9. Cultural Heritage Impact Assessment

9.1 Introduction

The cultural impact assessment has been conducted in accordance with Condition 3.4.10 of the EIA Study Brief No. ESB-198/2008.

This section presents the findings of the assessment of potential impacts on the cultural heritage resources, and is structured as follows:

Section 9.1: Provides discussions on study scope and legislation framework for the assessment;

Section 9.2: Describes the assessment methodology adopted for this EIA;

Section 9.3: Presents the findings of the archaeological baseline;

Section 9.4: Evaluates the archaeological potential;

Section 9.5: Proposes potential mitigation measures to ensure the environmental performance of the dredging works;

The cultural heritage impact has been undertaken in accordance with the requirements of Annexes 10 and 19 of the EIAO-TM and Study Brief. A Marine Archaeological Investigation (MAI) was completed to locate and assess the significance of any underwater cultural heritage which may be present on the seabed in the areas that will be impacted by the dredging works. The assessment found that the dredging area of the Project is of low archaeological potential, details of which are further elaborated in the following subsections. Appropriate mitigation measures have been recommended to avoid potential adverse impacts.

9.1.1 Study Scope

The aim of the project is to deepen the seabed of Kwai Tsing Container Basin (KTCB) and portions of Northern Fairway and Western Fairway to ensure adequate depth of water for the new larger generation of container ships. To achieve the enhanced navigation depth, CEDD intends to dredge the seabed concerned to –17.5mCD from the existing average of about –16.0mCD. Based on the latest bathymetric survey and engineering design, it is estimated that around 4.4 Mm^3 of sediment will be dredged.

The aim of the Marine Archaeological Investigation (MAI) was to locate and assess the significance of any underwater cultural heritage which may be present on the seabed in the areas that will be impacted by the dredging works.

The MAI covers the Study Areas shown in **Figures 9.1 and 9.2,** which provide 100% coverage of all dredging locations. The locations of the Tsing Yi and Kwai Chung Submarine Sewage Outfalls in relation to the Study Area are shown in **Figure 2.1a**.

9.1.2 Legislative Framework for Marine Archaeological Investigations in Hong Kong

The following legislation are applicable to the assessment of archaeological and historic resources in Hong Kong.

1. Antiquities and Monuments Ordinance
2. Environmental Impact Assessment Ordinance
3. Technical Memorandum on Environmental Impact Assessment Process
4. Guidelines for Marine Archaeological Investigation

9.1.3 Antiquities and Monuments Ordinance

Legislation relating to antiquities is set out in the Antiquities and Monuments Ordinance (Chapter 53 of the Laws of Hong Kong), which came into force on 1 January 1976. The Antiquities and Monuments Ordinance provides statutory protection against the threat of development on Declared Monuments, historical buildings and archaeological sites to enable their preservation for posterity.

The Ordinance contains the statutory procedures for the Declaration of Monuments. The legislation applies equally to sites on land and underwater. The purpose of the Ordinance is to prescribe controls for the discovery and protection of antiquities in Hong Kong. A summary of the key aspects of the legislation relevant to the current study is presented below.

Human artefacts, relics and built structures may be gazetted and protected as monuments. The Antiquities Authority may, after consultation with the Antiquities Advisory Board (AAB) and with the Chief Executive's approval, declare any place, building, site or structure which the Antiquities Authority considers to be of public interest by reason of its historical, archaeological or palaentological significance.

The discovery of an Antiquity, as defined in the Ordinance must be reported to the Antiquities Authority (the 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.

No archaeological excavation may 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.

Once declared a site of public interest, no person may undertake acts which are prohibited under the Ordinance, such as to demolish or carry on building or other works, unless a permit is obtained from the Antiquities Authority.

The Ordinance defines an antiquity as a relic (a moveable object made before 1800) and a place, building, site or structure erected, formed or built by human agency before the year 1800. Archaeological sites are classified into two categories, as follows:-

- Declared Monument – those that are gazetted in accordance with Cap. 53 by the Antiquities Authority and are to be protected and conserved at all costs; and
- Recorded Archaeological Sites – those have not been declared but recorded by the AMO under administrative protection.

It should also be noted that the discovery of an antiquity under any circumstances must be reported to the authority, i.e. the Secretary for Development or designated person. The authority may require that the antiquity or suspected antiquity is identified to the authority and that any person who has discovered an antiquity or suspected antiquity should take all reasonable measures to protect it.

