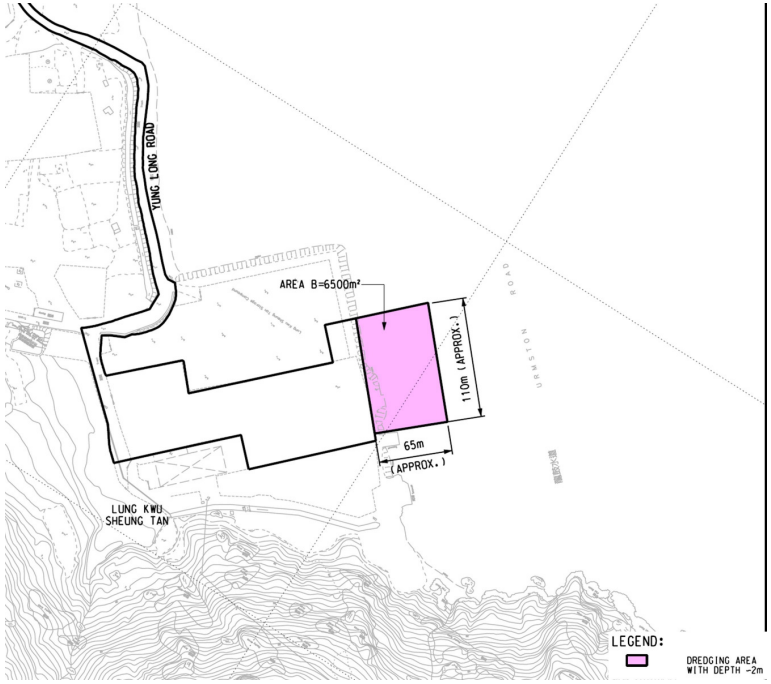

Figure 2: Lung Kwu Sheung Tan Barging Point Area and Dredging Area

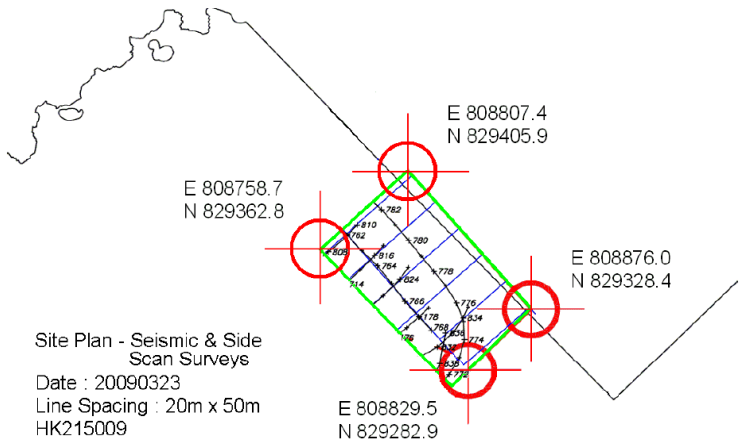

Figure 3: Dredging area and track plot for geophysical survey defines the MAI study area.

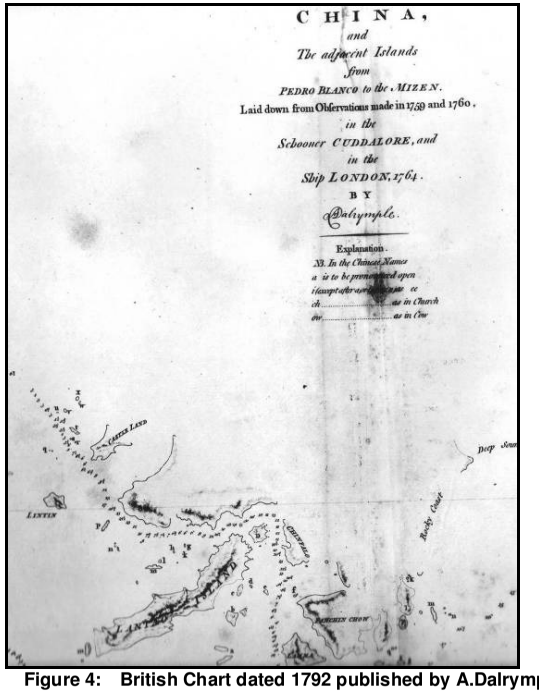

Figure 4: British Chart dated 1792 published by A.Dalrymple.

