Agreement No. CE 42/2008 (CE)
Tseung Kwan O – Lam Tin Tunnel and Associated Works – Investigation

Working Paper on Terrestrial Archaeological Review and Marine Archaeological Investigation (Final)

Contents

Page

FIGURES

APPENDIX

1 INTRODUCTION

1.1 Background

1.1.1 According to the integrated planning and engineering study - "Further Development of Tseung Kwan O – Feasibility Study" (CE 87/2001) conducted in 2002 commissioned by Civil Engineering and Development Department (CEDD), Tseung Kwan O (TKO) is recommended to further house a total population of 450,000. Huge traffic demand and serious congestion is foreseeable in the next decade with the Tseung Kwan O Tunnel as the only main connection between TKO and other areas in the territory for the time being.

1.1.2 In the light of this, the Tseung Kwan O – Lam Tin Tunnel (TKO – LT Tunnel) and Cross Bay Link (CBL) were therefore proposed to cope with the anticipated long-term traffic demand between TKO and external areas. Together with the proposed Trunk Road T2 (T2) in Kai Tak Development (KTD) and Central Kowloon Route (CKR), the TKO – LT Tunnel will form Route 6 in the strategic road network, providing an east-west express link between Kowloon and TKO areas. Upon completion in 2016, this strategic route will essentially soothe the existing heavily trafficked road network in the central and eastern Kowloon areas, and reduce the related environmental impacts on these areas.

1.1.3 AECOM Asia Co. Ltd. was appointed by CEDD to carry out the Assignment on Tseung Kwan O – Lam Tin Tunnel and Association Works – Investigation (hereafter referred to as "the Project"). The Assignment commenced on 16 March 2009 and shall be completed within 30 months, i.e. by mid-September 2011. **Figure 1.1** shows the general layout plan of the Project.

1.1.4 The outlined scope of the Project is to provide a highway connecting TKO at Po Yap Road in the east and T2 in the west with the associated interchange. It comprises the following:

(a) a dual two-lane highway approximately 4.8 km long. About 3 km of the highway is in the form of tunnel;

(b) slip roads, depressed roads, viaducts, TKO Interchange, toll plaza, ventilation, administration buildings, tunnel portal facilities and reclamation on TKO side;

(c) slip roads, branch tunnels, viaducts, Lam Tin Interchange, depressed roads, tunnel portal facilities, ventilation, administration buildings and the relocation of Lam Tin Ambulance Depot on Kowloon side; and

(d) the associated building, civil, structural, marine, electrical and mechanical, traffic control and surveillance system (TCSS), landscaping, and environmental protection and mitigation works.

1.1.5 The Associated Works cover the following:

(a) Proposed Lei Yue Mun Road Underpass (LYMR U/P) with the outlined scope as follows:

(i) construction of a single lane eastbound underpass of about 270m in length along Lei Yue Mun Road (LYMR) across its junctions with Kai Tin Road, slip road to Eastern Harbour Crossing (EHC) and Yau Tong Road;

(ii) modification of the LYMR/Kai Tin Road roundabout including the provision of a footbridge and the modification of the junctions of LYMR with Yau Tong Road and slip road to EHC; and

(iii) the associated civil, structural, TCSS (if needed), landscape and noise mitigation works.

(b) Provision of connection point for possible vehicular access connection from Junk Bay Chinese Permanent Cemetery (JBCPC) under planning by Home Affairs Department (HAD).

(c) Provision of tunnel portal and other facilities at Kwun Tong side for T2.

1.2 Objectives of this Working Paper

1.2.1 The Project is a designated project under Schedule 2 of the Environmental Impact Assessment Ordinance (EIAO) which requires an Environmental Permit (EP) for its construction and operation. The EIA Study Brief No. ESB-195/2008 for the Project was issued by the Environmental Protection Department (EPD) under Section 5(1) of the EIAO in August 2008.

1.2.2 Under Section 3.4.7 of the EIA Study Brief, a Cultural Heritage Impact Assessment (CHIA) which comprises a Built Heritage Impact Assessment (BHIA), a Terrestrial Archaeological Review and a Marine Archaeological Investigation (MAI) shall be conducted accordingly.

1.2.3 This is the working paper on Terrestrial Archaeological Review and MAI for the Project. The objectives of this paper are outlined as follows:

i) To conduct a Terrestrial Archaeological Review aiming at:

- Identifying any area of known or potential archaeological interests within the Study Area;
- Recommending further field investigation to obtain archaeological data if necessary.

ii) To conduct a Marine Archaeological Investigation (MAI) with the aim to:

- Identify and locate any underwater cultural heritage within the Study Area;
- Assess the archaeological potential of the Study Area;
- Assess the impact of the proposed works on archaeological resources, if present, and recommend mitigation strategy whenever necessary.

1.3 Structure of this Paper

1.3.1 The structure of this paper is set out as below:

- Section 2: Environmental Legislations and Standards
- Section 3: Terrestrial Archaeological Review
- Section 4: Marine Archaeological Investigation
- Section 5: Conclusions

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2 ENVIORNMENTAL LEGISLATION AND STANDARDS

2.1 Overview

2.1.1 Legislation, Standards, Guidelines and relevant to the consideration of Cultural Heritage impacts under this study include the following:

- *Environmental Impact Assessment Ordinance (EIAO);*
- *Technical Memorandum of Environmental Impact Assessment Ordinance (EIAO-TM);*
- *Antiquities and Monuments Ordinance (AM&O);*
- *Hong Kong Planning Standards and Guidelines (HKPSG);*
- *Guidelines for Cultural Impact Assessment (GCHIA); and*
- *Guidelines for Marine Archaeological Investigation Guidelines (GMAI)*

2.2 Environmental Impact Assessment Ordinance (Cap.499)

2.2.1 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 Antiquities and Monuments Ordinance and any place, building, site, or structure or a relic identified by the Antiquities and Monuments Office (AMO) to be of archaeological, historical or paleontological significance”.

2.3 Technical Memorandum on Environmental Impact Assessment Process

2.3.1 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.

2.4 Antiquities and Monuments Ordinance (Cap.53)

2.4.1 The Antiquities and Monuments Ordinance provides the statutory framework for the preservation of objects of historical, archaeological and paleontological interest.

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

2.4.3 Under section 6 and subject to subsection (4) of the Ordinance, the following acts are prohibited in relation to certain monuments, except under permit granted by the Secretary for Development:

- 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.

2.5 Hong Kong Planning Standards and Guidelines

2.5.1 Chapter 10 of HKPSG covers planning considerations relevant to conservation. It also details the principles of conservation, the conservation of natural landscape and habitats, historic buildings and archaeological sites, and addresses the issue of enforcement. The appendices list the legislation and administrative controls for conservation, other conservation related measures in Hong Kong, and Government departments involved in conservation.

2.6 Guidelines for Cultural Heritage Impact Assessment

2.6.1 The Guidelines for Cultural Heritage Impact Assessment (GCHIA) is attached in Appendix E of the EIA Study Brief No. ESB-195/2008 including a baseline study, field evaluation, impact levels and impact assessment.

2.7 Guidelines for Marine Archaeological investigation

2.7.1 The AMO have issued Guidelines for MAI which details 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 MAI should include a marine archaeological review, a geophysical survey and diver survey to establish archaeological potential whenever deemed necessary to obtain sufficient data.

3 TERRESTRIAL ARCHAEOLOGICAL REVIEW

3.1 Introduction

3.1.1 This chapter presents a terrestrial archaeological review conducted by a licensed archaeologist on the area that may be affected by the Project and its associated works, identifying areas with known or potential archaeological interests, and recommending further field investigation as necessary to obtain sufficient archaeological data to ascertain the archaeological potential of the Project area.

3.2 Methodology

Study Area

3.2.1 The Study Area of the terrestrial archaeological review is shown in **Figure 3.1**.

3.2.2 Based on the current scope of the Project, areas of concern would be the above-ground works areas at Cha Kwo Ling Village (CKLV) in Lam Tin area and the western shoreline of Junk Bay in TKO. No archaeological potential is anticipated within deep underground tunnel alignment, neither as in the heavily urbanized Lam Tin area.

Study Methodology

3.2.3 With reference to the Guidelines of Cultural Heritage Impact Assessment (GCHIA), a desk-based archaeological review has been conducted to identify any known or potential sites of archaeological interest. Any available and relevant information of previous archaeological, historic, geographic and geological studies related to the study area involving excavation works will be reviewed and collated to determine the presence of its historical occupation, and hence assess the potential existence of archaeology within the area.

3.2.4 If the results of the desk-based study indicate that there is insufficient data for purposes of identification of sites of archaeological interest, determination of cultural significance and assessment of impacts, an archaeological site visit and/or field investigation programme may need to be designed and submitted to the AMO for approval. The programme and associated tasks should be conducted by a qualified archaeologist with licence issued from AMO if archaeological excavation work is involved.

3.2.5 The interpretation of archaeological resources is based on the following aspects:

- the extent of archaeological deposit;
- the depth of archaeological deposit;
- the chronology of artefacts;
- the nature and condition of archaeological deposit; and
- the significance of findings.

3.3 Historical Background

3.3.1 TKO was an inlet is located east to Kowloon Bay. The shallowness of the water in Kowloon Bay had made the bay ideal for salt making since 4th century AD. The salt making area at shoreline of Kowloon Bay was formerly known as "Guanfu Chang" (**官富場**) in early South Song Dynasty (1127-1297AD), but no any record of salt production in Tseung Kwan O. The military garrison of 150 soldiers was situated along Guanfu Chang at this period to suppress salt smuggling.

3.3.2 TKO was record in a map of Chinese geography book of the period 1572-1619, Yuedaiji(**粵大記**), formerly occupied by fishing villages and settlements in Qing Dynasty, such as Rennie's Mill and Hang Hau, and also functioned as a site for small scale shipbuilding activities before reclamation.

3.3.3 In the middle of 19th century, some Hakka people settled in southeast Kowloon and became masonry workers. There were several villages along the eastern coast of southeast Kowloon, including Lei Yue Mun, Cha Kwo Ling, Ngau Tau Kok and Yau Tong, which were also known as the "Four Hills" among the locals and all of them were actively involved in stone-quarrying. A site behind CKLV was one of the sources of granite stones acquisited by the villagers for quarrying.

3.3.4 A village called Yau Yue Wan (魷魚灣), which was near to Project sites, was not listed in 1819 editions of Xian County Gazetteer. A detailed land surveying was conducted in 1868 in Hong Kong Kowloon and New Territories. Three villages near to the Project sites, are Kwun Tong (官塘), Hang Hau(坑口), Tseung Kwun O and Fat Tong (佛堂), were indicated in 1868 "Map of the Sun-on-District (新安縣全圖)". These villages also were listed in the Report on Extension of the Colony of Hong Kong of 1898.

3.3.5 Due to its location at the eastern chokepoint of the Victoria Harbor, TKO has functioned as a redoubt throughout the history of Hong Kong during 1900 to 1941. The fortifications were built on the shorelines and on Devil's Peak in the 1900s, and can still be found today.

3.4 Results of the Desk-based Study

3.4.1 Within the Study Area of terrestrial archaeology, there are no known archaeological sites recorded in the List of Archaeological Sites in Hong Kong maintained by AMO. The closest known archaeological sites are:

- Fat Tau Chau Qing Dynasty Grave Stone;
- Fat Tau Chau Archaeological Site;
- Junk Island House Ruin;
- Fat Tau Chau Site of Chinese Custom Station; and
- Yau Yue Wan Kiln.

3.4.2 Nevertheless, these known archaeological sites are not considered as the concerns of this review due to its far-off location from the Project area (more than 500m).

3.4.3 As mentioned in Section 3.2.2, no archaeological potential is anticipated within deep underground tunnel alignment and the highly urbanized Lam Tin area. The areas of concern would be the above-ground works areas at CKLV and western shoreline of Junk Bay in TKO. The archaeological potential at these two areas has been reviewed on account of the proposed works to be put forward in these areas.

Cha Kwo Ling Village (CKLV)

3.4.4 The topography of Cha Kwo Ling is characterized by a generally low-lying and gently sloping hill, named as Rocky Hill in the 1903 Ordinary Survey Map. To the north of Rocky Hill was the village of Sai Tso Wan, to the east and south were villages Tan Ka Tsing and Cha Ko Ling, where some agricultural land was also crossed by a further stream in a sandy bay, "Kun Tong", just to the north.

3.4.5 Cha Kwo Ling was recorded as an artifact collection area in the 1920s and 1930s. Walter Scholfield had conducted his archaeological survey in Cha Kwo Ling and stated that artefacts were collected at "on hill E.N.E. of Cha Kwo Ling, Kowloon Bay", in which prehistoric artefacts were discovered on northeast shore of the Cha Kwo Ling. An archaeological investigation was conducted in the early 1980s in Cha Kwo Ling and concluded that the site was "totally destroyed".

3.4.6 With the trace of geographical landscape and previous archaeological findings, prehistoric settlement was believed to be present within the current Cha Kwo Ling area. A baseline archaeological study report was conducted accordingly in the study "Planning and Site Review for the South East Kowloon Material Recovery and Transfer Station – Feasibility Study" in 2008 by AECOM for Environmental Protection Department (EPD). The field survey failed to reveal any intact or significant archaeological remains but 3 pieces of modern pillow, bowl and pot fragment. The study concluded that Cha Kwo Ling area carried no archaeological significance.

Tseung Kwan O Area

3.4.7 The western shoreline of Junk Bay is characterized by a hilly topography with steep slope (>27º). Based on the results of the 1998 Archaeological Survey in Western Coast Road Area, including Yau Tong region, hill slope of Lei Yu Mun and eastern slope of Devil's Peak and the site setting, no terrestrial archaeological potential is identified and expected at these hillside areas. There is no historic record of occupation or cultivation in the site as well.

3.5 Conclusion

3.5.1 From the result of desk-based review, there is neither known archaeological site nor area of archaeological potential identified within the Study Area. No subsequent archaeological site survey or investigation is deemed necessary.

Reference

Archaeo-Environments Ltd., 2004. A Built Heritage and Historic Survey Report for Feasibility Study of Further Development of Tseung Kwan O.

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古物古蹟辦事處，2007，〈香港佛頭洲遺址 2004 年考古調查簡報〉，《華夏考古》，2007(4) 。

張一兵 校點，2006，《深圳舊誌三種・嘉慶新安縣志》，深圳，海天出版社。

4 MARINE ARCHAEOLOGICAL INVESTIGATION

4.1 Introduction

4.1.1 In accordance with the requirements set out in Section 3.4.7 of the EIA Study Brief No. ESB-195/2008, the relevant requirements in the EIAO-TM and guideline issued by the Antiquities and Monuments Office, a Marine Archaeological Investigation (MAI) was conducted for this Project.

4.1.2 The legislations relevant and applicable to the MAI are listed in Chapter 2 of this report.

4.1.3 This chapter hereby presents a brief summary of the MAI which was conducted by SDA Marine Ltd in 2009. Details of the MAI are presented in **Appendix 1**.

4.2 Summary of MAI

4.2.1 The study area of the MAI is shown in **Figure 1** of **Appendix 1**. The MAI followed the methodology set out in the Guidelines for Marine Archaeological Investigation (GMAI) and the relevant requirements in the EIAO-TM, Annexes 10 and 19.

4.2.2 The Geophysical survey carried out in August 2009 located eight side scan sonar contacts and five seismic profiler contacts. The results were combined with data from a 2003 geophysical survey which located eight side scan sonar contacts and seven seismic profiler contacts. In total there were 28 sonar contacts on the seabed requiring further investigation.

4.2.3 Subsequent diver inspections were completed in September and October 2009 to investigate each target in the seabed. All 28 targets were successfully located and assessed, and were easily identified as modern construction waste, dumped materials and five rubber tyres. There was no target with archaeological value.

4.2.4 Conclusively, additional marine archaeological investigation or mitigation work is deemed unnecessary since no archaeological resource is identified in the seabed within the Study Area.

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5 CONCLUSIONS

Terrestrial Archaeological Review

5.1 There is no known and recorded archaeological site identified within the Study Area. The closest ones are all located more than 500m away from the Project area.

5.2 Cha Kwo Ling Village and the western shoreline of Junk Bay in TKO were considered as impacted areas under the proposed works. Nonetheless neither archaeological resources nor potential were identified in these areas.

5.3 It is therefore deemed unnecessary to further conduct any subsequent archaeological site survey or investigation.

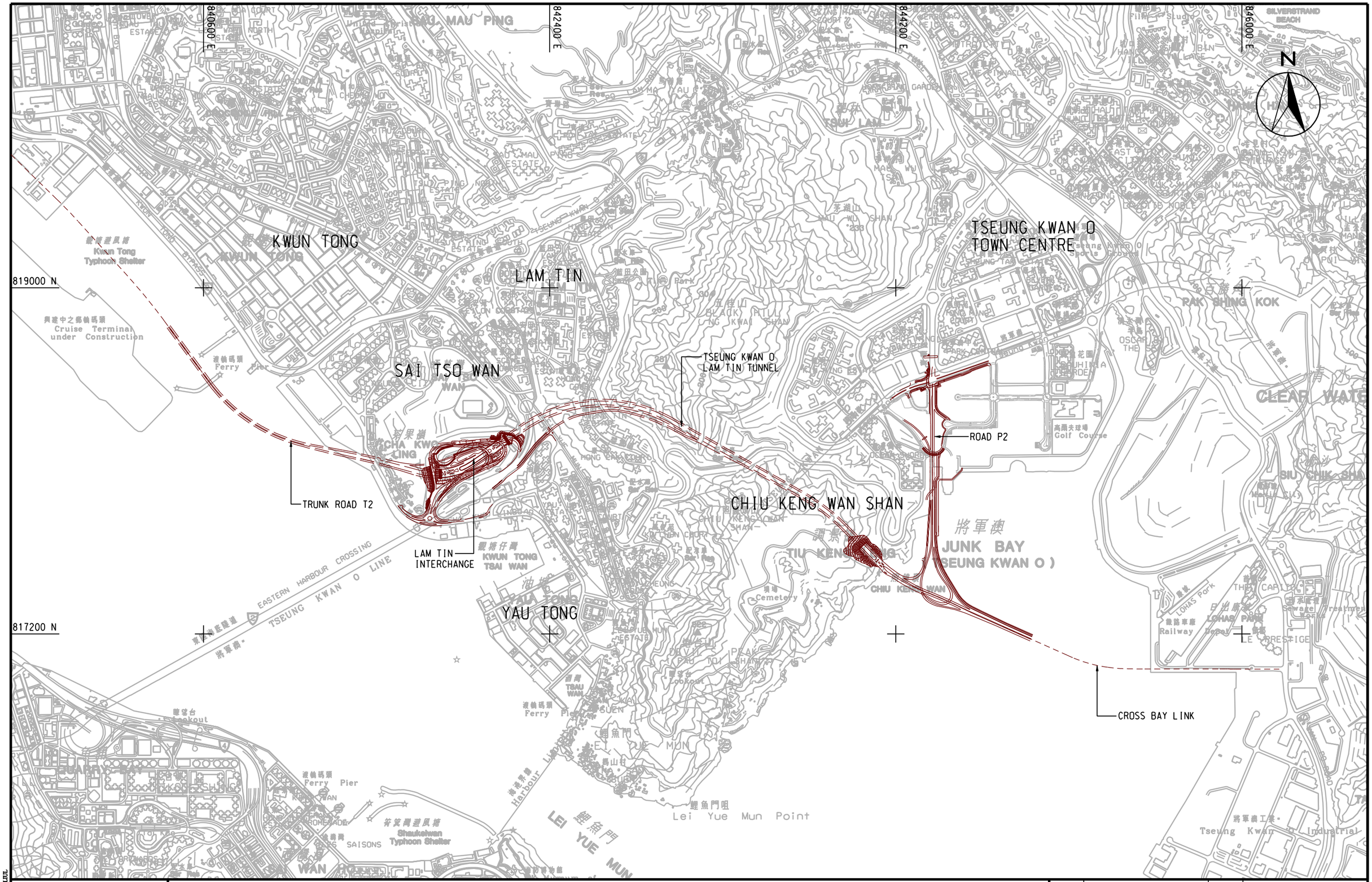
Marine Archaeological Investigation

5.4 The Geophysical Surveys located 28 sonar contacts on the seabed within the MAI Study Area. A diver inspection was carried out to locate and assess all these identified targets in September and October 2009. All targets were identified as of modern origin such as construction waste and ship parts.