9.1.4 The Environmental Impact Assessment Ordinance

Since the introduction of the 1998 Environmental Impact Assessment Ordinance (EIAO) (Cap. 499, S16), the Antiquities and Monuments Office (AMO) has the power to request a MAI for developments affecting the seabed. Its purpose is to avoid, minimise and control the adverse impact on the environment of designated projects, through the application of the Environmental Impact Assessment (EIA) process and the Environmental Permit (EP) system. The EIAO stipulates that consideration must be given to issues associated with cultural heritage and archaeology as part of the EIA process. Annexes 10 and 19 of the EIA Technical Memoranda (EIAO-TM) outline the criteria for evaluating the impacts on sites of cultural heritage and guidelines for impact assessment, respectively.

The EIAO-TM identifies a general presumption in favour of the protection and conservation of all sites of cultural heritage and requires impacts upon sites of cultural heritage to be 'kept to a minimum'. There is no quantitative standard for determining the relative importance of sites of cultural heritage, but in general sites of unique, archaeological, historical or architectural value should be considered as highly significant.

9.1.5 Technical Memorandum on Environmental Impact Assessment Process

The general criteria and guidelines for evaluating and assessing impacts to Sites of Cultural Heritage are listed in Annexes 10 and 19 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM), shown in **Appendix 9.1**. It is stated in Annex 10 that all adverse impacts to Sites of Cultural Heritage should be kept to an absolute minimum and that the general presumption of impact assessment should be in favour of the protection and conservation of all Sites of Cultural Heritage. Annex 19 provides the details of scope and methodology for undertaking Cultural Heritage Impact Assessment, including baseline study, impact assessment and mitigation measures.

9.1.6 Guidelines for Marine Archaeological Investigation

The AMO has issued "Guidelines for Marine Archaeological Investigation (MAI)" which sets out the standard practice, procedures and methodology which must be undertaken in determining the marine archaeological potential, presence of archaeological artefacts and defining suitable mitigation measures. The full document is included as **Appendix 9.2**.

9.2 Methodology

In accordance with Antiquities and Monuments Office (AMO) Guidelines, the MAI comprised the following tasks:

- Task 1: Marine Archaeological Review of previous studies relevant to this project;
- Task 2: Baseline Review to assess the archaeological potential of the Study Area from a desk-top based review of existing literature;
- Task 3: Geophysical Survey data analysis to obtain detailed information on the seabed and sub-surface sediments;
- Task 4: Establish archaeological potential and assess the location and significance of any seabed features requiring further investigation and evaluation;

- Task 5: Assess the impact of the dredging on archaeological resources, if present, and recommend a mitigation strategy, if necessary.

9.2.1 Marine Archaeological Review

An extensive search was conducted to locate all previous studies relevant to the MAI.

9.2.2 Baseline Review

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. Although not an exercise to retrieve exhaustive chronological history of the area, this review enables those incidents and information relevant to the current study to be obtained.

A Baseline Review was undertaken to compile a comprehensive inventory of cultural heritage resources of the Study Area. The review established the historical profile and potential for cultural heritage sites, including review of the following document:

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

9.2.3 Archive Search

All archives holding information on shipwrecks in Hong Kong and UK were explored for relevant data.

9.2.4 Geophysical Survey

The survey was planned to optimise the acquisition of data for the MAI and site investigation. **Figure 9.3** shows the location of survey areas A and B which were designed to provide 100% coverage of the Study Area. **Appendix 9.6 Chart Figures 1.1 – 1.3** show the exact survey coverage for Area A and **Chart Figures 1.4 – 1.6** show the coverage for Area B. **Table 9.1** below lists the techniques used.

Table 9.1: Geophysical Survey Techniques Used

Multibeam swath survey (Swath)	To measure sea bed levels in detail and locate any objects at the seabed.
Marine seismic profiling survey (Seismic)	To identify the geological succession over the survey areas and locate the existing utilities within survey areas A2 and B2.
Marine side scan sonar survey (SSS)	To identify any features and objects at or above the sea bed, such as rock outcrops, dumped materials and archaeological resources.

The survey was carried out between of 5th to 16th November 2009 by EGS (Asia) Limited who were commissioned by Lam Geotechnics Limited. The geophysical survey data was passed to SDA Marine Ltd (a specialist sub-consultant to Mott Macdonald for this study) to complete the MAI.

The technical details of the survey relevant to the archaeological assessment are set out in **Appendix 9.4.**

9.3 Results

9.3.1 Marine Archaeological Review

There have been no previous MAI Studies in the vicinity of the current study. Two previous EIA studies with some reference to the current study are listed below:

August 1991. SouthEast Tsing Yi Port Development. Planning and Engineering Feasibility Study for Container Terminal No. 09. Final Report.

May 1996. Agreement No CE89/95. Supplementary Environmental Impact Assessment for Dredging of the Anchorage Area for Stonecutters Island Naval Base. Final Report.

Neither of these studies contain any information relevant to the current investigation.