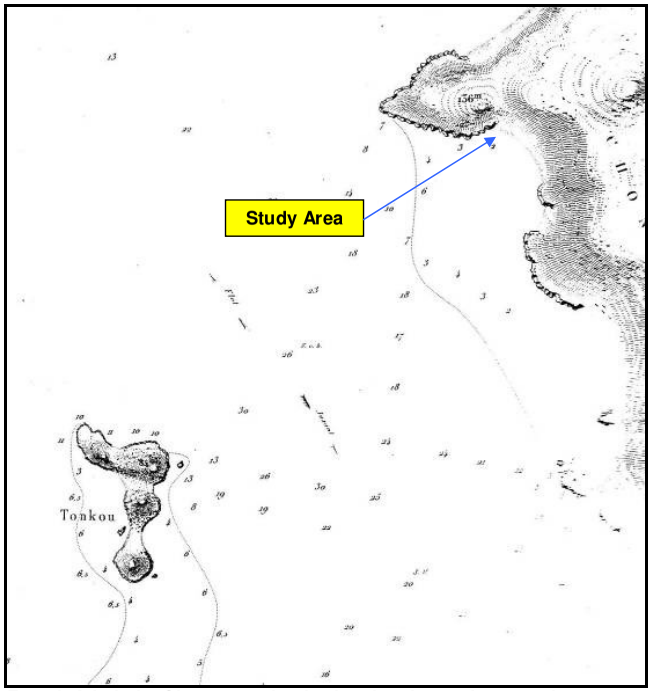

Figure 5: French Admiralty Chart 1856 clearly showing the study area prior to any reclamation or coastal development.

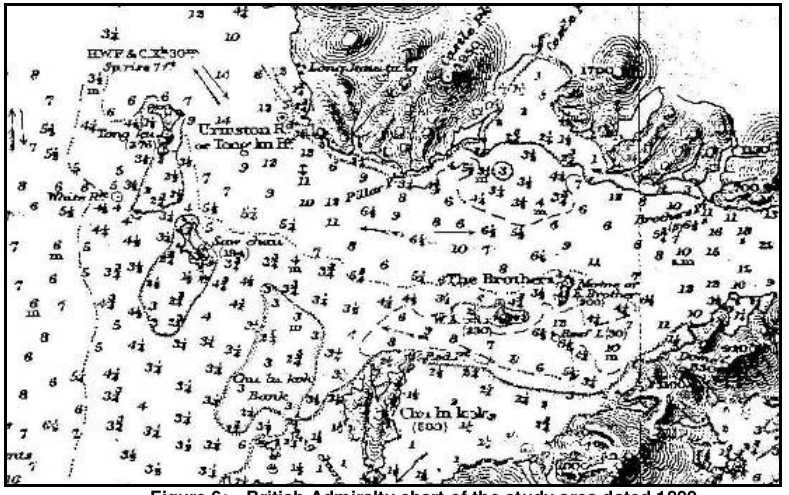

Figure 6: British Admiralty chart of the study area dated 1899.

Figure 7: Marine traffic during the survey.

Figure 8: Rubble mound seawall at the coast.

Figure 9: The discharge outfall covered by dumped rock.