5.5 No object on the seabed showed clues of submerged archaeological remains. There is no archaeological resource on the seabed within the Study Area.

5.6 Accordingly, no further action or mitigation measure is recommended as there is no underwater cultural resource within the Study Area.

Figures



AGREEMENT NO. CE 42/2008 (CE)
TSEUNG KWAN O - LAM TIN TUNNEL AND ASSOCIATED WORKS - INVESTIGATION

GENERAL LAYOUT PLAN

SCALE	A3 1 : 18000	DATE	JUN. 2012
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AGREEMENT NO. CE 42/2008 (CE)
TSEUNG KWAN O - LAM TIN TUNNEL AND ASSOCIATED WORKS - INVESTIGATION

STUDY AREA FOR TERRESTRIAL ARCHAEOLOGICAL REVIEW

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		REV	--

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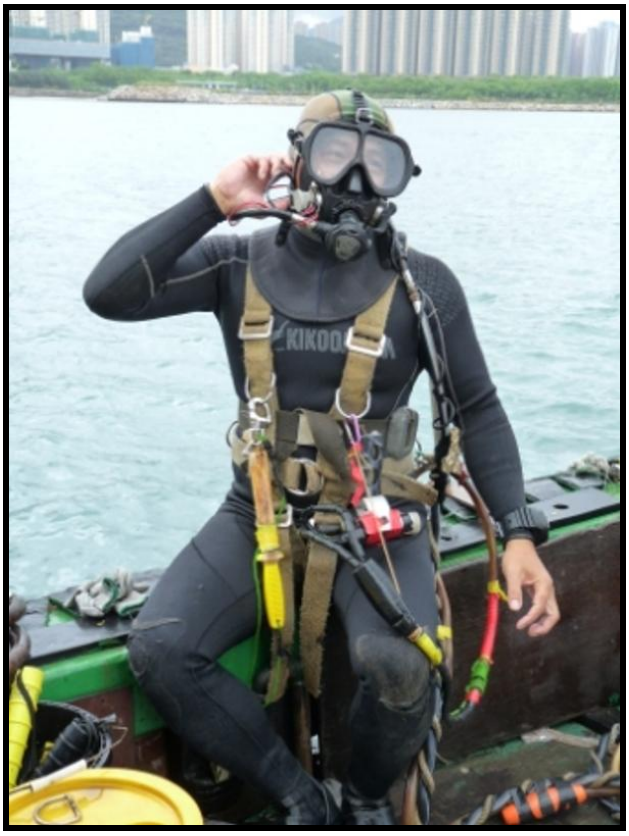
Appendix 1
Marine Archaeological Investigation

Marine Archaeological Investigation

Agreement No. CE 42/2008 (CE)
Tseung Kwan O – Lam Tin Tunnel and Associated Works
Investigation

March 2010



SDA Marine Ltd

Contents

FIGURES

1. SUMMARY

A Marine Archaeological Investigation was completed for the seabed area which will be impacted by the construction of the Tseung Kwan O – Lam Tin Tunnel and Associated Works.

The MAI followed the Guidelines for Marine Archaeological Investigation issued by the Antiquities and Monuments Office.

In August 2009 a geophysical survey was carried out. It located eight side scan sonar contacts and five seismic profiler contacts. The results were combined with data from a 2003 geophysical survey which located eight side scan sonar contacts and seven seismic profiler contacts. In total there were 28 sonar contacts on the seabed requiring further investigation.

In September and October 2009, a diver inspection was completed. All targets were successfully located and assessed. Each target was easily identified as modern construction waste, dumped materials and five rubber tyres. There was no target with archaeological value.

Therefore additional marine archaeological investigation or mitigation work is deemed unnecessary.

2. INTRODUCTION

The Civil Engineering and Development Department is planning the construction of the Tsueng Kwan O - Lam Tin Tunnel (TKO – LT Tunnel) with the aim to meet the long-term traffic demand between TKO and external areas. Together with the Trunk Road T2 and Central Kowloon Route, the TKO – LT Tunnel will contribute to form a strategic road network for the region to provide an east-west express link between TKO and Kowloon areas.

Since the TKO – LT Tunnel will contain slip roads, tunnel portal facilities such as toll plaza, ventilation and administration building which are planned to be constructed on reclaimed land along the western shoreline of Junk Bay in the Tseung Kwan O side, the associated construction works will likely impose adverse impact on the marine archaeological resources which may exist in Junk Bay.

The aim of this 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 construction and reclamation works of the Project.

2.1 Study Scope

The MAI covered the study area as shown in Figure 1. This included a significant buffer zone to allow for changes to the alignment and the impact of working vessels during construction. At present the final alignment remains undecided but all options are within the MAI study area.

In accordance with Antiquities and Monuments Office (AMO) Guidelines, the MAI comprised six 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 based review of existing literature;
- Task 3: Geophysical Survey data analysis to obtain detailed information about the seabed and sub-surface sediments;
- Task 4: Establish archaeological potential and the location and significance of any seabed features requiring further investigation and evaluation;
- Task 5: Diver visual inspection of seabed features to assess their archaeological significance;
- Task 6: Assess the impact of the construction of the on archaeological resources, if present, and recommend a mitigation strategy, if necessary.

2.2. Legislative Framework for Marine Archaeological Investigations in Hong Kong

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

- Antiquities and Monuments Ordinance

- Environmental Impact Assessment Ordinance
- Technical Memorandum on Environmental Impact Assessment Process
- Guidelines for Marine Archaeological Investigation

2.3 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.

2.4 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) have 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.

2.5 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). 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.

2.6 Guidelines for Marine Archaeological Investigation

The AMO have issued Guidelines for Marine Archaeological Investigation (MAI) which detail 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 in Appendix A.

3. METHODOLOGY

3.1 Marine Archaeological Review

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

3.2 Baseline Review

The aim of the Baseline Review is to compile a comprehensive inventory of cultural heritage resources in the Study Area. It is not an exhaustive chronological history of the area. Only incidents and information relevant to the current study are included.

The Review established the historical profile and potential for cultural heritage sites and included:

- 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
- Marine charts records held in British Library and the National Maritime Museum Library in London.

3.3 Archive Search

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

3.4 Geophysical Survey

The survey was planned to optimise the acquisition of data for the MAI and Site Investigation. The table below lists the techniques used:

METHOD	OBJECTIVE
Marine side scan sonar survey	To find objects at or above the seabed with archaeological potential
Marine seismic profiling survey	To establish the geological succession over the survey area and locate buried objects
Echo sounding and swath survey	To measure sea bed levels in detail and map anomalous features

The survey was carried out under the Geophysical Survey Term Contract Works Order No. GE/2007/04.27 dated 11th June 2009 issued by Civil Engineering and Development Department.

The survey was carried out during the period of 26th and 30th June 2009. The survey was designed to provide 100% coverage of the MAI study area.

The full technical details are included in Appendix B.

3.5 Visual Diver Survey

The diver survey was undertaken between 27th and 29th September 2009. This was done immediately after Typhoon Ketsana under an extremely bad weather. Therefore a return to the site was made on 10th October to complete the linear surveys along the western shore.

A team of four divers worked from a sampan to allow access to the shallow areas along the western shore.

Each target was located using Differential Global Positioning (DGPS). The boat was positioned above each target and a shot weight was placed on the seabed marked by a buoy on the surface. The drop position was checked against the target position on a

digital chart. The diver then used this shot weight as the centre point of circular searches at 0m, 3m, 5m, 10m, 15m and 20m radius from the shot weight.

The diver was equipped with a hand held video camera to record the contact and associated seabed features. A metal probe was used to look for buried objects. The video had a remote TV monitor in the boat's wheelhouse which displayed the video footage in real time. This facilitated managing the diver from the surface via the through water communications.

4. RESULTS

4.1 Marine Archaeological Review

The following reports were examined in detail to extract the data directly relevant to the current study and define the scope of additional work needed:

4.1.1 2000. Marine Archaeological Investigation.

Road P2 of Tseung Kwan O Development. Prepared for the Antiquities and Monuments Office by SDA Marine Ltd.

A comprehensive MAI was completed. The Baseline Review established high potential for shipwrecks based on documented historical evidence. The results can be applied to the current study as they cover the whole of Tseung Kwan O Bay.

4.1.2 2003. Further Development of Tseung Kwan O Feasibility Study.

Geophysical Surveys and Water Sampling (Term Contact).
Contract No. GE/2001/20. Agreement CE87/2001 (GE).
Institute of Geophysical and Geochemcial Exploration, MCR, PRC.

IGGE were appointed by GEO to complete the Site Investigation. The objectives of the survey were '*to determine the sub-seabed stratum to map features (anomalies), man made objects on or beneath the seabed within the study area*' (Page 1).

The survey included echo sounding, side scan sonar and seismic profiling. The data was of sufficiently high resolution to be used for the MAI.

The report was examined in detail to extract the data relevant to the current study. The following sonar contacts were found to be located within the MAI study area.

Sonar contacts from 2003 Side Scan Sonar Survey			
Sonar Contact No:	**Easting**	**Northing**	**Size (m x m)**
1803	844196.08	817278.51	11.3×38.4
1804	844286.91	817315.39	18.9×35.1
2004	844099.46	817381.74	18.5×25.1
2601	844633.47	817492.07	35.1×29.1
3401	844419.5	817672.62	12.3×31.9
4202	844468.67	817920.93	25.3×38.1

Sonar contacts from 2003 Side Scan Sonar Survey			
Sonar Contact No:	**Easting**	**Northing**	**Size (m x m)**
4401	844623.31	817964.21	13.1×16.8
4402	844557.37	817915.24	11×12.7

Seismic contacts from 2003 Seismic Profiler Survey		
Seismic contacts No.	**Easting**	**Northing**
EW17-13	844203.1898	817272.21
EW26-29	844635.9042	817490.44
EW28-59	844378.7546	817545.92
EW29-22	844631.0274	817571.62
SN62-31	844434.8378	817558.72
SN62-34	844422.5442	817533.01
A39-45	843820.7674	817027.86

A total of eight side scan sonar and seven seismic profiler contacts were identified.

4.1.3 2004. Further development at Tseung Kwan O – Feasibility Study.

Agreement Number CE 87/2001. Marine Archaeological Investigation. Assessment of Archaeological Potential. Task 3. Archaeo-environments Ltd.

This study was commissioned in 2004 to cover the Cross Bay Link and Western Coast Road projects. The study area is shown in Figure 2. As it includes the current study area some of the results can be directly applied to this project.

The MAI comprised a Baseline Review and analysis of Geophysical Survey data to establish archaeological potential.

The Baseline Review established high archaeological potential based on historical evidence. The review is mostly a summary of the 2000 SDA Marine Report for Road P2 which is summarised in Section 4.2 below.

The report concluded that diver inspection was required of the seismic and sonar contacts identified in the geophysical survey data.

4.2 Baseline Review

The Baseline Review completed in 2000 by SDA Marine Ltd for Road P2 of Tseung Kwan O Development under contract to the Antiquities and Monuments Office covers the same study area as the current project. It is therefore possible to re-use this information and a summary is provided below.

4.2.1 Maritime Activity in the Vicinity the Study Area

Tseung Kwan O, also known as Junk Bay, is located at the eastern entrance to Victoria Harbour. The entrance is sometimes called Fat Tong Mun (Temple Entrance or Temple Gate). The area got its name due to its popularity as a resort for Chinese

junks and sampans in the past, because of its relatively sheltered position during typhoons. The villages that formerly skirted the coast of Junk Bay, Hang Hau (Stream Mouth), Yau Yue Wan (Cuttlefish Bay), Tseung Kwan O, (Military General's Rocky Entrance) Pak Shing Kok (Hundred Victories Cape) now far inland, were all at one time on the coast. Junk Bay was originally much larger and more extensive than it is today as numerous reclamations have filled in the bay (Davis, 1949).

4.2.2 Early Maps of Junk Bay

Junk Bay was shown (as Fat Tong Mun) in the Cheng Ho navigation map of the China coast in 1425 AD. This map is believed to be based on the earlier map Mau K'un map executed from 1422-1430 AD by his grandson Mau Yuen-I, published in a book called Mo Pei Chi (Notes on Military Preparation, published in 1621 (Empson, 1992). The map indicates the routes taken by vessels of a 15th century Imperial Chinese fleet under the command of Admiral Cheng Ho.

There are references to Junk Bay in a 1723 map of Kwang Tung produced by Chiang Ting Sik in his book called Ku Kam To Shu Chap Sing. It is also positioned in 'Map of the entire coastline' by Chan Lun Kwing in his book Hoi Kwok Man Kin Luk (A Record of the Countries of the Sea, printed in Ngai Hoi Chu Chan in 1744 (Figure 3) (Empson, 1992).

The Kang Hsi Emperor commissioned the Jesuit Fathers to undertake a detailed map of China, which was reprinted in part in 1737. The Jesuit map relies heavily on pre-existing Chinese maps of coastal waters. Hong Kong waters are charted in this map, found in Nouvelle Atlas de la Chine, published in Paris in 1737. Further reference appears in the San On Yuen Chi a cartogram from the 1819 Directory of San On County, wherein Hong Kong is located (Figure 4). Another Chinese map of Kwangtung Province, dated from 1820, reportedly the work of a Taoist priest, clearly identifies Junk Bay (Empson, 1992).

A good subsequent Chinese map that records the south-eastern waters of Victoria Harbour is of San On District, in the 1864 edition of the Sun On Gazetteer (Figure 5).

These maps are particularly important as they indicate that Junk Bay was established as a known coastal settlement from the 15th century. Although there is no documentary material recording what took place there the fact it merited mapping is significant.

The first map which clearly depicts Hong Kong harbour in detail is an 1810 marine chart (Figure 6). This chart was prepared for the East India Company by Daniel Ross and Philip Maughan, Lieutenants of the Bombay Marine.

On the signing of the Treaty of Chuen-pi in 1841, HMS *Sulphur*, commanded by Captain Sir Edward Belcher, was commissioned to undertake a hydrographic survey of Hong Kong Island and the surrounding waters. Produced in the meticulous style typical of the Royal Navy, this chart is remarkable for its accuracy and detail. It takes into account depth soundings in a number of areas, which still form the basis of charts in unchanged areas (Morse, 1926). In this map, Junk Bay is clearly detailed up to the further reaches of Tseung Kwan O which remain uncharted. Junk Island is clearly delineated, and Joss House Bay is likewise charted (Figure 7).

4.2.3 Pirate Activity in Junk Bay

Piracy was a persistent problem in Hong Kong waters. Detailed documentary material provides evidence for intense activity in Junk Bay (Lo, 1963). Of particular relevance to the current study are the activities of the pirate leader Chêng Lien-ch'ang. He and his brother, based on Lantau, had been part of a pirate force that gained a victory over government troops at Kwangtung in 1619 AD. Following this victory Chêng Lien-ch'ang entrenched himself in the hills behind Lei Yue Mun. *'Because of his devilish cunning and his love of fighting*' (Lo, 1963), the hill where Chêng Lien-ch'ang encamped came to be called Devil's Peak, a name which it has retained. He also built on the shore of Lei Yue Mun a Tin Hau temple which is still in active use today. Behind the temple was a secret cave in Devil's Hill used as the hiding place for his plunder.

Historical documents record that all of the seven sons of Chêng Lien-ch'ang followed his father's profession of piracy. After his death the eldest son, Chêng I, assumed leadership, sharing with Kuo P'o-tai and Wu Shih-êrh the title of *'The Three Buccaneers of the South Seas'*. Eventually Chêng I encountered a typhoon while crossing the sea to attack lands to the south and was drowned. The six hundred ships based at Lei Yue Mun passed into the hands of his wife, who continued to resist the combined action of the Imperial Navy and the Portuguese fleet based at Macau. Eventually she was forced to yield to the mercy of the Government when both Kuo P'o-tai and Chang Pao-tsai surrendered to the Imperial Authority (Murray, 1987).

4.2.4 Maritime Trade

The whole Junk Bay area has a long history as a shipping corridor and trade route. From the Sung Dynasty (960-1279) onwards, a constant and rich traffic of trading junks sailed along the coast of Guangdong province carrying goods from the ports of northern China to Guangzhou at the mouth of the Pearl River. The strait between Tung Lung Island and the mainland is called Fat Tong Mun or Buddha Temple Entrance. This was one of the main entrances to the harbour and during the Sung Dynasty, a stone pagoda was built to guide ships (Lo, 1963).

Another important indicator of the intensity of shipping and piracy activities is the fort on Tung Lung Island overlooking the Fat Tong Mun Channel (Lui, 1990). The Ching Dynasty (1644-1911) naval station of Tung Lung is situated on the north east of Tung Lung Island. Tung Lung is also known as Tam Long Chau or Southern Temple Island and there are temples both to the north and south of Fat Tong Mun (Williams, 1976).

The Tung Lung fort was one of a number of garrisons established during the late Ming and early Ching dynasty to protect coastal shipping from pirates. The fort itself was built during the Kang Hsi period (1662-1722) as part of the anti-Ming loyalist anti-pirate activity of that period (Nixon, 1980).

Piracy remained an active threat in Hong Kong waters during the 19th Century. L.C. Arlington, who spent six years between 1893-9 in charge of a Customs Station on Kowloon, wrote in his autobiography:

> *'During my time in Kowloon territory piracies were so common that we regarded it as extraordinary if a day passed without one. Indeed, it was the daily routine for junk masters to report at the Customs Station that they had been pirated and all their cargo looted'* (Hayes, 1983).

4.2.5 Chinese Maritime Customs Station

In the Qing Dynasty (1644-1911), vessels passing through Fat Tong Mun and Tathong Channels stopped at a customs station on Fat Tong Chau or Junk Island, before proceeding west to the Pearl River delta. It is located with strategic significance at the eastern exit of the harbour. In April 1979, following the recovery of pieces of a broken pillar, the Antiquities and Monuments Office undertook a brief survey of the area (Bard, 1980). Broken stones, rubble, tiles and grey bricks were found and granite-slab steps with remains of door hinges were uncovered. At the south end, two column bases were discovered. This material indicated that an imposing structure had previously stood on the site. Large boulders, clearly deliberately aligned, were observed at low tide about the centre of the beach. It was suggested that these could be the remains of a large wooden pier or slipway.

After the Treaty of Tientsin was signed in 1858, Chinese Maritime Customs Stations were established at Ma Wan, Cheung Chau, Lai Chi Kok and at Junk Island. Armed Maritime Customs cruisers regularly patrolled the waters nearby looking for contraband (Sayer, 1975). The Maritime Customs station was closed, along with the others in the immediate vicinity of Hong Kong, after the Second Convention of Peking in 1898. The Maritime Customs Station buildings gradually fell into disrepair after they were abandoned.

4.3 Archive Search

The UK Hydrographic Office (UKHO) holds a database of surveyed shipwrecks in Hong Kong, including those not shown on Admiralty Charts.

Admiralty Chart number 3279 (Figure 8) shows two shipwrecks close to the study area. Further information about these wrecks was obtained from the (UKHO) who undertook the original surveys of the wrecks.

At position 22o 17' 07.4" N, 114o 14' 47.6" E there was a shipwreck (Hydrographic Office reference number 111303151) in 15 m of water with wreckage standing up to 5.1 m above the seabed. The origin of the wreck is unknown. The site was surveyed in October 1997.

At position 22o 16' 59.7" N, 114o 14' 46.4" E there was a shipwreck (Hydrographic Office reference number 111303138) in 21.8 m of water with wreckage standing 8.2 m above the seabed. The origin of the wreck is unknown. The site was surveyed in October 1997.

Although these wrecks lie just outside the study area, their presence could be significant. Both wrecks had considerable amounts of material still present on the seabed. This indicates that the seabed environment has not caused the wrecks to break up despite the fast currents in the area and their proximity to the main shipping lane. There are only 49 charted shipwrecks in Hong Kong waters and it is significant to note that two lie close to the study area.

The UK Hydrographic Office was contacted again in June 2009 to get an update on the status of the wrecks. Both wrecks have now been cleared as they represented a possible navigation hazard. The 2009 revised chart does not show either of the wrecks.

The UKHO holds historic navigation charts of the study area. The 1907 chart is presented as Figure 09. This chart is particularly interesting as it shows the study area before any reclamation has taken place.