9.3.2 Baseline Review

Archaeological evidence indicates that the waters of Hong Kong have been used by seafarers for over 6,000 years (Bard, 1988). The profusion of coastal sites but absence of permanent habitation sites suggests that the earliest inhabitants spent much of their time on boats, making frequent but temporary visits ashore. While to date there have been no underwater Prehistoric finds, the presence of coastal archaeological sites testifies to the early use of water transport.

On the island of Ma Wan, an archaeological site was discovered, which was subsequently voted as one of the ten most important new archaeological discoveries in China in 1997. Twenty graves, together with remains of habitation dating back to the late Neolithic and early Bronze Age (2,000 – 1,000 BC) were found (Meacham, 2009). This site indicates that the waters around the Study Area were used by Pre-historic civilisation.

Practically nothing is known about the archaeological potential of the seabed deposits in Hong Kong. The only marine archaeological discovery was that of a late Sung/early Ming Dynasty (1368-1644) boat uncovered during the construction of the High Island Reservoir, near Sai Kung (Frost, 1974). Since then, no other historic shipwreck has been found. However, this is probably because there were no dedicated marine archaeological surveys until the introduction of the 1998 EIA Ordinance. Marine archaeology is therefore a new area of study in Hong Kong with very little baseline data to draw upon.

Formation of archaeological underwater sites is mainly due to shipwrecks (Muckelroy, 1978). Since these are random and haphazard events it is difficult to predict their exact locations if no written references had survived. The aim of this review is to examine the evidence for maritime activity within the Study Area to predict the potential for shipwrecks.

9.3.3 Historical Background of Tsuen Wan Sub-district

The Study Area falls within the area previously known as the Tsuen Wan Sub-district. Kwai Chung and Tsing Yi were only combined into a separate district in 1985 (Johnson, 2000). The new district comprised no more than 9.25 square miles of land on the mainland plus the islands of Tsing Yi and Ma Wan. Its main physical characteristics comprised coastal fringes and a lot of hill country rising from sea level to a maximum height of over 3,000 feet, including Tai Mo Shan, the highest mountain in the Hong Kong region. In the mainland portion, before development, the lower foothills and the land near the sea were broken up

by numerous small hills and intersected by short, and in the wet season, fast flowing streams. The villages were remote because of the nature of the terrain. Because of the relatively small amount of cultivated land available the villages were not large.

No conclusive evidence has been found for occupation of the Tsuen Wan District before the coastal evacuation in 1662, although there is an oral tradition of such settlement on Tsing Yi. A Ming Dynasty tomb, dating from 1637, was found there in 1978, during clearance for development. The Tang lineage of Kam Tin has an ancestral tomb in Tsuen Wan dating from the middle of the Song Dynasty (Johnson, 2000). Historian James Hayes has been a particularly committed researcher on Tuen Mun and Kwai Tsing. He had administrative responsibilities for Tsuen Wan as District Officer and then Town Manager from 1975 to 1982 and as Regional Secretary for the New Territories from 1985 until his retirement in 1987. During this time he studied its history and contemporary development and established that approximately fifty Tsuen Wan lineages had written genealogies. They showed that the founding ancestors of many of the local lineages settled in the area in the first half of the 18th century, arriving from Fujian and North Eastern Guangdong provinces. There is a Tin Hau temple in this area which has a bell dated 1743 and a tablet from 1846 (Hayes, 1993).

In 1898, when the British influence commenced, few villages numbered over 300 occupants. Most residents would have been peasant farmers who owned a few houses and some land mainly given over to rice cultivation. There was also a small permanent boat population moored in Tsuen Wan Bay and other local anchorages. Local ferries ran between different points in the immediate area and outside it, including Hong Kong. Otherwise, communication between settlements and market places was entirely by a network of footpaths opened by village people. Even the main routes leading to Kowloon and over to the north-west New Territories were little better than mud paths, occasionally paved with stones.

By the late 19th century the Tsuen Wan sub-district was well populated and comprised three separate rural communities as well as a coastal market village at Tsuen Wan Bay itself. The coastal market centre in Tsuen Wan Bay was named Hoi Pa or 'embankment at the Sea'. It was the most important single place in the sub district being part port and anchorage, part market, part farming village (Hayes, 1983). **Figure 9.4** shows how it would have looked at this time.

Hoi Pa derived its significance from its coastal location which provided direct access to other places in the region and enabled materials for building and for manufacturing processing to be brought into the surrounding area without difficulty. It had a number of small bamboo piers, often washed away in storms. These served the local cargo junks and other craft which used it as a home port, as well as those coming from elsewhere in the region. Adjacent to the piers were a few boat building yards and rope walks with some lime kilns which produced lime for the building industry and for fertilizing fields. Although there were shops and businesses on Tsing Yi and at Ma Wan, Hoi Pa was the focal point for the economic and social activity of the surrounding area.