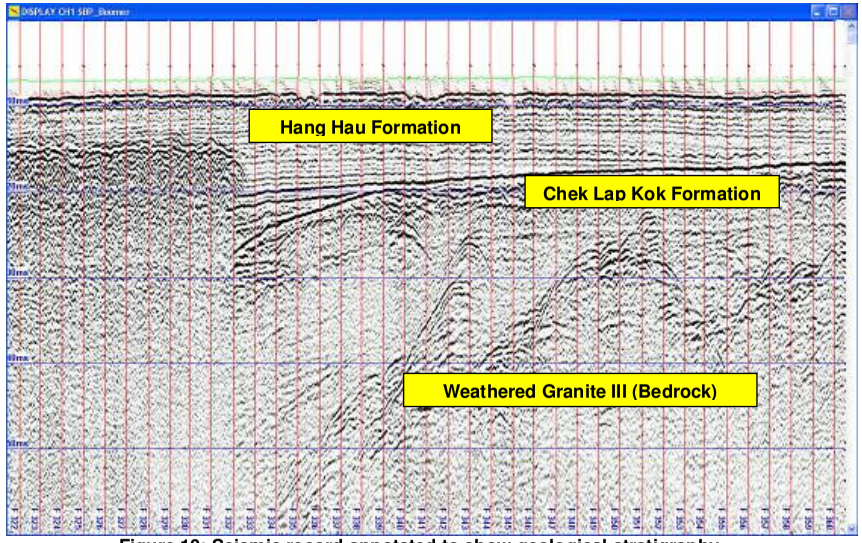

Figure 10: Seismic record annotated to show geological stratigraphy.

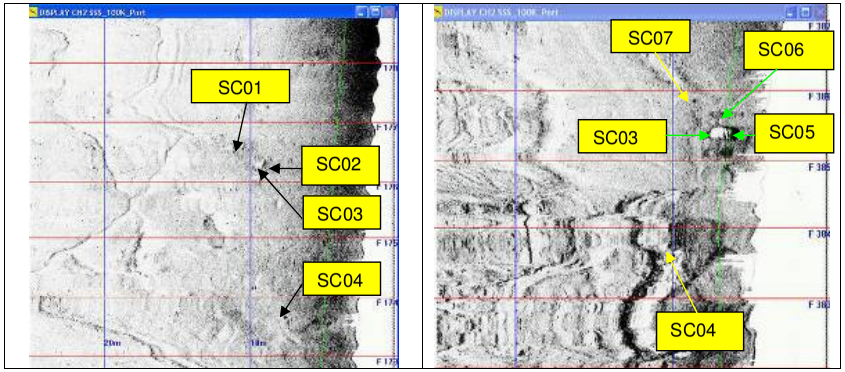

Figure 11: Side scan sonar data example showing Sonar Contact SC001 to SC07.

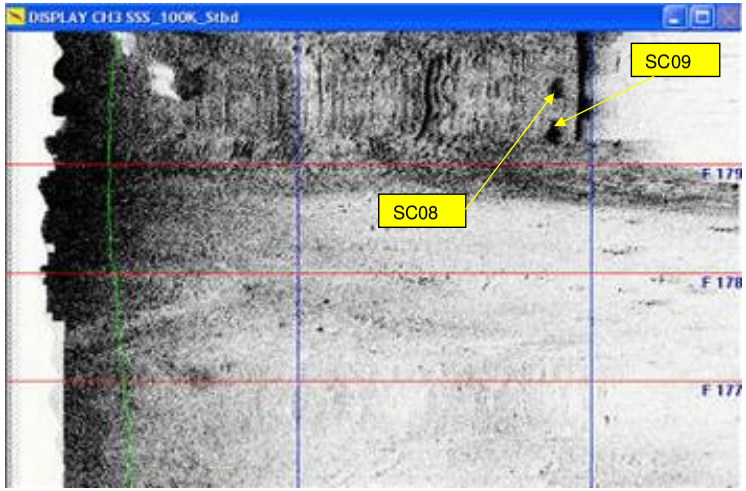

Figure 12: Side scan sonar data example showing Sonar Contact SC08 and SC09.

Figure 13: Diver entering water with hand held probe and rope for circular search.

Figure 14: Photograph of Sonar Contact SC01.

Figure 15: Photograph of Sonar Contact SC02.

Figure 16: Photograph of Sonar Contact SC03.

Figure 17: Photograph of Sonar Contact SC04.

Figure 18: Photograph of Sonar Contact SC05.

Figure 19: Photograph of Sonar Contact SC06.

Figure 20: Photograph of Sonar Contact SC07.

Figure 21: Photograph of Sonar Contact SC08.

Figure 22: Photograph of Sonar Contact SC09.

Figure 23: Modern concrete pipe found on the seabed in the study area.