4.4 Geophysical survey

The detailed results of the geophysical survey are presented in Appendix B and a summary is presented below. The tables below list the details of the eight sonar contacts and five seismic contacts located during the survey

. **2009 Sonar Contact List**				
Contact number	**Easting Northing**	**Latitude Longitude**	**Dimensions (m)**	**Water Depth (mPD)**
WH2-SC001	844138.3E 817297.2N	22° 17.6746’ N 114° 15.1952’ E	0.9x1.0xnmh	-9.1
WH2-SC002	844551.0E 817378.4N	22° 17.7185’ N 114° 15.4355’ E	1.0x0.9x0.2	-10.5
WH2-SC003	844471.2E 817759.9N	22° 17.9252’ N 114° 15.3891’ E	0.4x0.9x0.1	-7.9
WH2-SC004	844471.7E 817767.3N	22° 17.9292’ N 114° 15.3894’ E	0.5x0.9x0.2	-7.9
WH2-SC005	844472.7E 817768.8N	22° 17.9300’ N 114° 15.3900’ E	0.4x0.9x0.2	-7.9
WH2-SC006	844463.9E 817768.5N	22° 17.9299’ N 114° 15.3849’ E	2.3x1.1x0.2	-7.7
WH2-SC007	844473.9E 817773.1N	22° 17.9323’ N 114° 15.3907’ E	0.7x0.9x0.2	-7.9
WH2-SC008	844465.1E 817782.0N	22° 17.9372’ N 114° 15.3856’ E	3.6x1.9xnmh	-7.9

2009 Seismic Contact List			
Contact Number	**Easting Northing**	**Latitude Longitude**	**Water Depth (mPD)**
WH2-SEI001	844026.3E 817233.4N	22° 17.6400' N 114° 15.1299' E	-9.2
WH2-SEI002	844165.3E 817367.6N	22° 17.7127' N 114° 15.2109' E	-8.5
WH2-SEI003	844211.8E 817429.9N	22° 17.7465' N 114° 15.2380' E	-8.0
WH2-SEI004	844322.3E 817376.8N	22° 17.7177' N 114° 15.3023' E	-10.2
WH2-SEI005	844202.9E 817272.7N	22° 17.6613' N 114° 15.2327' E	-8.4

A copy of the data showing each of the side scan sonar and seismic profiler contacts is presented in Appendix B.1 and B.2

The sonar contacts were plotted onto the study area in combination with the results of the 2003 geophysical survey. The results are presented as Figure 10.

Marine Deposit is up to 14m thick across the study area except along the rocky coast where it is not present.

4.5 Visual Diver Survey

The diving team successfully located all the 28 targets. They were all easily identified as being of modern origin. They ranged from the sort of tyres used as protection on HK ships and construction waste. Particularly notable, was the high volume of rock which was identical to type used on the rubble mound seawall at the back of the bay.

The linear searched along the rocky western shoreline did not locate any archaeological resources. It is a very high energy seabed environment with a large number of rocks. The divers were not able to penetrate more than 20cm into the sandy seabed so it is not possible that there are buried items.

Appendix B.3 presents a series of photographs which demonstrate the weather conditions on site. It was extremely rough due to the recent storm Ketsana. This resulted in the water being very stirred up. It was very difficult to obtain underwater photographs. Some examples of underwater photographs of the sonar contacts are shown and they are the highest quality that could be achieved in the conditions.

5. CONCLUSION

Each phase of the MAI was completed successfully**.** The Marine Archaeological Investigation covered 100% of the study area. There was no object on the seabed that indicated submerged archaeological remains. It is therefore concluded that there is no archaeological resource on the seabed within the study area.

5.1 Identification of Potential Impacts

As there is no underwater cultural resource at this location, no negative impact requiring mitigation is anticipated.

5.2 Recommendation

There is no need for any mitigation measure or further action.

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Appendix A

Guidelines for Marine Archaeological Investigation (MAI)
(As at Nov 2006)

The standard practice for MAI should consist of four separate tasks, i.e. (1) Baseline Review, (2) Geophysical Survey, (3) Establishing Archaeological Potential and (4) Remote Operated Vehicle (ROV)/Visual Diver Survey/Watching Brief.

(1) Baseline Review

1.1 A baseline review should be conducted to collate the existing information in order to identify the potential for archaeological resources and, if identified, their likely character, extent, quality and value.

1.2 The baseline review will focus on known sources of archive data. It will include:

a. Geotechnical Engineering Office (GEO) – the Department holds extensive seabed survey data collected from previous geological research.

b. Marine Department, Hydrographic Office - the Department holds a substantial archive of hydrographic data and charts.

c. The Royal Naval Hydrographic Department in the UK – the Department maintains an archive of all survey data collected by naval hydrographers.

1.3 The above data sources will provide historical records and more detailed geological analysis of submarine features which may have been subsequently masked by more recent sediment deposits and accumulated debris.

(2) Geophysical Survey

2.1 Extensive geophysical survey of the study area should deploy high resolution boomer, side scan sonar, an echo sounder and high resolution multi beam sonar. The multi beam data must be presented as processed digital terrain models to facilitate the archaeological analysis. The data received from the survey would be analysed in detail to provide:

a. Exact definition of the areas of greatest archaeological potential.

b. Assessment of the depth and nature of the seabed sediments to define which areas consist of suitable material to bury and preserve archaeological material.

c. Detailed examination of the boomer and side scan sonar records to map anomalies in and on the seabed which may be archaeological material.

d. Detailed examination of the multi beam sonar data to assess the archaeological potential of the sonar contacts.

(3) Establishing Archaeological Potential

3.1 The data examined during Task 1 and 2 will be analysed to provide an indication of the likely character and extent of archaeological resources within the study area. This would facilitate formulation of a strategy for investigation.

3.2 The results would be presented as a written report and charts. If there is no indication of archaeological material there would be no need for further work.

3.3 Charts should be presented at 1:500 scale and show each survey contact. Its dimensions and exact location should also be shown.

(4) Remote Operated Vehicle (ROV)/Visual Diver Survey/Watching Brief

4.1 Subject to the outcome of Task 1, 2 and 3, accepted marine archaeological practice would be to plan a field evaluation programme to acquire more detailed data on areas identified as having archaeological potential. The areas of archaeological interest can be inspected by ROV or divers. ROV or a team of divers with both still and video cameras would be used to record all seabed features of archaeological interest.

4.2 Owing to the heavy marine traffic in Hong Kong, the ROV/visual diver survey may not be feasible to achieve the target. If that is the case, an archaeological watching brief is the most appropriate way to monitor the dredging operations in areas of identified high potential to obtain physical archaeological information.

4.3 A sampling strategy for an archaeological watching brief would be prepared based on the results of Task 1, 2 and 3 to focus work on the areas of greatest archaeological potential. Careful monitoring of the dredging operations would enable immediate identification and salvage of archaeological material. If archaeological material is found, the AMO should be contacted immediately to seek guidance on its significance and appropriate mitigation measures would be prepared.

4.4 If Task 4 is undertaken, the results would be presented in a written report with charts.

Report

Three copies of the final report should be submitted to the AMO for record.

APPENDIX B: Marine Geophysical Survey

1. Survey Objectives

The survey was planned to optimise the acquisition of data for the MAI and Site Investigation. The table below lists the techniques used:

METHOD	OBJECTIVE
Echo sounding and swath survey	To measure sea bed levels in detail and for archaeological analysis
Marine seismic profiling survey	To establish seabed stratigraphy and the geological succession over the survey area
Marine side scan sonar survey	To find objects at or above the seabed with archaeological potential.

The survey was carried out under the Geophysical Survey Term Contract Works Order No. GE/2007/04.27 dated 11th June 2009 issued by Civil Engineering and Development Department.

The survey was carried out during the period of 26th and 30th June 2009.

2. Equipment List

The following equipment was mobilised onboard WH2, a Class IV commercially licensed vessel.

Equipment	Qty
C-Nav GcGPS	1
The EGS computerised navigation package v1.2 and PC	1
Knudsen echo sounder	1
The Reson 8125 multibeam system	1
Swath PC	1
Boomer	1
Hydrophone	1
EGS TVG console	1
Waverley recorder	1
Klein 2000 Side Scan Sonar system with digital tow fish	1
TSS Gyro compass	1
TSS 320B heave motion compensator (SBES)	1
Valeport velocity profiler	1
TSS DMS 3-05 heave motion compensator	1

Echo sounding survey over the shallow water area was conducted with a speed boat where GPS and echo sounder only were mobilized.

Equipment	Qty
C-Nav GcGPS	1
The EGS computerised navigation package v1.2 and PC	1
Odom echo sounder	1
Kundsen echo sounder	1

3. Location Control

The survey vessel was located with a Globally Corrected Global Positioning System (GcGPS) unit called C-Nav. The system provides corrected positions to an accuracy of +/- 0.3m without the need for a shore-based transmitting system.

4. Computerised Navigation

The EGS 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
GcGPS diagnostics enabling quality control

Other information displayed for the assistance of the hydrographic surveyor includes, course, speed, fixing status, and coordinates on the Hong Kong Metric Grid.

5 Calibration, Accuracy and Quality Assurance

The positioning system was calibrated by checking the co-ordinates displayed by the navigation system at the previously co-ordinated point located at the Yau Ma Tei typhoon shelter and Kowloon Bay Jetty.

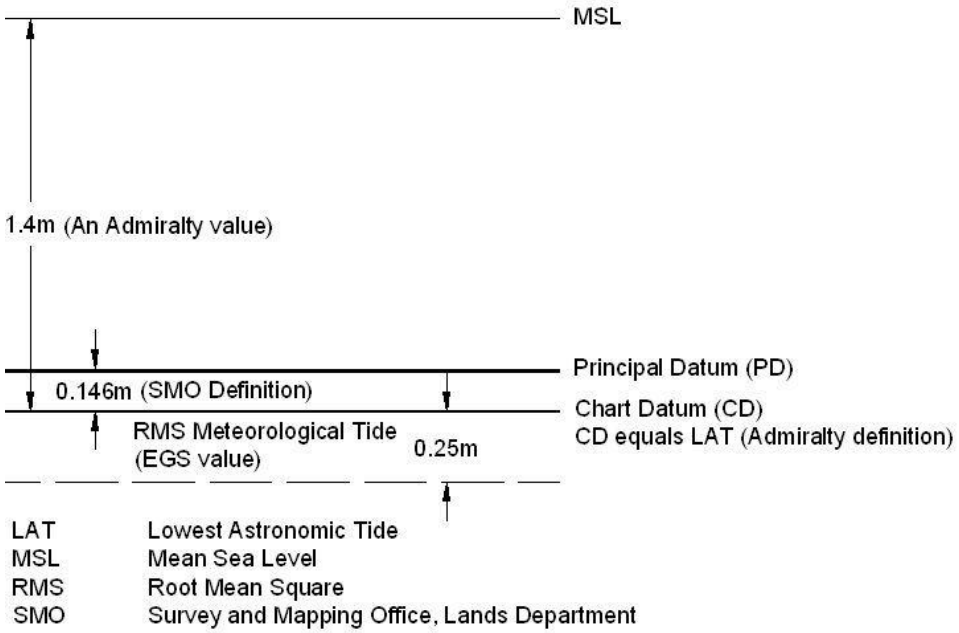
Carrying out the above quality assurance checking procedure ensured an accuracy of +/-1m or better.

6. Tide Data

Tidal measurements were recorded at Tung Lung Island and tidal data collected were used to reduce all echo sounding data to Principal Datum, Hong Kong (PD).

7. Datums

The datums in use or implied in Hong Kong are as follows:



8. Utilization of Tidal Measurements

Based on the relationship between datums mentioned above, tide data collected at Tung Lung Island was used to reduce all observations to Principal Datum, Hong Kong (PD).

9. Operating System on Board the Survey Vessels and in the Office

EGS has developed the C-View operating and interpretation software package. This system was installed on the survey vessels and in the office.

10. Field Procedures

11. Survey Vessels

The single and multi beam echo sounding, seismic reflection survey and side scan sonar survey were carried out from a Class IV survey vessel, MV Wing Hung 2.

Wing Hung 2, Class IV commercially licensed survey vessel

Echo sounding survey was carried out using the small speedboat as shown in the picture below.

Wing Hung 2, Class IV commercially licensed survey vessel

The speedboat used for echo sounding survey

12. Coverage

Survey Type	**Survey Spacing (m)**
Swath	20 x 100
Echo Sounding	10 x 50
Seismic and Side Scan Sonar	40 x 100

13. Swath (Multibeam) Bathymetry

14. Arrangement of Swath Equipment on Board

Seabed level observations were made with a multi beam echo sounder system with the transducers mounted over the starboard side of the survey vessel. The GcGPS antenna was mounted directly above the transducers and as such the swath transducer acted as the datum for the survey vessel.

Illustrations of swath bathymetry systems

The transducer of the swath system

15. Principle

The swath system is a multibeam echo sounder (MBES). Instead of transmitting a single vertical pulse, which provides a record of water column thickness beneath the vessel track, the swath measures the same type of data over a 'fan' on both sides of the vessel.

16. Calibration

For errors to be avoided, the MBES system requires careful calibrations. A potential source of error relates to the speed of sound in water; the MBES system requires the speed of sound be measured through the water column, and for these data to be entered into a file which is accessed by the MBES acquisition and processing software. In addition, due to the fact that the speed of sound can vary significantly near the sea surface, a speed velocity probe is installed at MBES transducer so that measurements are recorded at all times during the survey and the corresponding corrections can be made within the MBES system in real-time.

In addition, a patch test is required to calibrate system components, as follows:

17. Navigation Delay

A survey line is set exactly over a well-defined feature, such as a rock outcrop, a significant slope or a man-made structure. The line is run twice in the same direction, once at the slowest possible speed and once at the highest speed.

18. Pitch Offset

A survey line is set exactly over a well-defined feature. The line is run in opposite directions at the same speed.

19. Roll Offset

A survey line is set over an area with a flat and featureless seabed. The line is run in opposite directions at the same speed.

20. Yaw (Heading) Offset

Two parallel lines are set to either side of a well-defined feature with the feature positioned in the middle of the two lines. The off-track distance between the feature and the lines are selected according to water depth and the fan width of the MBES system, so that the feature will be detected at the outer part of sounding "fan". The lines are run in the same direction at the same speed; once passing the feature to Port and once to Starboard.

By applying appropriate algorithms to match the apparent differences in the positions of the selected feature and the seabed topography measured in the calibration line, these calibration factors can be determined. They are then entered into the acquisition system to correct the seabed level measurements in real-time.

21. Side Scan Sonar Survey

Prior to the commencement of survey the side scan sonar system was wet tested to ensure the system was working correctly.

The side scan sonar tow fish was towed behind the vessel at a depth of about 1-4m beneath the sea surface, to ensure sufficient data coverage.

Klein 2000 was used in the side scan sonar survey

The recording parameters for the side scan survey were as follows:

- Vessel speed: 1.5 – 2.2 m/sec
- Fix interval: 10 seconds
- Source frequency: 100 kHz and 500 kHz
- Pulse length: 25 *u*s
- Gain setting: Manually controlled
- Slant range: 50m

All data was logged to the C-View SDMP where two channels (100kHz port and starboard; 500kHz port and starboard) were simultaneously recorded with navigation, fix, vessel heading, cable out angle and length, fish heading, water depth.

Detailed log sheets were recorded with unique survey line number, start fix and end fix of each survey line, roll number, range, frequency and cable out value and angle. The corresponding C-View data file name was also recorded in these log sheets.

22. Seismic Reflection Survey

Prior to the commencement of survey the EGS boomer was wet tested to ensure the system was working correctly. The EGS boomer was towed from the stern of the survey vessel, at a distance of 18m such that noise from the survey vessel was kept to a minimum.

The recording parameters for the seismic reflection survey were as follows:

- Vessel Speed: 1.5 – 2.2m/sec
- Fix Interval: 10 seconds
- Sweep: 80ms (paper)
- Delay: 10ms
- Gain setting: manually controlled

	
Seismic acquisition and printing system	The EGS boomer and hydrophone were towed astern of the vessel for sub-bottom seismic profiling

23. Site Safety

Safety was generally in accordance with the 'Marine Geophysical Operations Safety Manual' (International Association of Geophysical Contractors, Ninth Edition, 2004).

24. Quality Assurance

Quality was assured by adopting the measures set out in the EGS ISO9001 Quality Handbook.

25. RESULTS

Reduction of Observations and Interpretation

Sounding and Swath (Multibeam) Data

For echo sounding data, the influence of wave action was corrected in real time by a heave motion compensator. The sounding data was then reduced to levels below Principal Datum (PD) using the measured tide levels.

Tidal correction and filters were applied before the swath data sets were edited manually. Judgement was required at this stage, to identify small features which were real reflections from low-level noise; for guidance, two or more mutually consistent soundings which were higher or lower than the general sea bed level were accepted, especially if the same anomalous soundings were present on separate survey traverses.

Gridded sounding selection was used for engineering purposes. The selection procedures for this project were as follows:

The processed data were gridded on to both 1m and 2m spacing datasets. The 1m gridded dataset has been presented here as En, Nn, Zn, in ASCII format on disc. During the gridding process, median sounding values were used

These gridded data were then plotted at a spacing of 6mm at the charting scale, to provide a sounding plan for the whole area surveyed

This gridded plot was contoured using the 2m spacing dataset and coloured using 'C-View Bathy' processing and charting software, to provide the sounding plans

26. Side Scan Sonar Data

Processing and interpretation of side scan sonar data was carried out using the C-View interpretation software. All features were individually marked or grouped into regions using on- screen digitising. All offsets and laybacks were applied to the C-View system. The 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.

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

- Seafloor with rock outcrops
- Disturbed seafloor with dumped materials
- Seafloor with cobble and boulders
- Seafloor with mega ripples
- Seafloor with scars
- Seafloor with possible construction debris
- Rubble mound seawall

The results have been recorded in summary charts extracted from the Contractors Survey Report as follows and presented with this report.

27. Contoured Sounding Plan Figures 3.1 and 3.2

The most obvious features on the sounding plan are the rock outcrops located near the steep shoreline. The rock outcrops are generally more than 0.5m high. There is also evidence of dumped materials with a maximum height of 2.3m.

The seabed varies between 0m PD and –11.0m PD within the survey area.

28. Sea bed Features Figures 4.1 and 4.2

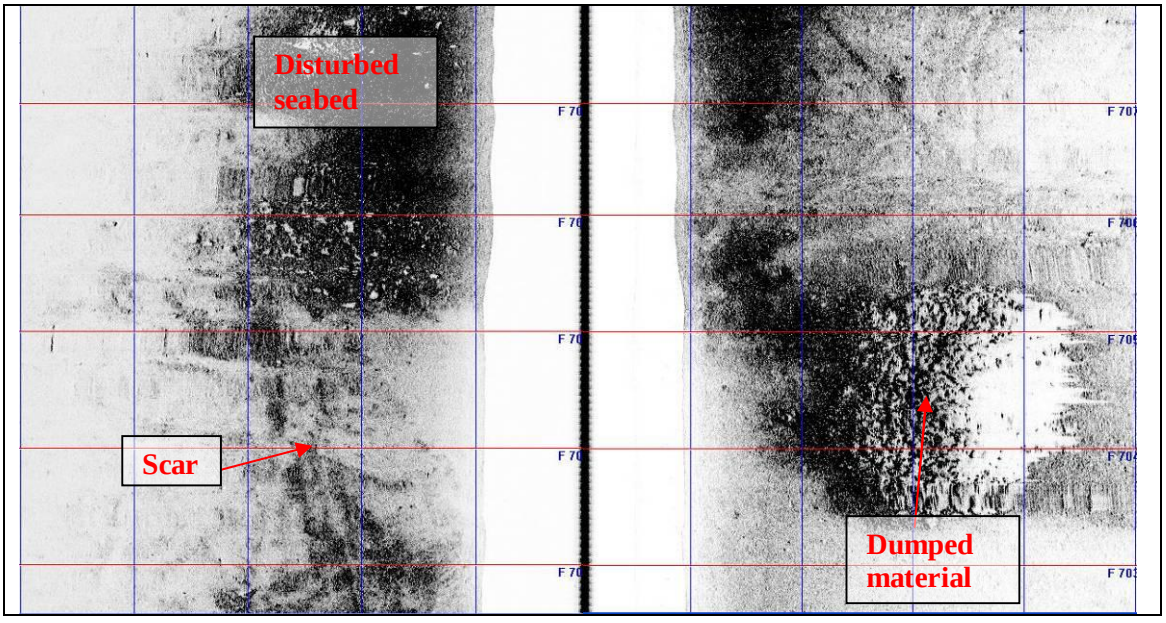
As shown on the drawings, the survey area is mainly covered with soft sediments. Rock outcrops were observed close to shore in the northwest of survey area. Mega ripples were found near the shore.