All through the second half of the 19th century the villagers continued to sell produce to Hong Kong. It is very likely that they supplied the infant colony in 1842-43. In 1866, there is proof of the regular export of produce to Hong Kong. Tsuen Wan was among the places whose shipping activity was listed in a Chinese petition presented to the Governor following enactment of a new ordinance regulating the native ships using the port. The new requirements were thought to bear too heavily on local traders and merchants, and the petitioners had reminded the British authorities, '*It is on these Junks alone that the Colony is dependant for its daily supply of Fresh Vegetables, Fruit, Poultry, Eggs and other articles of consumption*' (Hayes, 1993).

Pineapples were another favoured import into Hong Kong. The soil in parts of the Tsuen Wan sub district was particularly well suited to pineapple cultivation. The Hong Kong Guide 1893 mentions that *'a good deal of this pleasing district is taken up with pineapple cultivation*'. All the pineapples grown at Tsuen Wan and Kwai Chung were consumed fresh in Hong Kong and Kowloon and there was no commercial packaging or preservation of locally produced pineapple (Wordie, J. 2007).

Tsuen Wan was home to a number of other well established rural industries operated by both local people and outsiders. Some of this business was reliant on the abundant water in the several mountain streams which emptied into Tsuen Wan Bay. The incense powder factories were by far the most prominent. Using water mills placed beside local streams, a thriving industry developed. Logs of fragrant wood were imported from outside Hong Kong and carried to the water mills. The wood was crushed by stone hammers operated by fast water channeled onto slowly turning watermills. Mixed with fragrant herbs, the incense powder was sent to Hong Kong for manufacture, export and local retail. It is documented that there were twenty five factories in Tsuen Wan in 1905 (Hayes, 1993).

Other rural industries located in Tsuen Wan itself included the processing of bean curd into its several forms, soy and preserved fruits, brick works, boat building and lime making. These various businesses would certainly have added to the activity and swelled the stream of people taking goods on and off cargo junks and sampans in the bays around Tsuen Wan.

Apart from a market town, in the 20th century, factories moved in gradually due to its proximity to urban Kowloon. With the construction of Castle Peak Road, motor vehicles could reach the town in addition to on foot and by boat. Between 1949 and 1958 more than a million people fled from Mainland China for a new life in Hong Kong. Many of them headed for the rapidly developing factory areas in Kwai Chung and Tsuen Wan. In the 1950s numerous spinning, weaving and dying factories were established, mostly financed with Shanghainese capital. In 1950s, the Hong Kong Government developed the area with new town concepts and massive housing estate developments. In the 1970s it was developed as part of the Tsuen Wan New Town. By 1971 the area housed 400,000 residents and now it is home to over a million people.

9.3.4 Piracy in the region

Another name for Tsuen Wan was *Tsak Wan*, pirate bay, indicating the former presence of pirates. In fact, the area around Rambler Channel was known as *Sam Pak Tsin* literally meaning three hundred coins. There was a legend that pirates would collect three hundred coins from people passing through the area (Hayes, 1993).

Local seaways were often dangerous. The crew of a ship and their passengers often risked their property and sometimes their lives when they journeyed through the region. At times the situation was particularly bad. Even though in the 1860s the Governor Sir Richard Graves MacDonnell had taken resolute administrative and legal action to curb pirates and their support network, piracy continued to be a menace in right up to the end of the century.

Tsuen Wan was a favoured spot for off-loading pirated goods and for either disposing of them locally or taking them elsewhere quickly. It was an excellent location on account of the footpaths leading over the hills to Tai Po, from which boats could quickly take stolen goods to the mainland. Borrowing the words of a frustrated British naval officer after an unsuccessful piratical attack on another new town, *it is all too likely that Tsuen Wan is* '*merely a market town for pirates*'. (Hayes, 1993).

In 1856, Tsing Yi was the location of a small naval action against a number of pirate junks flying the rebel flag of the Taipings. The captain of the *H.M.S. Sampson* states in his dispatch:

> *"In proceeding through the Mandarin channel going west, some junks were observed at anchor inside the island. Close in the N.E. corner. My pilot not being acquainted with the channel, I got a fisherman's boat to go up with one of the crew I had on board, to see if he could recognize any of his property. He shortly returned on board, saying his boat was there, and that the other boats were pirates. I immediately stood in under easy steam, when the pirates seeing my intention, made sail, and ran through the channel towards Wanchowchow (Stonecutters). I fired a few shots at them, but they soon got under the cover of the land. Then sending my boats after them, and running round outside the island, I had the satisfaction of driving them on shore, and destroying five, as well as liberating two market-boats and several passengers who had been in confinement many days. Three captured men are sworn to by one of the owners of the boats, and I have sent them in irons to Hong Kong.*
>
> *These piratical boats had all the rebel flag flying and fired upon our boats, without however doing any damage.' (Schofield, 1977).*

The intensity of maritime activity in this area is indicated by the presence of the Chinese Maritime Customs station on Ma Wan. They were only established at the principal maritime gateways to Victoria Harbour; Cheung Chau, Fat Tong Chau (Junk Island) and Kap Shui Mun (Ma Wan). In 1897, a customs office, known as Kowloon Pass, was established on Ma Wan and the personnel increased to 35. The presence of a customs station suggests that the waters around it were regularly used by traders. At Yu His Park near Ma Wan Rural Office, two stone tablets still remain, one with the inscription *"Kowloon Pass"* and the other *"Seven feet of land leased to the Kowloon Pass".* The second tablet was erected on the demand of the villagers who allowed the government to build only a seven foot wide road leading from the customs house to the shore. No trace of the customs office or the military post remains on Ma Wan. The only relics are the two stone tablets. In several chronicle books of the Ching Dynasty the history of Kap Shui Mun and the Kowloon Pass and the posting of the garrison were recorded. The site was surveyed by archaeologists in January 1983 (Peacock & Nixon, 1988) who confirmed that there are no remains of the customs station but the tablets remain.

The Ma Wan Customs Station was only closed after the cession of the New Territories in 1898 and British control effectively established the following year (Sayer, 1975).

9.3.5 Queen Elizabeth I

The Study Area is close to the wreck site of the famous Cunard ocean liner Queen Elizabeth. When the 84,000-ton *Queen Elizabeth* was launched in 1938, she was the largest passenger ship ever built. But before becoming known as one of the world's most luxurious ocean liners, she was used to transport British troops in World War II. She sailed all around the world, deploying troops and returning with German prisoners. By the end of the war the ship had carried over 750,000 troops and travelled some 500,000 miles.

With its release from government duty finalized, the *Queen Elizabeth* finally set out on its maiden passenger voyage to New York on Oct. 16, 1946. It was a hugely popular and glamorous ship that was frequented by many famous people. Eventually safer and quicker airline travels across the Atlantic put ships like the *Queen Elizabeth* out of business. Despite switching to cruises in 1963 and undergoing major

renovations in 1965, it made its final Atlantic crossing on Nov. 5, 1968. *Elizabeth's* reign as the largest passenger ship ever, ended in 1997 when Carnival launched the 101,000-ton cruise ship *Destiny*.

The Queen Elizabeth made its last Atlantic Crossing in 1968 and was later purchased by Hong Kong based shipping magnate CY Tung and sailed to Hong Kong from the USA in 1971. The Seawise, as it was then renamed by Tung, undertook major refit into a floating university campus. On 9 January 1971, with the refit almost complete, several fires were discovered in various parts of the ship which spread and burned throughout the night before the ship rolled on to its side. The hull continued to burn and smoulder for over a week. **Figure 9.5** is a photograph of the ship during the fire and **Figure 9.6** of after the fire. Fortunately there was only one casualty but it was clear that the ship was now only fit for scrap.

An enquiry in July 1972 confirmed that it had been the work of an arsonist but the culprit was never found. In December 1973 it was decided to scrap the hull. The buried remains of this vessel now form part of the reclaimed shoreline on the South–East coast of Tsing Yi. The current location of the ship in relation to the Study Area is shown on **Figure 9.7 (data sourced from the UK Hydrographic Office data base of shipwrecks, as included in Appendix 9.3)**. Between 1974 and 1975 a massive salvage operation was conducted by a team of South Korean divers. They removed 45,000 tonnes of valuable steel and brass (Galbraith, 1988). Additional salvage and safety work was carried out prior to construction of CT9. The current dredging will not impact the location of the *QE1*.

9.3.5.1 Aerial Photographic Evidence

The six aerial photographs presented as **Figures 9.8** to **9.13** demonstrate the extraordinary rate of reclamation and development which has taken place within the Study Area.

The earliest available aerial photograph dating from 1924 (**Figure 9.8**) shows Tsuen Wan as little more than a large fishing village on Castle Peak Road and Kwai Chung appears as a tiny settlement above Gin Drinker's Bay. The photograph was taken by the Pegasus mission of the Fleet Air Arm mission.

In earlier times Kwai Chung was called Kwai Chung Tsz. Kwai Chung was a stream (Chung) that emptied into Gin Drinkers Bay. The whole bay was reclaimed for land and the stream is no longer visible.

The same view taken 30 years later in 1954 (**Figure 9.9**) by the Royal Air Force shows the beginning of development with the emergence of the Tsuen Wan factory complex and Route Twisk.