The seabed was largely disturbed by dumping activities, especially in the northwest boundary.

In the east boundary of the survey area, away from the rocky shore, the seabed is furrowed with numerous scars.

Eights sonar contacts, WH2-SC001 to WH2-SC008 were found from the survey. Copies of the data showing each contact are presented in Appendix B.1

Examples of side scan images are shown below for reference.



29. Interpretation of the Geological Succession

The interpretation of the seismic records sought to quantify the following four elements of the offshore geological succession:

FORMATION	EVENT
Sea bed	N/A
Marine Deposits of Holocene age (Hang Hau Formation)	The base of these deposits occurred during the last ice age

Alluvium (Chek Lap Kok Formation; mainly coarse sediments with gravels)	Up to four ice ages occurred during the Pleistocene
The top of rock in some state of decomposition (Jurassic-Cretaceous age)	N/A
Grade III rock	N/A

Marine Deposits are generally soft or very soft clays or silts, and as such are readily identifiable on seismic records as a clear conformable horizon sometimes with an unconformity represented by a desiccated layer or by local re-working of deposits by dumping activities and the water currents regime.

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 rocky shorelines.

Interpretation was carried out as follows:

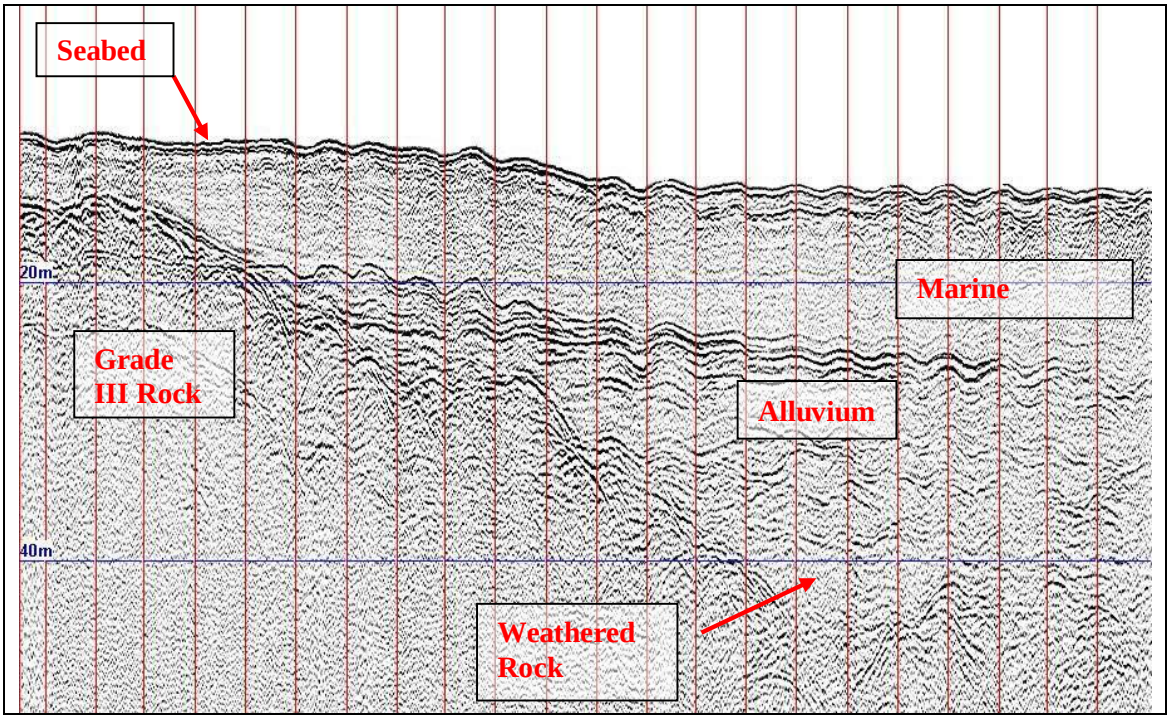
The seismic horizons were selected for interpretation in accordance with the list above, and drawn on copies of the seismic records during preliminary interpretation

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

Here is an example of the seismic data from the survey.



30. Geology and Borehole Correlation

General Marine Geological Succession

Previous investigations have revealed the following general succession for Hong Kong:

----------	Sea bed (Figures 3.1 and 3.2)
Marine Deposits (Very soft/soft silty CLAY, sometimes SANDY at the base or near the shorelines)	
----------	Base of Marine Deposits (Figures 5.1 and 5.
Alluvium (Soft/firm silty sandy CLAY/ compact/dense silty fine SAND sometimes with gravel)	
----------	Tope of Variably Decomposed Rock (Figures 6.1 and 6.2)
Decomposed ROCK (Firm/stiff silty fine/coarse SAND, fine sandy clayey SILT)	
----------	Top of Grades II/III Rock (Figures 7.1 and 7
Grades II/III ROCK	
----------	

31. Marine Deposits — Figures 5.1, 5.2 and 8.1, 8.2

The drawings illustrate level variations at the base of the Marine Deposits.

The thickness of Marine Deposits is generally thin or missing close to the rock outcrop area; and gets thicker away from the shore. The maximum thickness of Marine Deposits over the survey area is about 14-15m.

Five unknown objects within Marine Deposits were recognised; details of the contacts are included in Appendix B. 2. This area used to be used as a shipyard – it is possible that these obstructions are associated with steel dropped into this water and settled into the sediments.

32. Alluvium — Figures 6.1, 6.2 and 9.1, 9.2

Figure 6 shows the level on the top of rock in any state of decomposition, equivalent to the base of Alluvium where present. The surface is varying and reaches to around -40m below PD at the east of the survey boundary.

Isopachs of Alluvium are presented on Figures 9.1 and 9.2. The survey results show that alluvium is missing near the rock outcrop areas. It gets thicker away from the shore with the maximum thickness of 14m.

33. Rock in Any State of Decomposition — Figures 7.1, 7.2 and 10.1, 10.2

The level variation of the base of rock in any state of decomposition corresponds to the top of moderately decomposed rock. This horizon is presented in Figures 7.1 and 7.2.

Rock in any state of decomposition is missing in most of the survey area, as shown in Figures 10.1 and 10.2. It is appeared in the southwest, north and east boundaries of the survey area. The maximum thickness of rock in any state of decomposition is about 15m in the southwest boundary.10

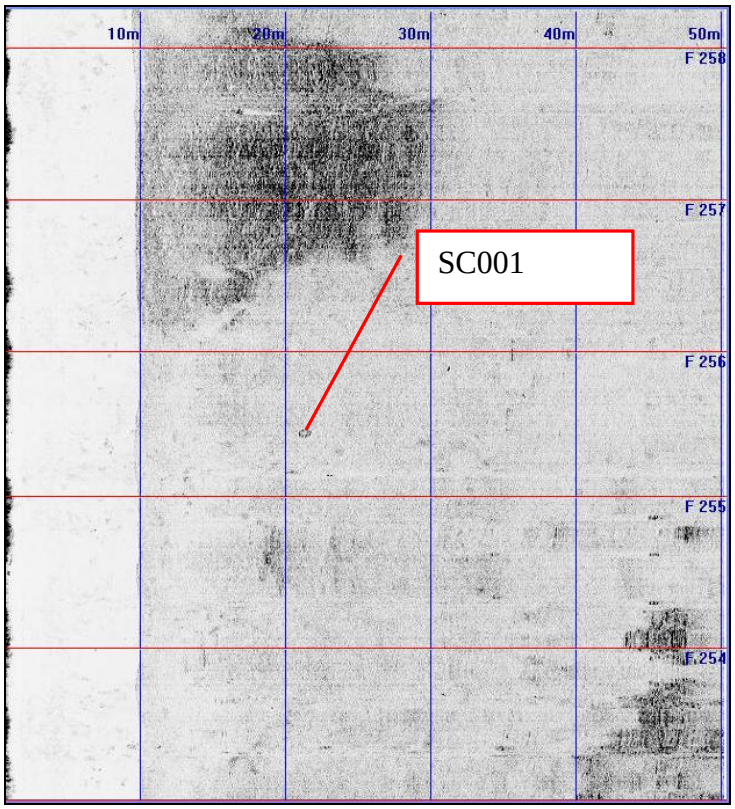
34. Estimates of Accuracy

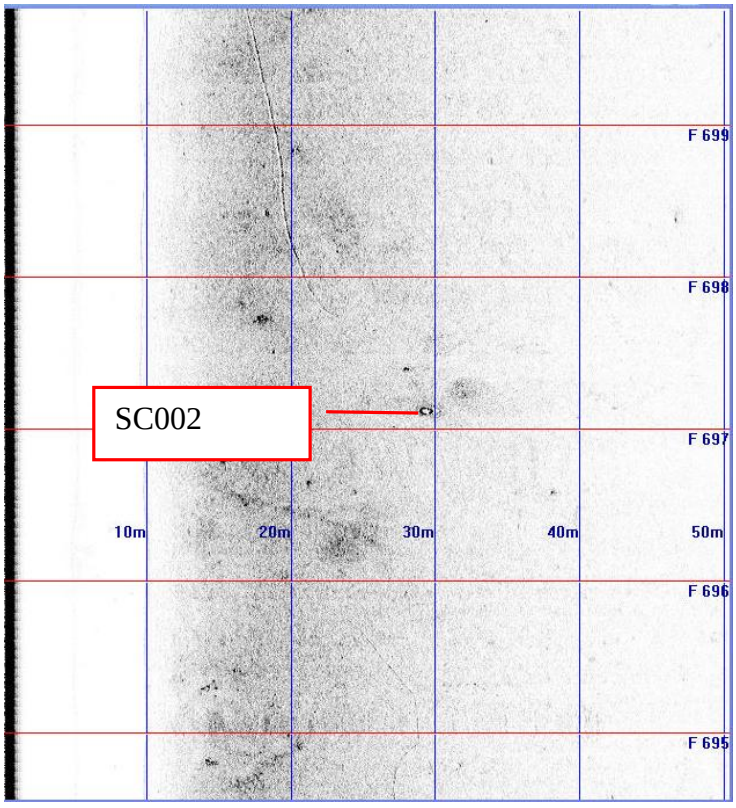
The following estimates of accuracy would seem to be appropriate in this case:

Sounding	+/- 0.15m
Base of Marine Deposits	+/- 1 m
Top of Rock in Any State of Decomposition	+/- 2 m
Top of Grade III, II Rock	+/- 5 m

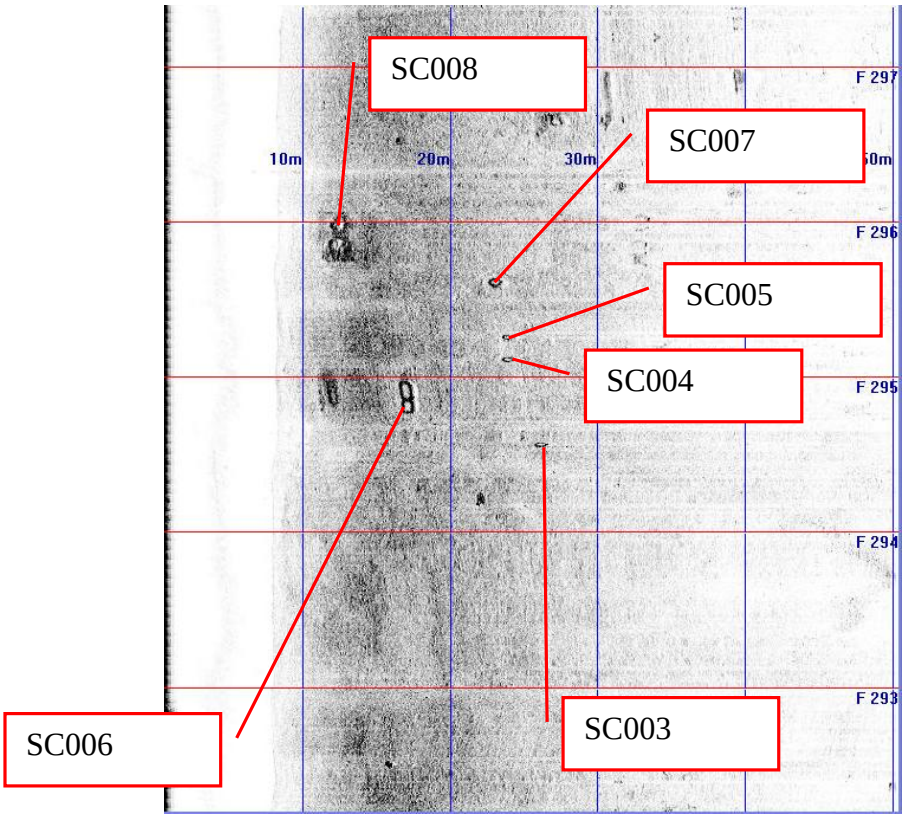
The results of 8 drillholes and 2 vibrocores were used for seismic data correlation.

Appendix B.1 Images of Side Scan Sonar Contacts

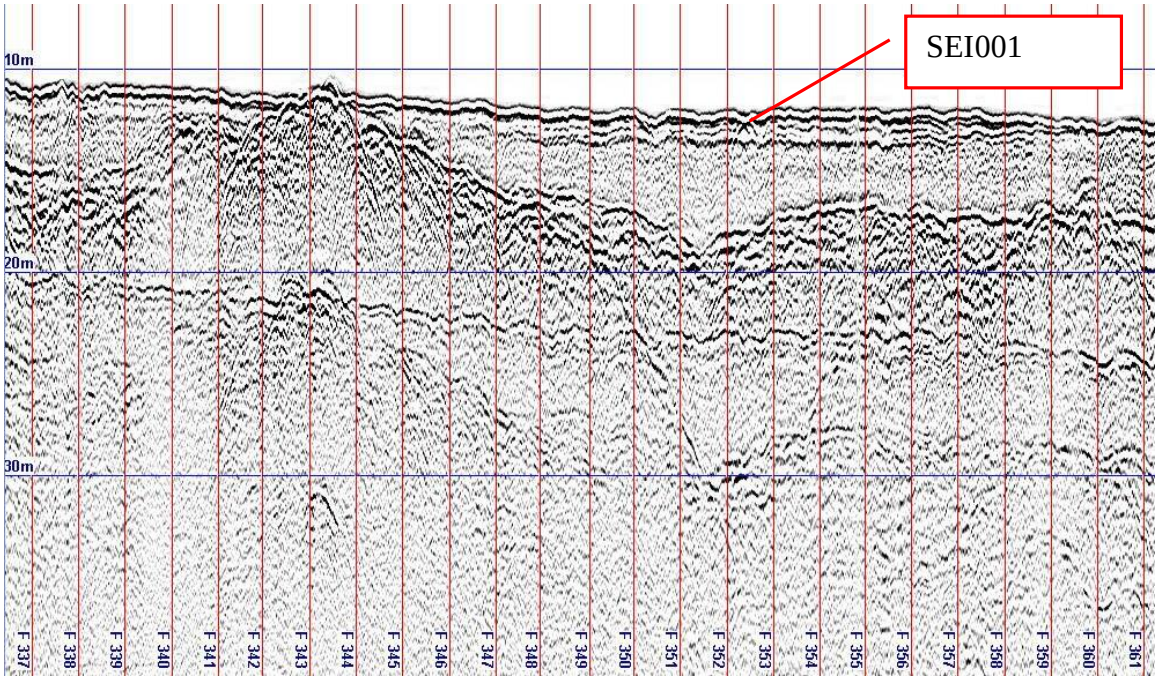


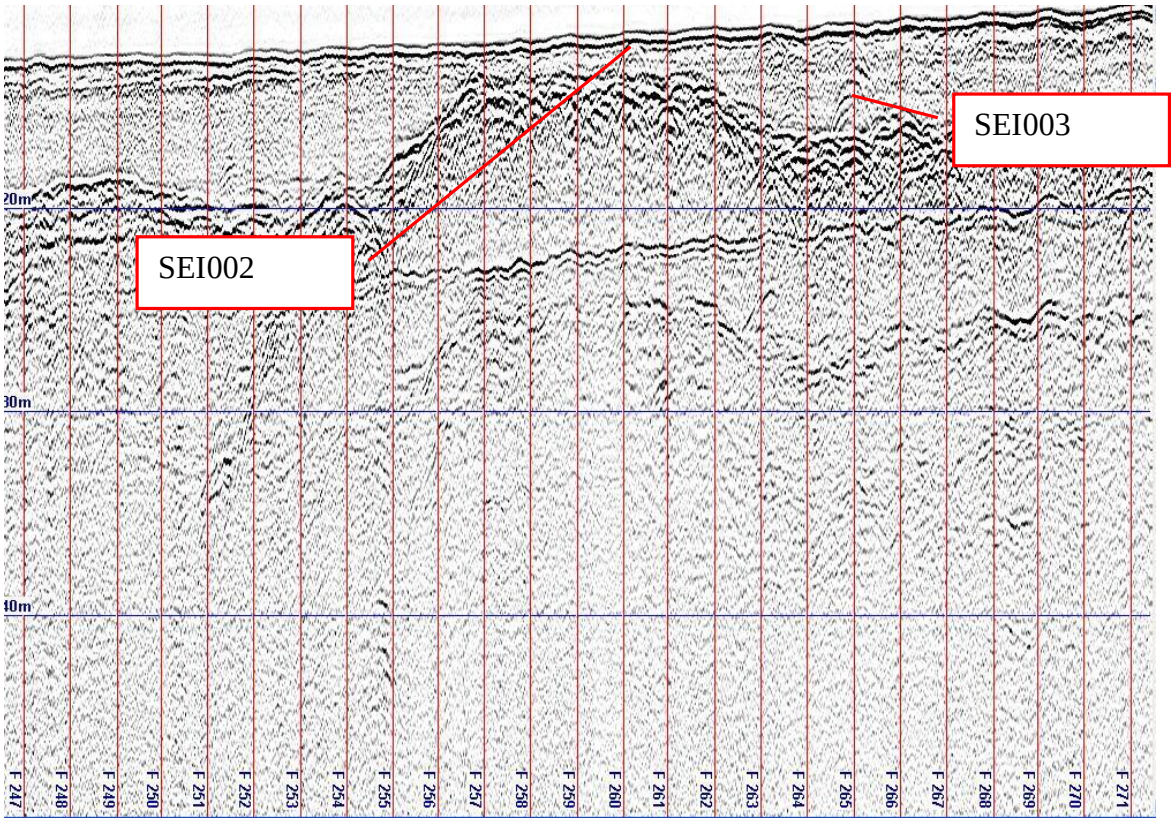


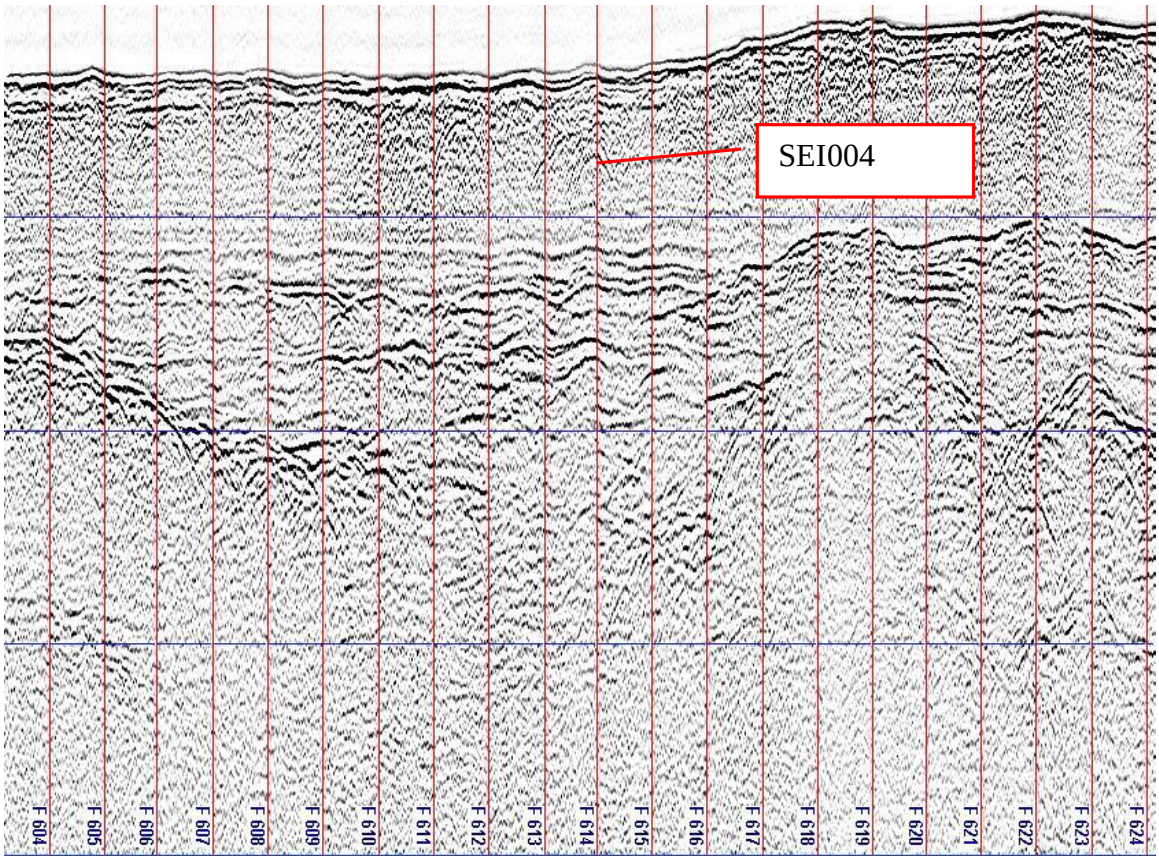
Appendix B.1 Side Scan Sonar Images of Sonar Contacts