By 1964 (**Figure 9.10**) enormous changes have started as can be seen in the photograph by Huntings Air Photography. The coastline has changed and Gin Drinker's Bay has become reclamation with a prime source of fill being refuse from Kowloon. At this time it became known locally as Lap Sap Wan which translates as 'rubbish bay'. Gin Drinker's Bay is famous for the Gin Drinker's Line, a defence line against Japanese invasion in 1941. Resettlement estates at Tai Wo Hau and the upgrading of the road to Kowloon are all evident.

Tsing Chau or Pillar Island was an island sitting on the mouth of Gin Drinker's Bay, by the side of Rambler Channel, opposite to Tsing Yi Island. In the 1960s, the bay was reclaimed and Tsing Chau became a land extension of Kwai Chung. In the early 1970s, a cross-channel bridge, Tsing Yi Bridge, was built and the island was at the Kwai Chung end of the bridge.

By 1975 (**Figure 9.11**) the area has transformed and Gin Drinkers Bay become Kwai Chung. There was already a container port, and the Lai Chi Kok Bridge was several years old but the Tsing Yi Bridge was new. It was fast becoming one of Hong Kong's major industrial areas.

The shoreline of the channel has changed rapidly owing to the development of Tsuen Wan New Town and the Kwai Chung Container Port. Three islands (Nga Ying Chau, Pillar Island and Mong Chau have all been joined to land by reclamation. Tsing Yi Island has extended drastically by reclamation along almost all its natural shore and the annexation of Nga Ying Chau and Chau Tsai. Three major bays or harbours, Tsing Yi Tong, Mun Tsai Tong and Tsing Yi Bay in the northeast, have been completely reclaimed for new towns.

The aerial photograph from 1989 (**Figure 9.12**) shows the final stages of the major reclamation as Tsuen Wan transformed into a high rise residential area. **Figure 9.13** shows the Study Area in 2008, when it had a population of over a million and is continuing to grow.

9.3.6 Archive Search

The UK Hydrographic Office (UKHO) holds a database of surveyed shipwrecks in Hong Kong, including those not shown on Admiralty Charts. A search for shipwrecks within the two Study Areas was commissioned in July 2008. The results are presented in **Appendix 9.3** and only include the Queen Elizabeth 1 discussed in **Section 9.3.5** above.

Hong Kong Marine Department were also contacted and confirmed that there were no known wrecks, except the Queen Elizabeth 1 in the vicinity of the Study Area.

The UKHO also holds a huge archive of historic charts. These charts are particularly useful as they may show wrecks which have been subsequently buried or broken up. They also show the original shore lines prior to any reclamation. Copies of the relevant charts are included as follows: 1764 (**Figure 9.14**), 1841 (**Figure 9.15**), 1864 (**Figure 9.16**) and 1888 (**Figure 9.17**).

Detailed records relating to previous dredging in the Study Area were provided by Port Works Department. A summary is presented in **Section 9.4** below.

9.3.7 Geophysical Survey

The detailed results of the geophysical survey are presented in **Appendices 9.4 to 9.6** and a summary is presented below.

9.3.7.1 Bathymetry

The seabed in the areas surveyed is generally flat with depths varying from -14mCD (close to the shore) to -18mCD. As shown on the **Appendix 9-6 Chart Figures 7.1 – 7.6** the survey areas were predominately covered with soft and fine sediments. Deep depressions, most likely related to previous dredging activity, are apparent on the northern portion of survey Area B. Over area A and in the northern part of area B, the seabed appeared to be highly irregular and disturbed. Scattered debris and seabed scars were commonly found from the side scan data. It is likely that these features are related to earlier dredging and dumping activities. Some rock outcrops/boulders/construction related materials were recorded at the northern end of area A. Rubble mounds and materials related to the existing Tsing Yi and Kwai Chung submarine outfalls are apparent along their alignment.

9.3.7.2 Side Scan Sonar Data

A total of 74 sonar contacts were identified from the side scan sonar data. Their location can be seen in **Appendix 9-6 Chart Figures 7.1 to 7.6**. Analysis of the data enabled 54 of the sonar contacts to be disregarded as having archaeological potential. This was due to their identification as objects such as mooring buoys, concrete slabs and other modern debris. **Figure 9.18** shows clearly an example of this kind of debris where a concrete block and rubble fill associated with the outfalls are clearly visible. The distribution of the sonar contacts as shown on **Appendix 9-6 Chart Figures 7.1 to 7.6** clearly indicates their association with the existing utilities.

Table 9.2 below contains the details of the remaining 20 sonar contacts. These are unidentified objects that cannot be explained either through their location or appearance. The location of these unidentified sonar contacts are shown in **Figure 9.19**. Modern debris and dumped material usually has a very distinctive appearance which facilitates its classification.

Table 9.2: Locations of Unidentified Sonar Contacts

Contact number	Easting	Northing	Dimensions (m)	Description
SC002	829851.7824	822891.2648	3.6x3x1.2	Unidentified Object
SC007	830246.6592	822885.7087	2.1x2.7x0.7	Unidentified Object
SC008	829978.5186	822352.2194	2.6x2.2x0.8	Unidentified Object
SC009	830031.0358	822409.1255	1.5x1.7x0.5	Unidentified Object
SC010	830168.6223	822435.5497	2.1x0.7x1.1	Unidentified Object
SC016	830104.2261	822267.2808	2.5x2.2x0.6	Unidentified Object
SC018	830151.7932	822209.8664	1.6x0.9x0.4	Unidentified Object
SC020	830266.3448	822145.6995	2.2x1.9x0.6	Unidentified Object
SC021	830662.3767	822057.4482	1.9x2x0.6	Unidentified Object
SC022	830391.3804	821785.5769	1.1x1.2x0.4	Unidentified Object
SC024	830734.2832	821617.7639	3x3x0.8	Unidentified Object
SC027	830677.7176	820957.9651	2.3x1x0.7	Unidentified Object
SC029	830750.9245	820951.9157	1.8x0.8x0.5	Unidentified Object
SC030	830086.7864	820754.0668	2.1x1.8x0.8	Unidentified Object
SC046	828833.3707	820257.8647	2.8x2.8x0.4	Unidentified Object
SC047	829095.4212	820247.5591	7.1x0.6x0.8	Unidentified Object
SC049	829242.3622	819987.2695	2.3x2.1xnmh	Unidentified Object
SC058	828551.9395	819949.3631	2x1.7x0.5	Unidentified Object
SC059	828741.8895	819900.4086	2.2x2.9x0.6	Unidentified Object
SC068	828412.51	819412.0553	2.3x2.5x0.4	Unidentified Object

The data showing each of the above sonar contacts is presented in **Appendix 9.5**.

9.3.7.3 Seismic Profiler

The seismic profiler data established the seabed stratigraphy across the Study Area. **Appendix 9-6 Chart Figures 3.1 to 3.6** illustrate the general levels at the base of the Marine Deposits. Incised channels formed on the surface of alluvium are apparent in survey area A.

Isopachs of marine deposits are presented on **Appendix 9-6 Chart Figures 6.1 to 6.6**. For area A, the thickness of marine deposits is very thin in the north where the bedrock level is shallow. The layer gets thicker approaching to the South of Tsing Yi with maximum thickness of almost 20m.

For area B, the Marine Deposit layer is also thin in the north and gets thicker to the south (up to 32m thick). It was noticed that Marine Deposit Layer was missing at the NE edge of the survey area.

A total of 36 seismic contacts was identified in the seismic profiler data.

Table 9.3: Seismic Data contacts

Contact number	Easting	Northing	Approx. Depth below seabed (m)	Description
SEI01	E 829768.1751	N 822928.3076	0 (exposed)	Tsing Yi submarine outfall
SEI02	E 829788.8834	N 822937.0964	0 (exposed)	Tsing Yi submarine outfall
SEI03	E 829801.9114	N 822941.5408	0 (exposed)	Tsing Yi submarine outfall
SEI04	E 829817.8960	N 822945.4079	0 (exposed)	Tsing Yi submarine outfall
SEI05	E 829862.5199	N 822959.7914	0 (exposed)	Tsing Yi submarine outfall
SEI06	E 829897.8212	N 822988.7109	0 (exposed)	Kwai Chung submarine outfall
SEI07	E 829903.6369	N 822827.4860	1.2	Material related to submarine outfall
SEI08	E 829902.6060	N 822815.9125	1.2	Kwai Chung submarine outfall
SEI09	E 829907.6319	N 822718.1562	1	Kwai Chung submarine outfall
SEI10	E 829915.0827	N 822649.7007	1.2	Material related to submarine outfall
SEI11	E 828636.4015	N 814526.9950	4	Pipeline WSD
SEI12	E 828682.5900	N 814529.4600	3	Pipeline WSD
SEI13	E 828717.7800	N 814535.1950	3.5	Pipeline WSD
SEI14	E 828760.5700	N 814538.7600	3.2	Pipeline WSD
SEI15	E 828771.7166	N 814538.6048	2.3	Pipeline WSD
SEI16	E 828796.2597	N 814544.4969	2	Pipeline WSD
SEI17	E 828818.2250	N 814543.5636	2.5	Pipeline WSD
SEI18	E 828841.4496	N 814548.0828	3.5	Pipeline WSD
SEI19	E 828876.1209	N 814549.5770	3	Pipeline WSD
SEI20	E 828875.4244	N 814575.0530	2.8	Unknown
SEI21	E 828904.0650	N 814548.4250	3	Pipeline WSD
SEI22	E 828922.7542	N 814550.6592	2.6	Pipeline WSD
SEI23	E 828957.2550	N 814552.9500	1.8	Pipeline WSD
SEI24	E 828988.8695	N 814555.5908	2.1	Pipeline WSD
SEI25	E 828999.4998	N 814604.3532	3.2	Unknown
SEI26	E 829001.8531	N 814559.7791	1.8	Pipeline WSD
SEI27	E 829035.7700	N 814556.1000	2.1	Pipeline WSD
SEI28	E 829081.7400	N 814563.4700	4	Pipeline WSD
SEI29	E 829116.0650	N 814562.7750	2.1	Pipeline WSD
SEI30	E 829160.7686	N 814569.0724	1.8	Pipeline WSD