Appendix B2: Seismic profiler data images






SEI004
F 604
F 605
F 606
F 607
F 608
F 609
F 610
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F 612
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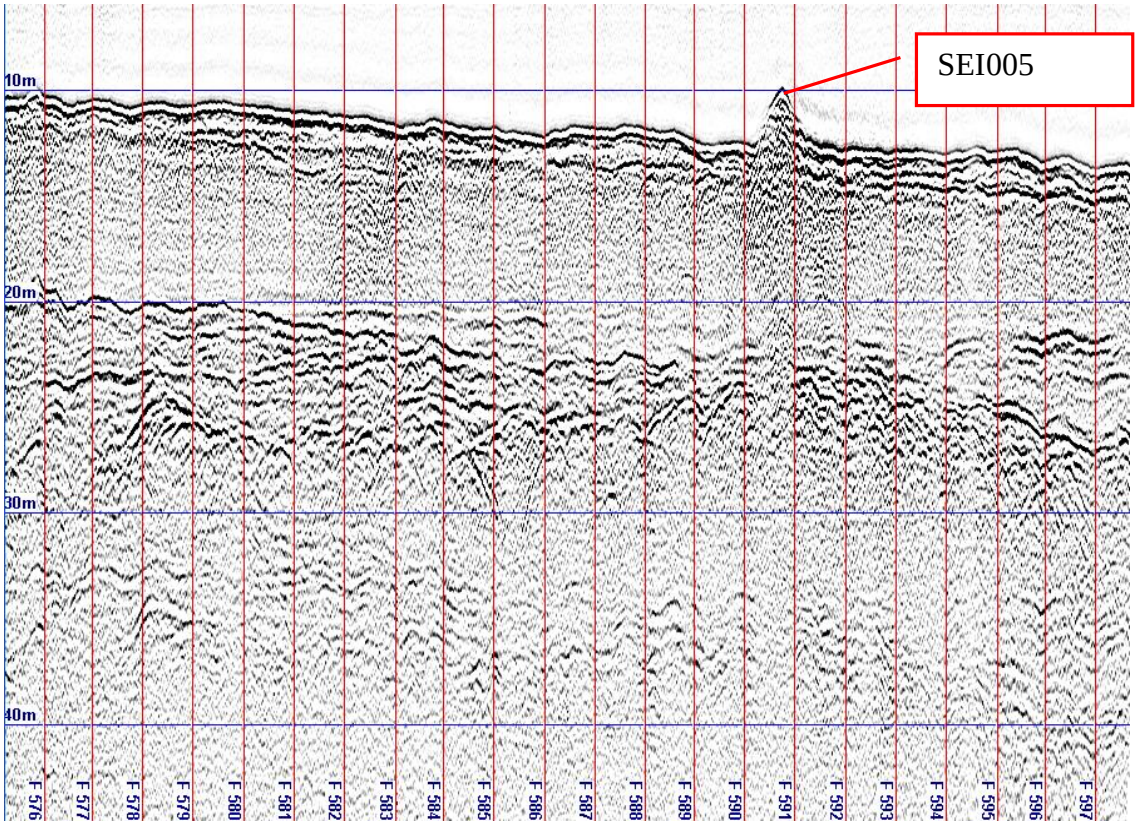
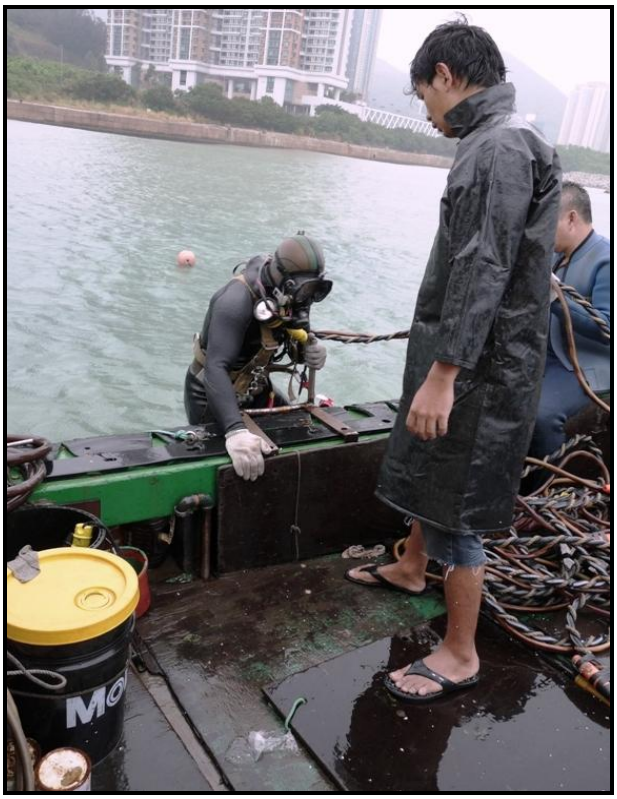
F 614
F 615
F 616
F 617
F 618
F 619
F 620
F 621
F 622
F 623
F 624


SEI005
10m
20m
30m
40m
F 576
F 577
F 578
F 579
F 580
F 581
F 582
F 583
F 584
F 585
F 586
F 587
F 588
F 589
F 590
F 591
F 592
F 593
F 594
F 595
F 596
F 597

Appendix B3: Underwater photographs of diver inspection and underwater sonar contacts.

Figures 1 -4: Stormy weather on site between 27th -29th September 2009.



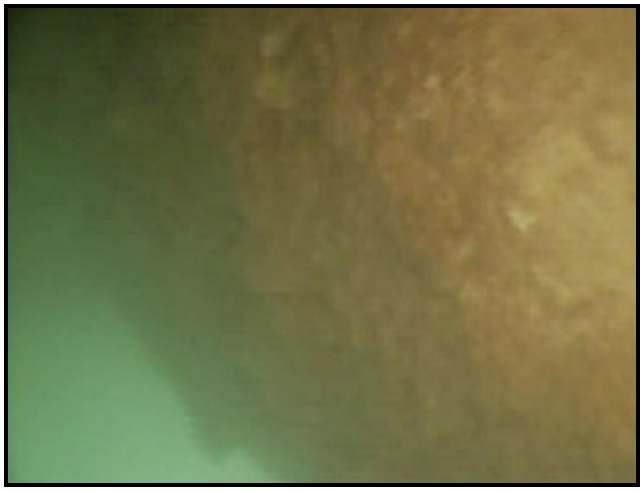


Figure 5: Underwater Photograph showing Sonar Contact SC001, modern building rubble

Figure 6: Underwater Photograph showing Sonar Contact SC003, modern building rubble

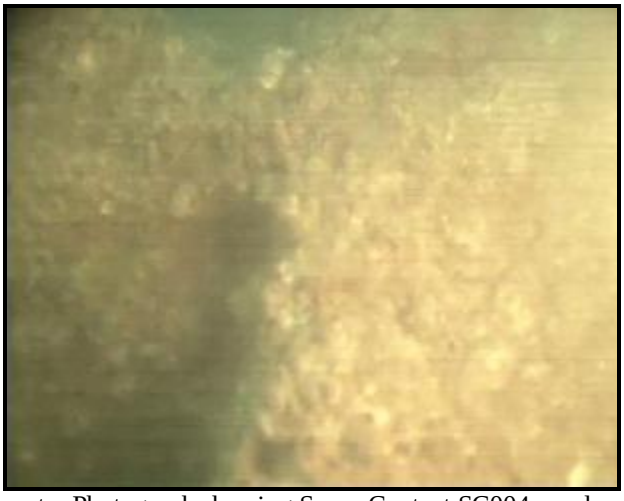


Figure 7: Underwater Photograph showing Sonar Contact SC004, modern building rubble

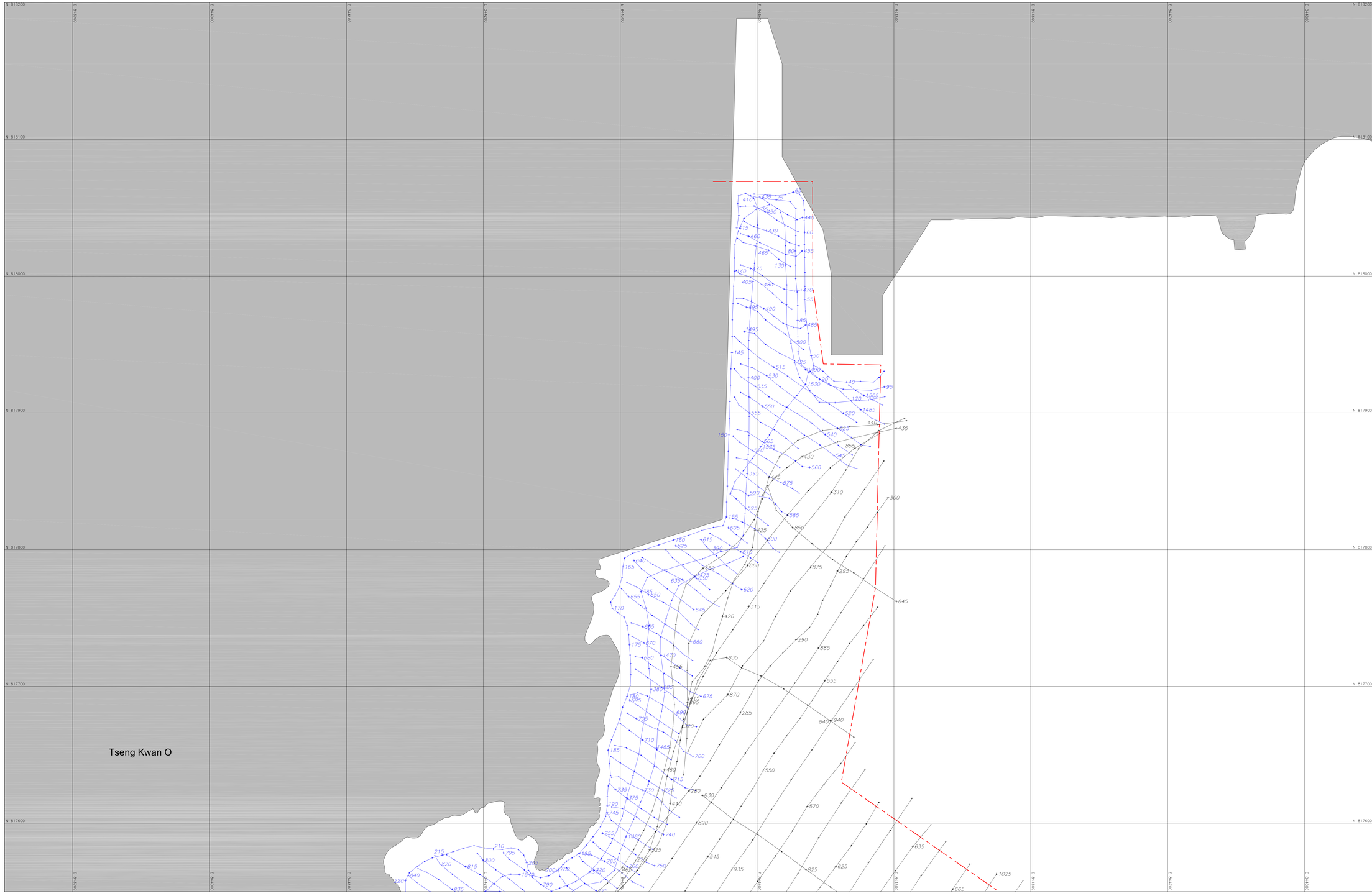
Figure 8: Underwater Photograph showing Sonar Contact SC006, modern building rubble

Figure 9: Underwater Photograph showing Sonar Contact SC002, a tyre heavily encrusted with marine growth.

Figure 10: Modern building rubble retrieved at the location of SC003 and brought to the surface for validation.

Figure 11: An example of the poor photography which was a consequence of the high turbidity following the recent hurricane Ketsana.

Appendix B4
Chart Figures



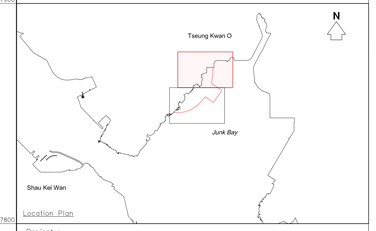
N

Legend :

650 Echo sounding track with fix positions

330 Swath bathymetry track with fix positions

Survey boundary



Location Plan

Project :

WORKS ORDER NUMBER GE/2007/04.27
AGREEMENT NO. CE 42/2008 (CE)
TSEUNG KWAN O - LAM TIN TUNNEL AND ASSOCIATED WORKS -
FIRST STAGE G.I. REQUEST FOR GEOPHYSICAL SURVEY
AT WEST COAST OF TSUENG KWAN O

FIGURE NUMBER : 1.1

Drawing Title :

SWATH BATHYMETRY AND ECHO SOUNDING TRACK PLOTS

Notes :

1. Survey Date : 25–26th June, 2009
2. Survey Grid : Hong Kong Metric Grid
3. Survey Datum : Hong Kong Principle Datum
4. Positioning : C–Nav GcGPS (Globally corrected GPS)
5. Equipment : EGS Boomer System
   Reson 8125 Multibeam Echo Sounder
   Knudsen 320M Dual Frequency Echo Sounder
   Odom Echo Sounder
   Klein 2000 Side Scan Sonar System
6. Coastline taken from 1:1,000 Survey Sheets, Survey and Mapping Office, Lands Department

Revision No.	Date	Drawn by	Checked by	Approved by	Remarks
0	09/07/2009	Clarence Siu	W L Lam	Margie Chen	Preliminary

METRIC SCALE 1:1,000

50 40 30 20 10 0 50 100

Client :

CEDD Civil Engineering and Development Department

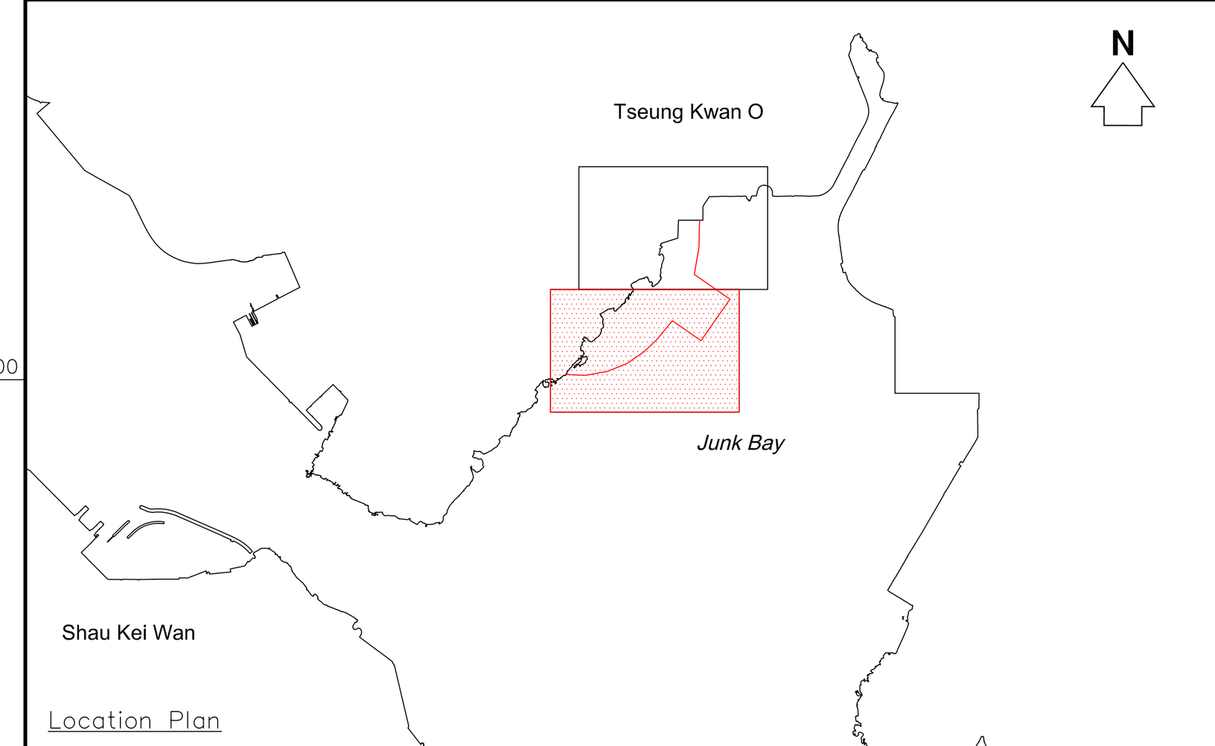
Surveyor :

EGS (ASIA) LIMITED
N.P. SOUTH, SUNBEST HOUSE,
TAKOO PLACE, 979 KING'S ROAD,
QUARRY BAY, HONG KONG
Tel: (852) 28948823
Fax: (852) 25763590
Web: www.egsasia.com

JOB NO. : HK216609

Legend :

- Echo sounding track with fix positions
- Swath bathymetry track with fix positions
- Survey boundary



Project :

WORKS ORDER NUMBER GE/2007/04.27
AGREEMENT NO. CE 42/2008 (CE)
TSEUNG KWAN O - LAM TIN TUNNEL AND ASSOCIATED WORKS -
FIRST STAGE G.I. REQUEST FOR GEOPHYSICAL SURVEY
AT WEST COAST OF TSUENG KWAN O

FIGURE NUMBER : 1.2

Drawing Title :

SWATH BATHYMETRY AND ECHO SOUNDING TRACK PLOTS

Notes :

1. Survey Date : 25–26th June, 2009
2. Survey Grid : Hong Kong Metric Grid
3. Survey Datum : Hong Kong Principle Datum
4. Positioning : C–Nav GcGPS (Globally corrected GPS)
5. Equipment : EGS Boomer System
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METRIC SCALE 1:1,000

50 40 30 20 10 0 50 100

Client : Civil Engineering and Development Department

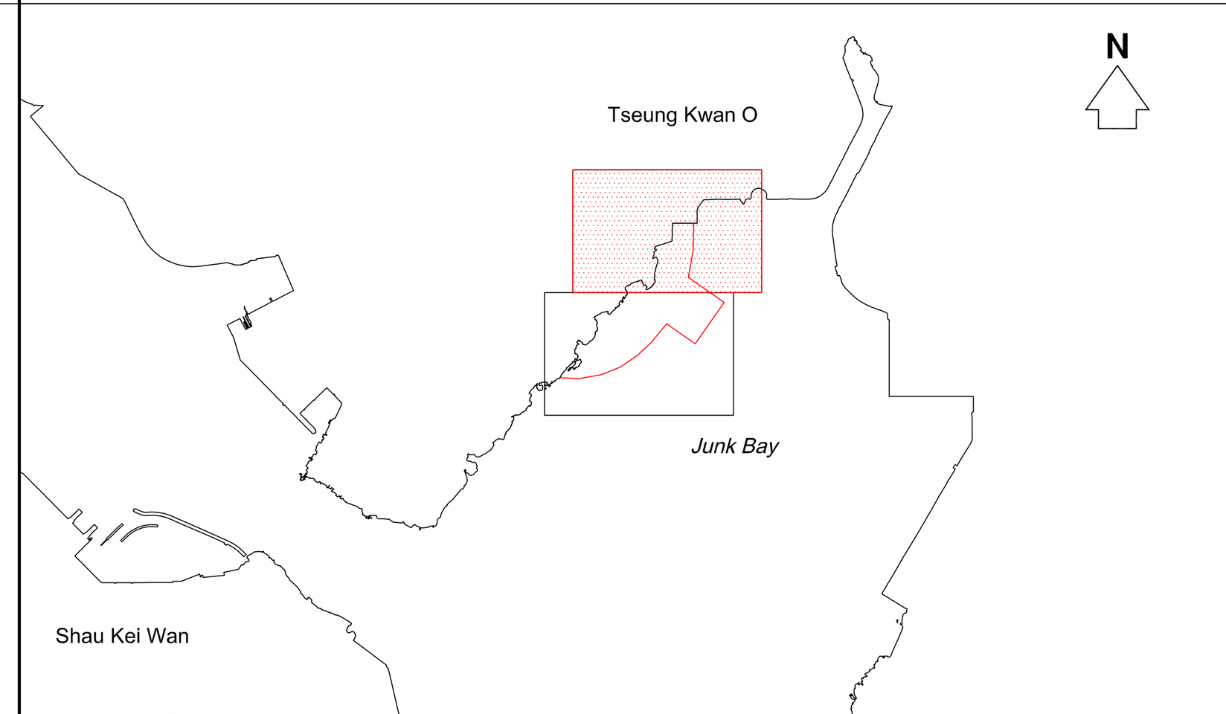
Surveyor : EGS (ASIA) LIMITED
9/F SOUTH, SOMERSET HOUSE,
TAIKOO PLACE, 979 KING'S ROAD,
QUARRY BAY, HONG KONG
Tel: (852) 28948622
Fax: (852) 25763590
Web: www.egssurvey.com

EARTH SCIENCES & SURVEYING

JOB NO. : HK216609

Legend :

225 E1000	Hydrophone and side scan sonar track with fix positions and line number
— · —	Survey boundary



Location Plan

Project :

WORKS ORDER NUMBER GE/2007/04.27
AGREEMENT NO. CE 42/2008 (CE)
TSEUNG KWAN O - LAM TIN TUNNEL AND ASSOCIATED WORKS - FIRST STAGE G.I. REQUEST FOR GEOPHYSICAL SURVEY AT WEST COAST OF TSUENG KWAN O

FIGURE NUMBER : 2.1

Drawing Title :

SEISMIC AND SIDE SCAN SONAR TRACK PLOTS

Notes :

1. Survey Date : 25–26th June, 2009
2. Survey Grid : Hong Kong Metric Grid
3. Survey Datum : Hong Kong Principle Datum
4. Positioning : C–Nav GcGPS (Globally corrected GPS)
5. Equipment : EGS Boomer System
   Reson 8125 Multibeam Echo Sounder
   Knudsen 320M Dual Frequency Echo Sounder
   Odom Echo Sounder
   Klein 2000 Side Scan Sonar System
6. Coastline taken from 1:1,000 Survey Sheets, Survey and Mapping Office, Lands Department

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0	09/07/2009	Clarence Siu	W L Lam	Margie Chen	Preliminary

METRIC SCALE 1:1,000

50 40 30 20 10 0 50 100

Client :

Civil Engineering and Development Department

Surveyor :

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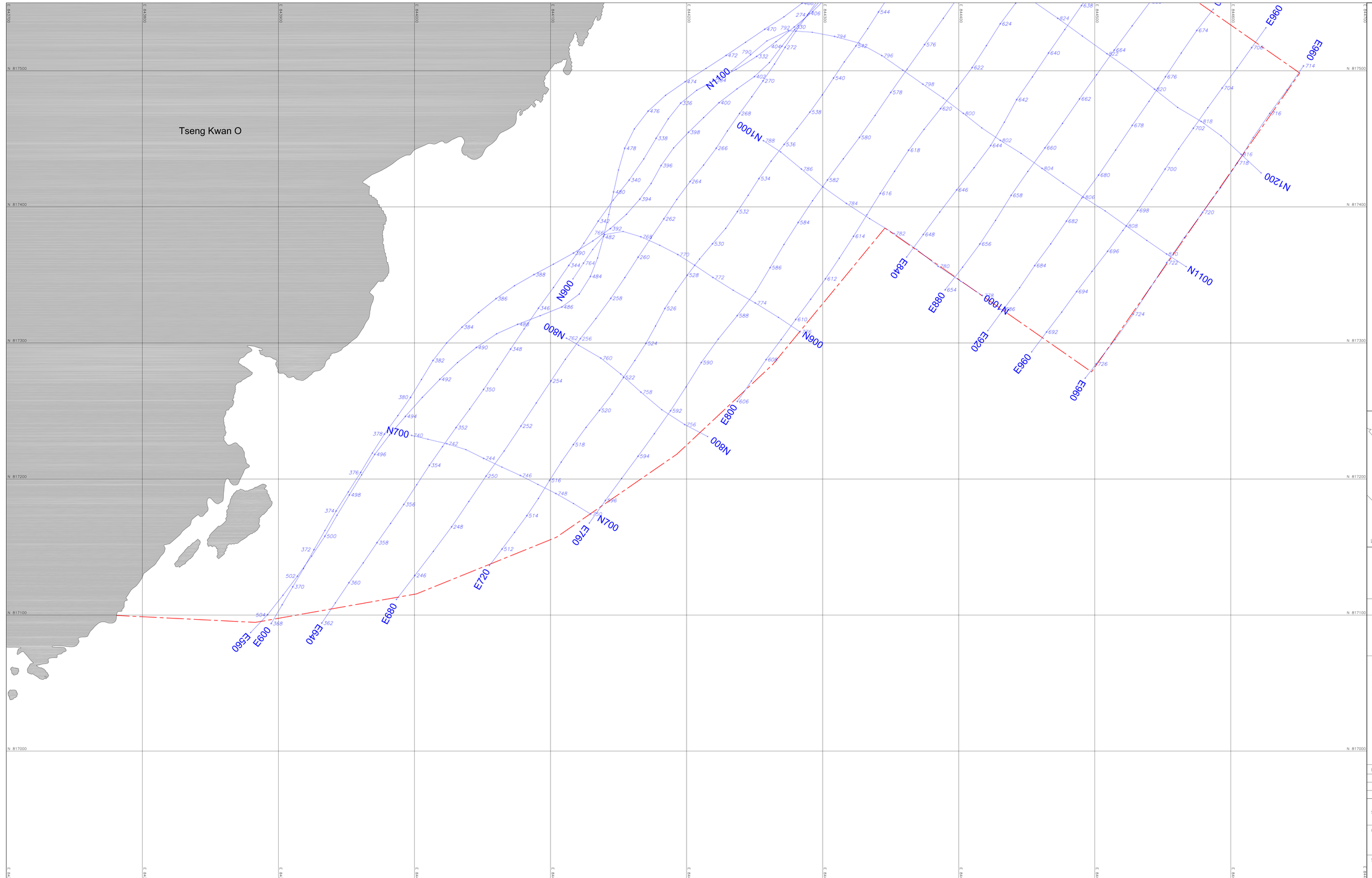
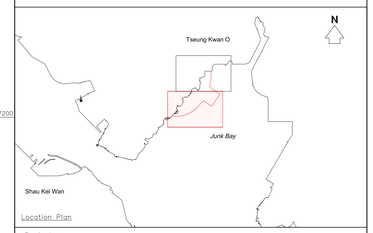
JOB NO. : HK216609



Legend :

225 E1000 — Hydrophone and side scan sonar track with fix positions and line number

Survey boundary



Location Plan

Project :

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AGREEMENT NO. CE 42/2008 (CE)
TSEUNG KWAN O - LAM TIN TUNNEL AND ASSOCIATED WORKS -
FIRST STAGE G.I. REQUEST FOR GEOPHYSICAL SURVEY
AT WEST COAST OF TSUENG KWAN O

FIGURE NUMBER : 2.2

Drawing Title :

SEISMIC AND SIDE SCAN SONAR TRACK PLOTS

Notes :

1. Survey Date : 25–26th June, 2009
2. Survey Grid : Hong Kong Metric Grid
3. Survey Datum : Hong Kong Principle Datum
4. Positioning : C-Nav GcGPS (Globally corrected GPS)
5. Equipment : EGS Boomer System
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   Odom Echo Sounder
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METRIC SCALE 1:1,000

50 40 30 20 10 0 50 100

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Fax: (852) 28948833
Web: www.egsasia.com

JOB NO. : HK216609

Legend :

Gridded sounding data in metres below HKPD

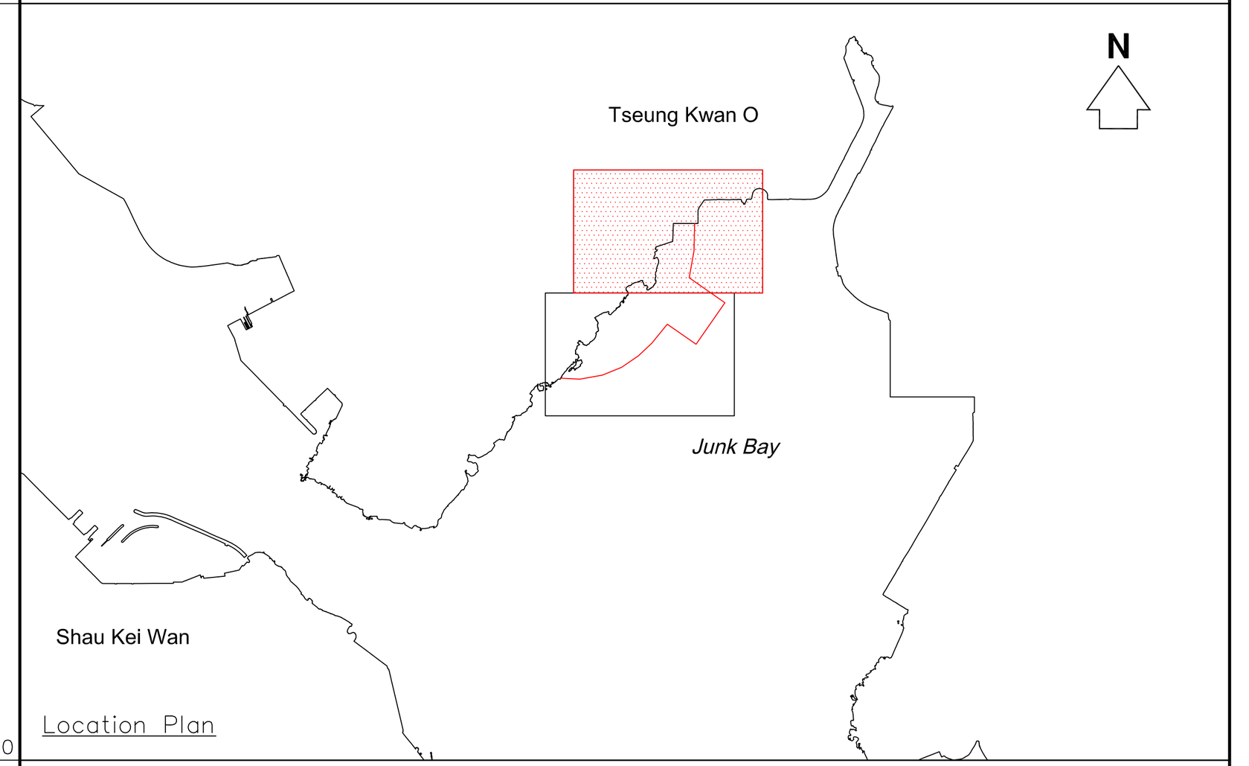
Sounding data in metres above/below HKPD

Contour at 1 metre interval

Survey boundary

Metres in HKPD

4 5 6 7 8 9 10 11 12



Location Plan

Project :

WORKS ORDER NUMBER GE/2007/04.27
AGREEMENT NO. CE 42/2008 (CE)
TSEUNG KWAN O - LAM TIN TUNNEL AND ASSOCIATED WORKS -
FIRST STAGE G.I. REQUEST FOR GEOPHYSICAL SURVEY
AT WEST COAST OF TSEUNG KWAN O

FIGURE NUMBER : 3.1

Drawing Title :

COLOUR CONTOURED SWATH BATHYMETRY PLAN

Notes :

1. Survey Date : 25–26th June, 2009
2. Survey Grid : Hong Kong Metric Grid
3. Survey Datum : Hong Kong Principle Datum
4. Positioning : C–Nav GcGPS (Globally corrected GPS)
5. Equipment : EGS Boomer System
   Reson 8125 Multibeam Echo Sounder
   Knudsen 320M Dual Frequency Echo Sounder
   Odom Echo Sounder
   Klein 2000 Side Scan Sonar System
6. Coastline taken from 1:1,000 Survey Sheets, Survey and Mapping Office, Lands Department

Revision No.	Date	Drawn by	Checked by	Approved by	Remarks
0	09/07/2009	Clarence Siu	W L Lam	Margie Chen	Preliminary

METRIC SCALE 1:1,000

50 40 30 20 10 0 50 100

Client : Civil Engineering and Development Department

Surveyor : EGS (ASIA) LIMITED
EARTH SCIENCES & SURVEYING
9/F SOUTH, SOMERSET HOUSE,
TAIKOO PLACE, 979 KING'S ROAD,
QUARRY BAY, HONG KONG
Tel: (852) 28948622
Fax: (852) 25763590
Web: www.egssurvey.com

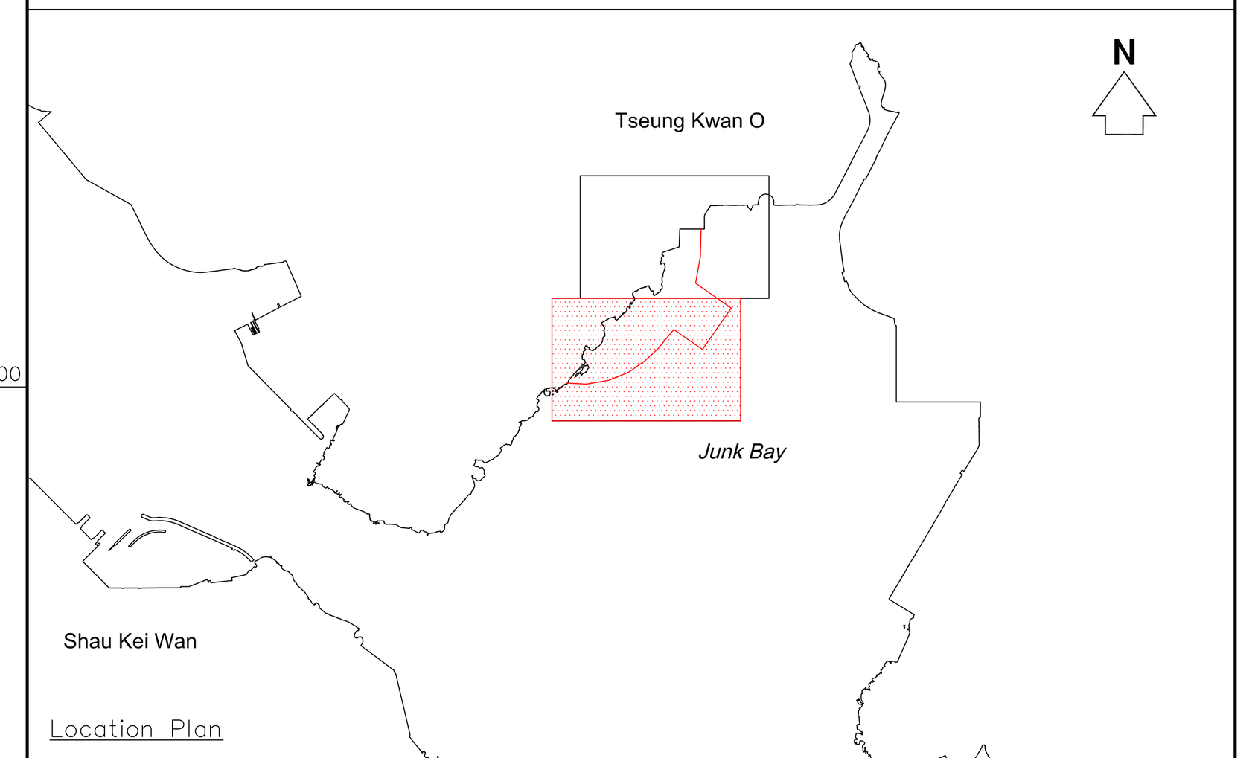
JOB NO. : HK216609

Legend :

8₅	Gridded sounding data in metres below HKPD
1₀ / 1₅	Sounding data in metres above/below HKPD
(line)	Contour at 1 metre interval
(red dashed line)	Survey boundary

Metres in HKPD

4 5 6 7 8 9 10 11 12



Location Plan

Project :

WORKS ORDER NUMBER GE/2007/04.27
AGREEMENT NO. CE 42/2008 (CE)
TSEUNG KWAN O - LAM TIN TUNNEL AND ASSOCIATED WORKS - FIRST STAGE G.I. REQUEST FOR GEOPHYSICAL SURVEY AT WEST COAST OF TSUENG KWAN O

FIGURE NUMBER : 3.2

Drawing Title :

COLOUR CONTOURED SWATH BATHYMETRY PLAN

Notes :
1. Survey Date : 25–26th June, 2009
2. Survey Grid : Hong Kong Metric Grid
3. Survey Datum : Hong Kong Principle Datum
4. Positioning : C–Nav GcGPS (Globally corrected GPS)
5. Equipment : EGS Boomer System
   Reson 8125 Multibeam Echo Sounder
   Knudsen 320M Dual Frequency Echo Sounder
   Odom Echo Sounder
   Klein 2000 Side Scan Sonar System
6. Coastline taken from 1:1,000 Survey Sheets, Survey and Mapping Office, Lands Department

Revision No.	Date	Drawn by	Checked by	Approved by	Remarks
0	09/07/2009	Clarence Siu	W L Lam	Margie Chen	Preliminary

METRIC SCALE 1:1,000

50 40 30 20 10 0 50 100

Client : Civil Engineering and Development Department

Surveyor :

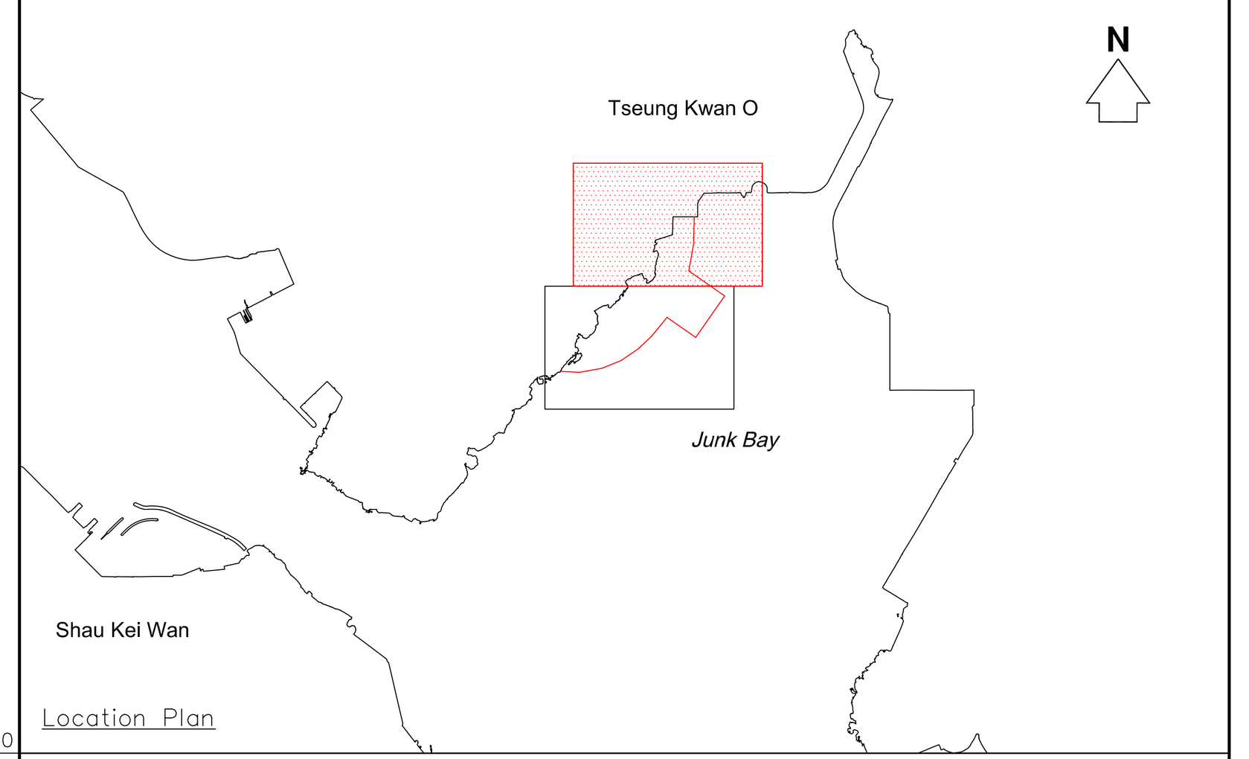
EGS (ASIA) LIMITED
9/F SOUTH, SOMERSET HOUSE,
TAIKOO PLACE, 979 KING'S ROAD,
QUARRY BAY, HONG KONG
Tel: (852) 28948622
Fax: (852) 25763590
Web: www.egssurvey.com