Contact number	Easting	Northing	Approx. Depth below seabed (m)	Description
SEI31	E 829194.4243	N 814571.9948	1.8	Pipeline WSD
SEI32	E 829241.5764	N 814566.4102	2.1	Pipeline WSD
SEI33	E 828887.3894	N 814401.6587	1.2	Cable HKT
SEI34	E 829044.6083	N 814407.6747	1.5	Cable HKT
SEI35	E 829051.8019	N 814407.0839	1.3	Cable HKT
SEI36	E 829250.1938	N 814411.8536	2	Cable HKT

Whenever there is a large contrast of acoustic impedances between pipeline/cable and its surrounding materials, an outstanding hyperbola is formed at the position of the utilities. This can be seen clearly in **Figures 9.20** and **9.21**. This phenomenon enabled classification of 34 of the contacts as directly associated with the modern utilities. It was not possible to classify two in this way. However SE120 is at 2.8m and SE125 is at 3.5m beneath the seabed so neither will be impacted by the dredging.

Seismic data is not available for 100% of the Study Area. This is due to masking and the extent is shown on **Appendix 9-6 Chart Figures 6.1 – 6.3.** It only occurs in Study Area A. It is therefore possible that buried objects could be present which were not detected during the survey.

The dredging will not disturb any sediments lower than the Marine Deposit so only the drawings showing this and no deeper are included in **Appendix 9.6**.

9.4 Archaeological Potential

Historical evidence indicates that the waters within the Study Area have been the focus of intense maritime activity. The main shipping route to Guangzhou passes though this area although the Kap Shui Mun passage would be used in preference to the Rambler channel. The prevalence of piracy throughout the Hong Kong region gives an increased likelihood of shipwreck occurrence.

However, the land and islands adjacent to the Study Area have been the focus of some of the most intensive development in Hong Kong. Most of the original coastline is now buried beneath extensive reclamation.

The most significant impact on the seabed across the Study Area is the extent of previous dredging. This started in 1990 with maintenance dredging. The location and depth of the maintenance dredging is shown in **Figure 9.22.** When construction of Container Terminal 9 commenced in 1998, a further 24 million m^3 of sediment was removed. After construction of Container Terminal 9 a lesser amount of dredging was required due to faster water flow within the basin area as shown in **Figure 9.23**. A summary of all dredging and the location of the twenty sonar contacts is shown in **Figure 9.24**. It can be seen that all of the Study Area has been impacted by previous dredging. Dredging has taken place at the location of each of the 20 unidentified sonar contacts. The dredging would have had a negative impact on the seabed and would have served to destroy or redistribute archaeological remains, if present. The result of the previous dredging is that the seabed has very low archaeological potential. It is very likely that the 20 sonar contacts arrived on the seabed after the previous dredging and are therefore probably of modern origin.

Existing utilities in the form of 2 submarine outfalls, 1 pipeline and 2 cables exist within the survey areas A2 and B2. Their locations can be seen on **Appendix 9-6 Chart Figures 7.1 to 7.6**. It is assumed that at each of these locations any archaeological material, if present, would have been destroyed during construction

and installation. **Figure 9.18** shows the seabed disturbance associated with the Tsing Yi Submarine Sewage Outfall and the Kwai Chung Submarine Sewage Outfall.

9.5 Recommendation

None of the unidentified sonar contacts are within area B which therefore has no archaeological potential and no further action is required in this area.

Area A has low archaeological potential but there are 20 unidentified sonar contacts. The archaeological potential of the sonar contacts is very low due to the extent of previous dredging across the whole area.

It is recommended that a monitoring brief shall be conducted during the dredging. It shall only be required during dredging at the locations of the 20 unidentified sonar contacts and masked areas and does not need to cover all of the dredging activities. Dredging staff should be briefed about the possibility of locating archaeological objects and a marine archaeologist shall be available to monitor the dredged spoil and provide advice. If material indicative of archaeological remains is retrieved, the AMO should be contacted as soon as possible.

9.6 References

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