EARTH SCIENCES & SURVEYING

JOB NO. : HK216609

Legend :

- Dumped Material
- Gravelly SAND
- ROCK outcrop
- Scattered debris
- SILT/CLAY
- Scar/Trawl marks
- Survey boundary
- WH2-SC001 0.9x1.0xnmh Tyre — Sonar contact with reference number (length x width x height in metres)
- WH2-SEI001 0.5m below seabed Unknown object — Seismic contact with reference number



Location Plan

Project :

WORKS ORDER NUMBER GE/2007/04.27
AGREEMENT NO. CE 42/2008 (CE)
TSEUNG KWAN O - LAM TIN TUNNEL AND ASSOCIATED WORKS -
FIRST STAGE G.I. REQUEST FOR GEOPHYSICAL SURVEY
AT WEST COAST OF TSEUNG KWAN O

FIGURE NUMBER : 4.1

Drawing Title :

SEABED FEATURES

Notes :

1. Survey Date : 25–26th June, 2009
2. Survey Grid : Hong Kong Metric Grid
3. Survey Datum : Hong Kong Principle Datum
4. Positioning : C-Nav GcGPS (Globally corrected GPS)
5. Equipment : EGS Boomer System
   Reson 8125 Multibeam Echo Sounder
   Knudsen 320M Dual Frequency Echo Sounder
   Odom Echo Sounder
   Klein 2000 Side Scan Sonar System
6. Coastline taken from 1:1,000 Survey Sheets, Survey and Mapping Office, Lands Department

Revision No.	Date	Drawn by	Checked by	Approved by	Remarks
0	09/07/2009	Clarence Siu	W L Lam	Margie Chen	Preliminary

METRIC SCALE 1:1,000

50 40 30 20 10 0 50 100

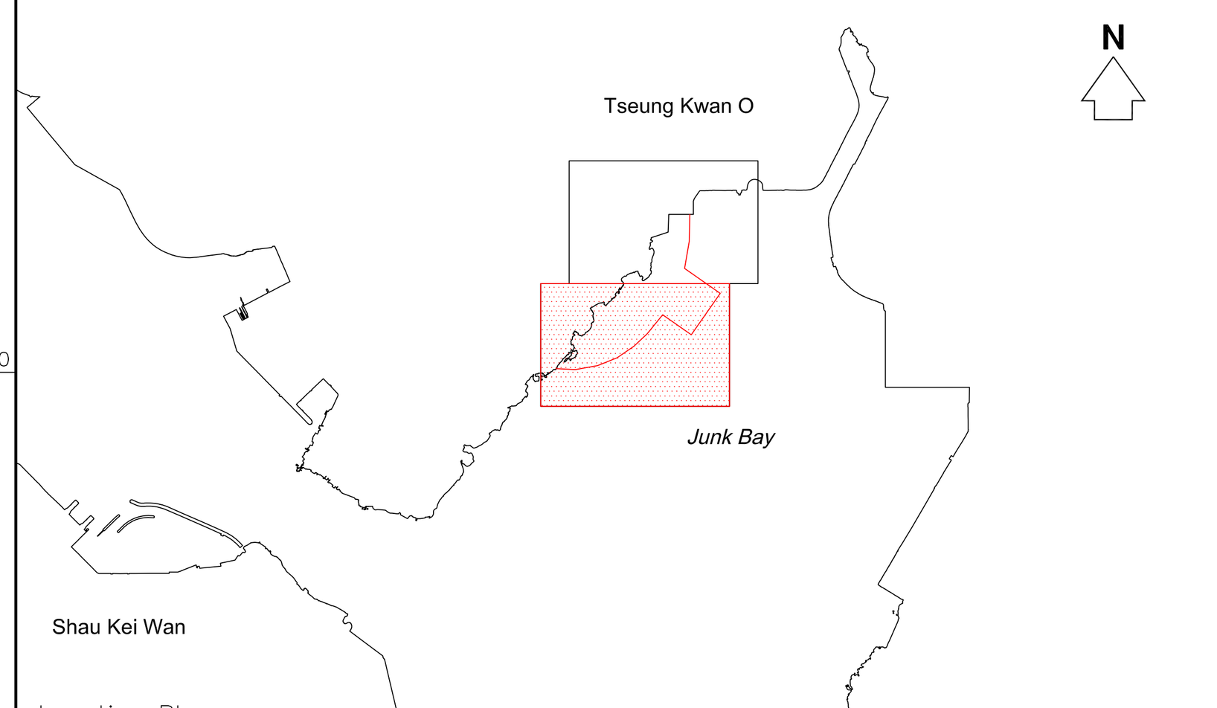
Client : Civil Engineering and Development Department

Surveyor : EGS (ASIA) LIMITED
EARTH SCIENCES & SURVEYING
9/F SOUTH, SOMERSET HOUSE,
TAIKOO PLACE, 979 KING'S ROAD,
QUARRY BAY, HONG KONG
Tel: (852) 28948622
Fax: (852) 25763590
Web: www.egssurvey.com

JOB NO. : HK216609

Legend :

(cyan fill)	Dumped Material
(light orange fill)	Gravelly SAND
(salmon fill)	ROCK outcrop
(green fill)	Scattered debris
(yellow fill)	SILT/CLAY
(grey line)	Scar/Trawl marks
(red dashed line)	Survey boundary
▲ WH2-SC001 0.9x1.0xnmh Tyre	Sonar contact with reference number (length x width x height in metres)
⊗ WH2-SEI001 0.5m below seabed Unknown object	Seismic contact with reference number



Location Plan

Project :

WORKS ORDER NUMBER GE/2007/04.27
AGREEMENT NO. CE 42/2008 (CE)
TSEUNG KWAN O - LAM TIN TUNNEL AND ASSOCIATED WORKS - FIRST STAGE G.I. REQUEST FOR GEOPHYSICAL SURVEY AT WEST COAST OF TSUENG KWAN O

FIGURE NUMBER : 4.2

Drawing Title :

SEABED FEATURES

Notes :
1. Survey Date : 25–26th June, 2009
2. Survey Grid : Hong Kong Metric Grid
3. Survey Datum : Hong Kong Principle Datum
4. Positioning : C–Nav GcGPS (Globally corrected GPS)
5. Equipment : EGS Boomer System
   Reson 8125 Multibeam Echo Sounder
   Knudsen 320M Dual Frequency Echo Sounder
   Odom Echo Sounder
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6. Coastline taken from 1:1,000 Survey Sheets, Survey and Mapping Office, Lands Department

Revision No.	Date	Drawn by	Checked by	Approved by	Remarks
0	09/07/2009	Clarence Siu	W L Lam	Margie Chen	Preliminary

METRIC SCALE 1:1,000
50 40 30 20 10 0 50 100

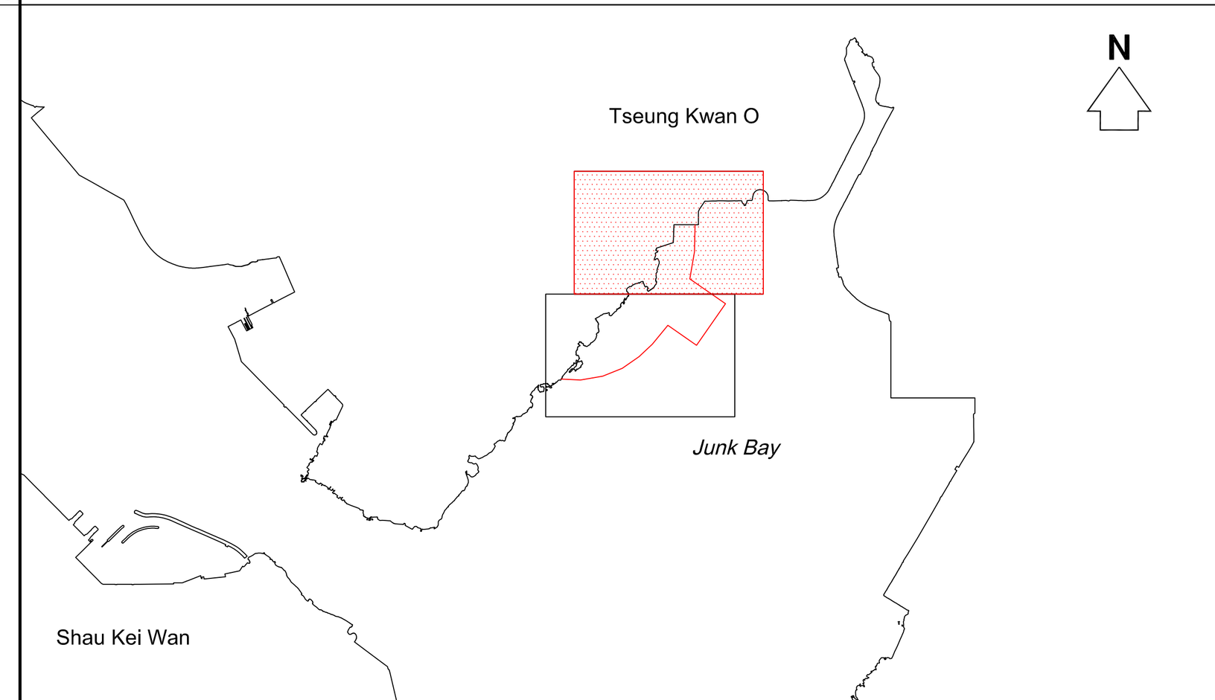
Client : Civil Engineering and Development Department

Surveyor : EGS (ASIA) LIMITED
9/F SOUTH, SOMERSET HOUSE, TAIKOO PLACE, 979 KING'S ROAD, QUARRY BAY, HONG KONG
Tel: (852) 28948622
Fax: (852) 25763590
Web: www.egssurvey.com
EARTH SCIENCES & SURVEYING

JOB NO. : HK216609

Legend :

9·5	Isopachs value in metres
	Contour at 1 metre interval
	Survey boundary
	Rock outcrop



Location Plan

Project :

WORKS ORDER NUMBER GE/2007/04.27
AGREEMENT NO. CE 42/2008 (CE)
TSEUNG KWAN O - LAM TIN TUNNEL AND ASSOCIATED WORKS -
FIRST STAGE G.I. REQUEST FOR GEOPHYSICAL SURVEY
AT WEST COAST OF TSUENG KWAN O

FIGURE NUMBER : 5.1

Drawing Title :

CONTOURED LEVELS AT BASED OF MARINE DEPOSITS

Notes :

1. Survey Date : 25–26th June, 2009
2. Survey Grid : Hong Kong Metric Grid
3. Survey Datum : Hong Kong Principle Datum
4. Positioning : C–Nav GcGPS (Globally corrected GPS)
5. Equipment : EGS Boomer System
   Reson 8125 Multibeam Echo Sounder
   Knudsen 320M Dual Frequency Echo Sounder
   Odom Echo Sounder
   Klein 2000 Side Scan Sonar System
6. Coastline taken from 1:1,000 Survey Sheets, Survey and Mapping Office, Lands Department

Revision No.	Date	Drawn by	Checked by	Approved by	Remarks
0	09/07/2009	Clarence Siu	W L Lam	Margie Chen	Preliminary

METRIC SCALE 1:1,000

50 40 30 20 10 0 50 100

Client : Civil Engineering and Development Department

Surveyor : EGS (ASIA) LIMITED
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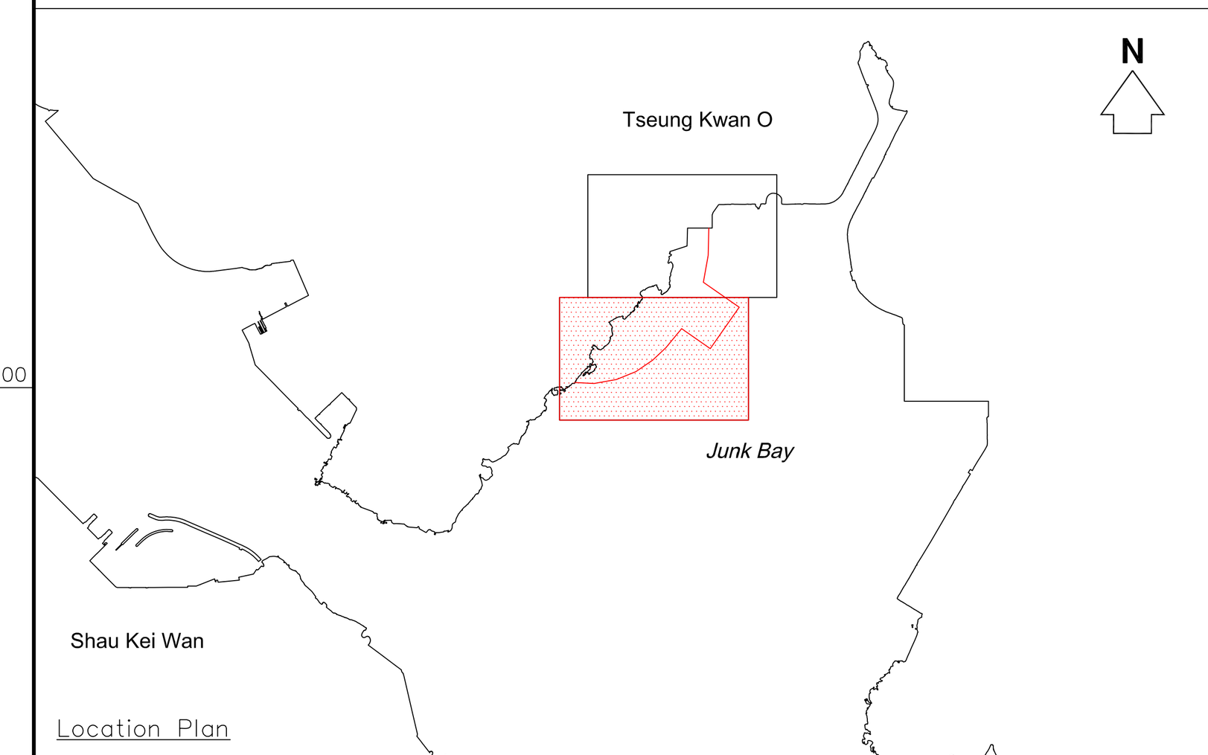
EARTH SCIENCES & SURVEYING

JOB NO. : HK216609



Location Plan

Project :

WORKS ORDER NUMBER GE/2007/04.27
AGREEMENT NO. CE 42/2008 (CE)
TSEUNG KWAN O - LAM TIN TUNNEL AND ASSOCIATED WORKS - FIRST STAGE G.I. REQUEST FOR GEOPHYSICAL SURVEY AT WEST COAST OF TSEUNG KWAN O

FIGURE NUMBER : 5.2

Drawing Title :

CONTOURED LEVELS AT BASED OF MARINE DEPOSITS

Notes :
1. Survey Date : 25–26th June, 2009
2. Survey Grid : Hong Kong Metric Grid
3. Survey Datum : Hong Kong Principle Datum
4. Positioning : C–Nav GcGPS (Globally corrected GPS)
5. Equipment : EGS Boomer System
   Reson 8125 Multibeam Echo Sounder
   Knudsen 320M Dual Frequency Echo Sounder
   Odom Echo Sounder
   Klein 2000 Side Scan Sonar System
6. Coastline taken from 1:1,000 Survey Sheets, Survey and Mapping Office, Lands Department

Revision No.	Date	Drawn by	Checked by	Approved by	Remarks
0	09/07/2009	Clarence Siu	W L Lam	Margie Chen	Preliminary

METRIC SCALE 1:1,000

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Fax: (852) 25763590
Web: www.egssurvey.com
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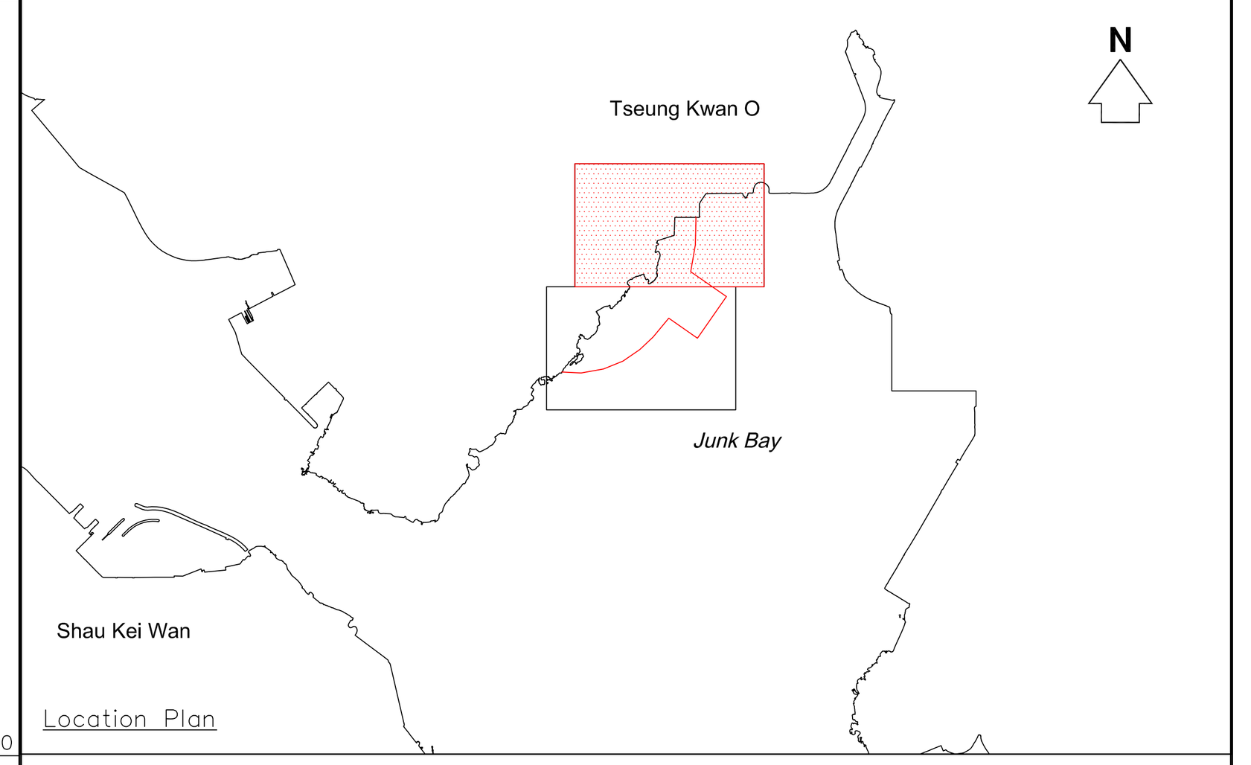
JOB NO. : HK216609

Legend :

- 9.5 Isopachs value in metres
- Contour at 2 metre interval
- Survey boundary
- Rock outcrop



Project :

WORKS ORDER NUMBER GE/2007/04.27
AGREEMENT NO. CE 42/2008 (CE)
TSEUNG KWAN O - LAM TIN TUNNEL AND ASSOCIATED WORKS -
FIRST STAGE G.I. REQUEST FOR GEOPHYSICAL SURVEY
AT WEST COAST OF TSEUNG KWAN O

FIGURE NUMBER : 6.1

Drawing Title :

CONTOURED LEVELS ON TOP OF ROCK IN ANY STATE OF DECOMPOSITION

Notes :

1. Survey Date : 25–26th June, 2009
2. Survey Grid : Hong Kong Metric Grid
3. Survey Datum : Hong Kong Principle Datum
4. Positioning : C-Nav GcGPS (Globally corrected GPS)
5. Equipment : EGS Boomer System
   Reson 8125 Multibeam Echo Sounder
   Knudsen 320M Dual Frequency Echo Sounder
   Odom Echo Sounder
   Klein 2000 Side Scan Sonar System
6. Coastline taken from 1:1,000 Survey Sheets, Survey and Mapping Office, Lands Department

Revision No.	Date	Drawn by	Checked by	Approved by	Remarks
0	09/07/2009	Clarence Siu	W L Lam	Margie Chen	Preliminary

METRIC SCALE 1:1,000

50 40 30 20 10 0 50 100

Client :

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Surveyor :

EGS (ASIA) LIMITED
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Web: www.egssurvey.com
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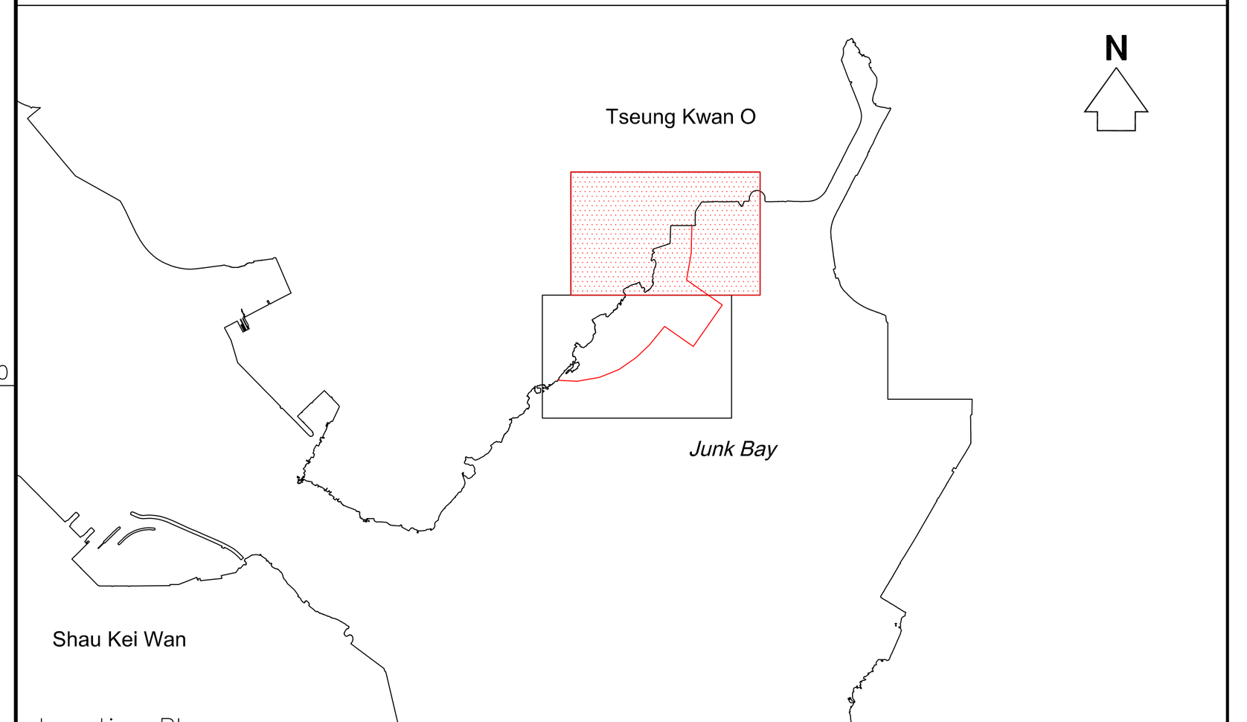
JOB NO. : HK216609



Location Plan

Project :

WORKS ORDER NUMBER GE/2007/04.27
AGREEMENT NO. CE 42/2008 (CE)
TSEUNG KWAN O - LAM TIN TUNNEL AND ASSOCIATED WORKS -
FIRST STAGE G.I. REQUEST FOR GEOPHYSICAL SURVEY
AT WEST COAST OF TSUENG KWAN O

FIGURE NUMBER : 6.2

Drawing Title :

CONTOURED LEVELS ON TOP OF ROCK IN ANY STATE OF DECOMPOSITION

Notes :
1. Survey Date : 25–26th June, 2009
2. Survey Grid : Hong Kong Metric Grid
3. Survey Datum : Hong Kong Principle Datum
4. Positioning : C–Nav GcGPS (Globally corrected GPS)
5. Equipment : EGS Boomer System
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   Knudsen 320M Dual Frequency Echo Sounder
   Odom Echo Sounder
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6. Coastline taken from 1:1,000 Survey Sheets, Survey and Mapping Office, Lands Department

Revision No.	Date	Drawn by	Checked by	Approved by	Remarks
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METRIC SCALE 1:1,000

50 40 30 20 10 0 50 100

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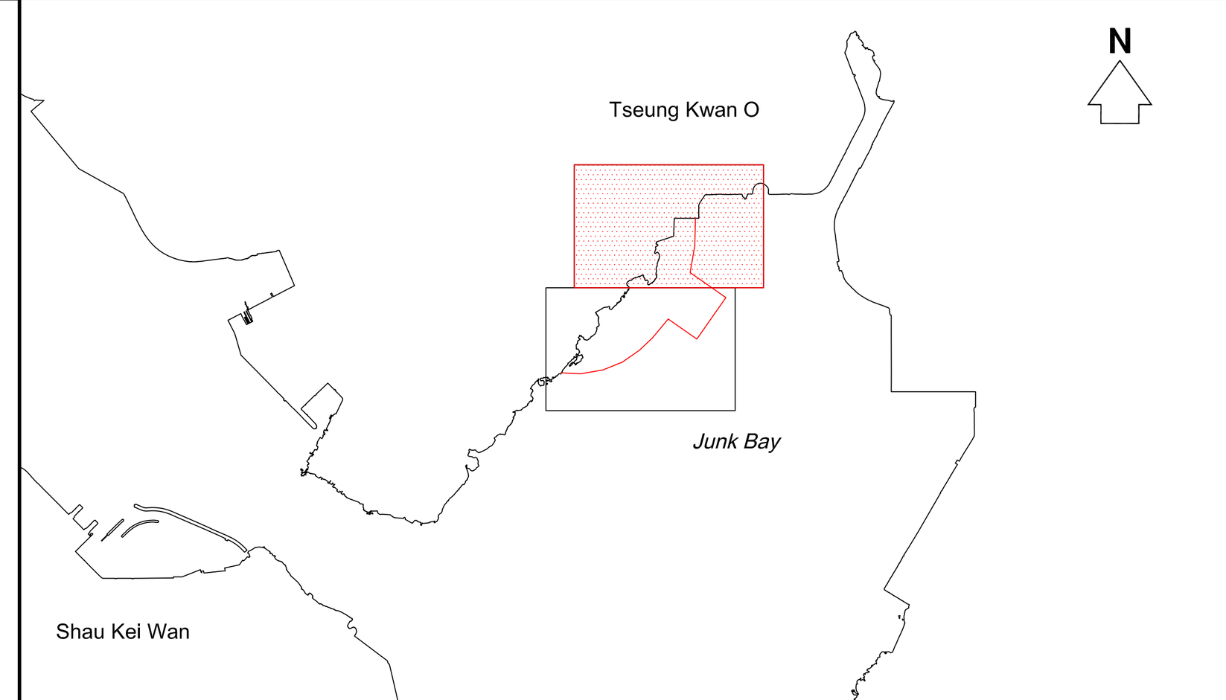
Fax: (852) 25763590
Web: www.egssurvey.com

JOB NO. : HK216609

Legend :

9·5	Isopachs value in metres
(line)	Contour at 5 metre interval
(red dash-dot line)	Survey boundary
(magenta symbol)	Rock outcrop



Location Plan

Project :

WORKS ORDER NUMBER GE/2007/04.27
AGREEMENT NO. CE 42/2008 (CE)
TSEUNG KWAN O - LAM TIN TUNNEL AND ASSOCIATED WORKS -
FIRST STAGE G.I. REQUEST FOR GEOPHYSICAL SURVEY
AT WEST COAST OF TSUENG KWAN O

FIGURE NUMBER : 7.1

Drawing Title :

CONTOURED LEVELS ON TOP OF PRESUMED MODERATELY DECOMPOSED ROCK

Notes :

1. Survey Date : 25–26th June, 2009
2. Survey Grid : Hong Kong Metric Grid
3. Survey Datum : Hong Kong Principle Datum
4. Positioning : C–Nav GcGPS (Globally corrected GPS)
5. Equipment : EGS Boomer System
   Reson 8125 Multibeam Echo Sounder
   Knudsen 320M Dual Frequency Echo Sounder
   Odom Echo Sounder
   Klein 2000 Side Scan Sonar System
6. Coastline taken from 1:1,000 Survey Sheets, Survey and Mapping Office, Lands Department

Revision No.	Date	Drawn by	Checked by	Approved by	Remarks
0	09/07/2009	Clarence Siu	W L Lam	Margie Chen	Preliminary

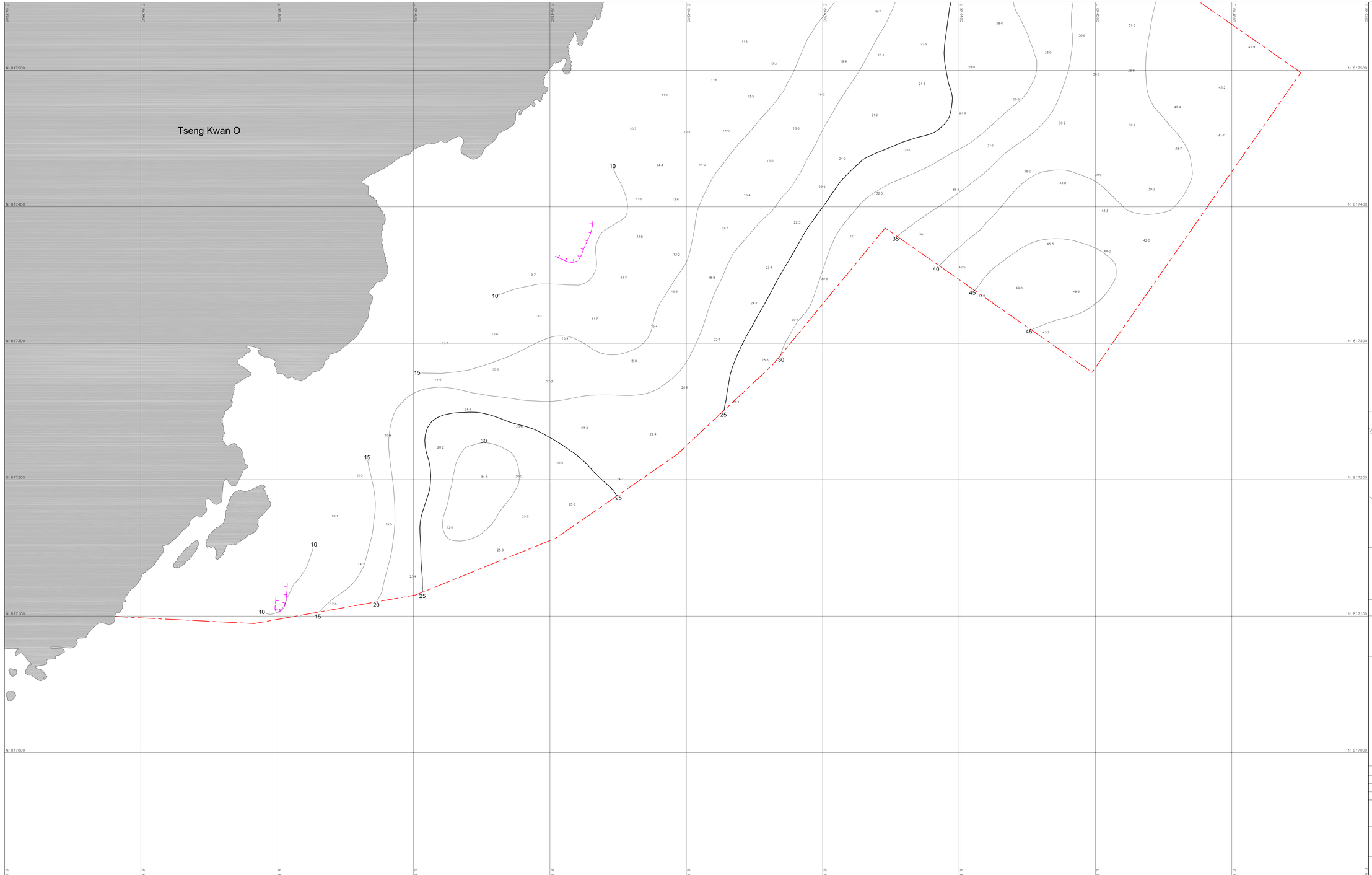
METRIC SCALE 1:1,000

50 40 30 20 10 0 50 100

Client : Civil Engineering and Development Department

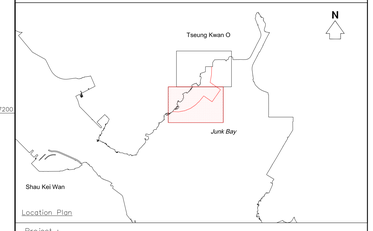
Surveyor : EGS (ASIA) LIMITED
EARTH SCIENCES & SURVEYING
9/F SOUTH, SOMERSET HOUSE,
TAIKOO PLACE, 979 KING'S ROAD,
QUARRY BAY, HONG KONG
Tel: (852) 28948622
Fax: (852) 25763590
Web: www.egssurvey.com

JOB NO. : HK216609



Legend :

9·5	Isopachs value in metres
	Contour at 5 metre interval
	Survey boundary
	Rock outcrop



Location Plan

Project :

WORKS ORDER NUMBER GE/2007/04.27
AGREEMENT NO. CE 42/2008 (CE)
TSEUNG KWAN O - LAM TIN TUNNEL AND ASSOCIATED WORKS -
FIRST STAGE G.I. REQUEST FOR GEOPHYSICAL SURVEY
AT WEST COAST OF TSUENG KWAN O

FIGURE NUMBER : 7.2

Drawing Title :

CONTOURED LEVELS ON TOP OF PRESUMED MODERATELY DECOMPOSED ROCK

Notes :

1. Survey Date : 25–26th June, 2009
2. Survey Grid : Hong Kong Metric Grid
3. Survey Datum : Hong Kong Principle Datum
4. Positioning : C-Nav GcGPS (Globally corrected GPS)
5. Equipment : EGS Boomer System
   Reson 8125 Multibeam Echo Sounder
   Knudsen 320M Dual Frequency Echo Sounder
   Odom Echo Sounder
   Klein 2000 Side Scan Sonar System
6. Coastline taken from 1:1,000 Survey Sheets, Survey and Mapping Office, Lands Department

Revision No.	Date	Drawn by	Checked by	Approved by	Remarks
0	09/07/2009	Clarence Siu	W L Lam	Margie Chen	Preliminary

METRIC SCALE 1:1,000

50 40 30 20 10 0 50 100

Client :

Civil Engineering and Development Department

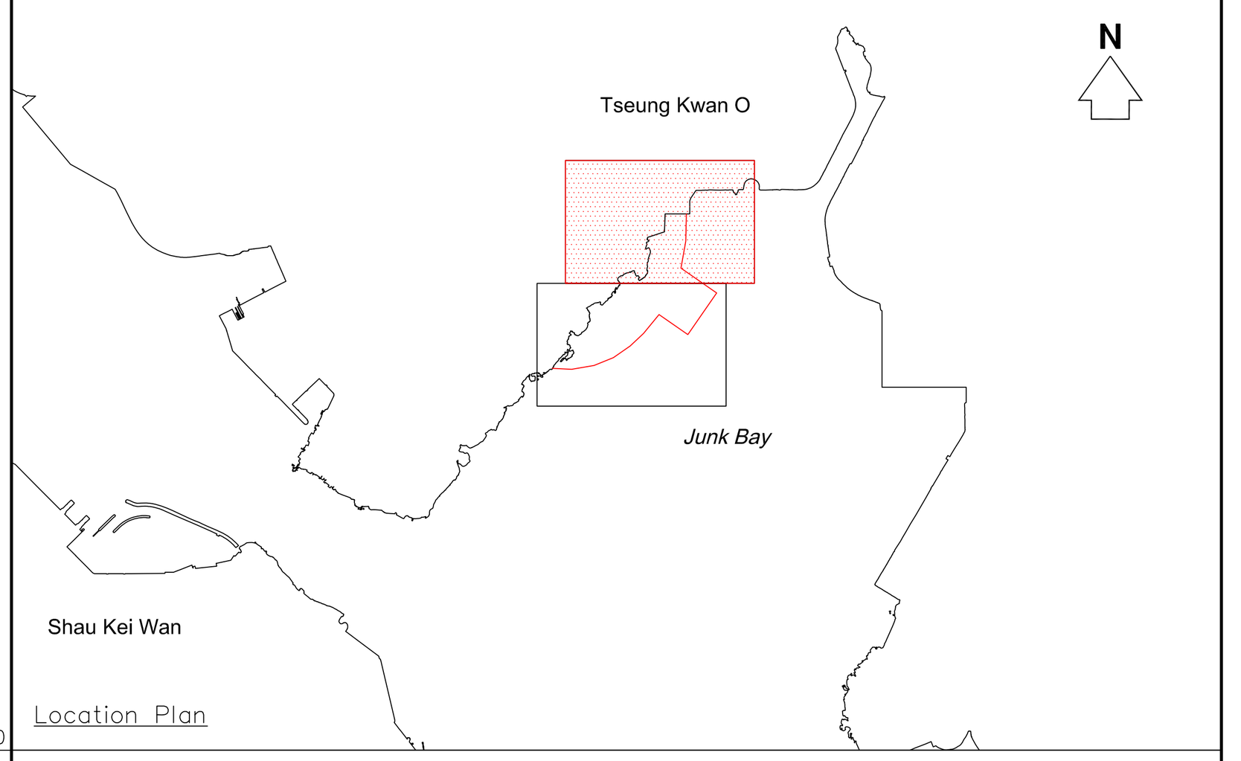
Surveyor :

EGS (ASIA) LIMITED
9/F SOUTH, SOMERSET HOUSE,
TAIKOO PLACE, 979 KING'S ROAD,
QUARRY BAY, HONG KONG
Tel: (852) 28949222
Fax: (852) 28949233
Web: www.egsasia.com

JOB NO. : HK216609

Legend :

- 9.5 — Isopachs value in metres
- Contour at 1 metre interval
- Survey boundary



Location Plan

Project :

WORKS ORDER NUMBER GE/2007/04.27
AGREEMENT NO. CE 42/2008 (CE)
TSEUNG KWAN O - LAM TIN TUNNEL AND ASSOCIATED WORKS -
FIRST STAGE G.I. REQUEST FOR GEOPHYSICAL SURVEY
AT WEST COAST OF TSEUNG KWAN O

FIGURE NUMBER : 8.1

Drawing Title :

CONTOURED ISOPACHS OF MARINE DEPOSITS

Notes :

1. Survey Date : 25–26th June, 2009
2. Survey Grid : Hong Kong Metric Grid
3. Survey Datum : Hong Kong Principle Datum
4. Positioning : C–Nav GcGPS (Globally corrected GPS)
5. Equipment : EGS Boomer System
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   Knudsen 320M Dual Frequency Echo Sounder
   Odom Echo Sounder
   Klein 2000 Side Scan Sonar System
6. Coastline taken from 1:1,000 Survey Sheets, Survey and Mapping Office, Lands Department

Revision No.	Date	Drawn by	Checked by	Approved by	Remarks
0	09/07/2009	Clarence Siu	W L Lam	Margie Chen	Preliminary

METRIC SCALE 1:1,000

50 40 30 20 10 0 50 100

Client : Civil Engineering and Development Department

Surveyor : EGS (ASIA) LIMITED
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TAIKOO PLACE, 979 KING'S ROAD,
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Tel: (852) 28948622
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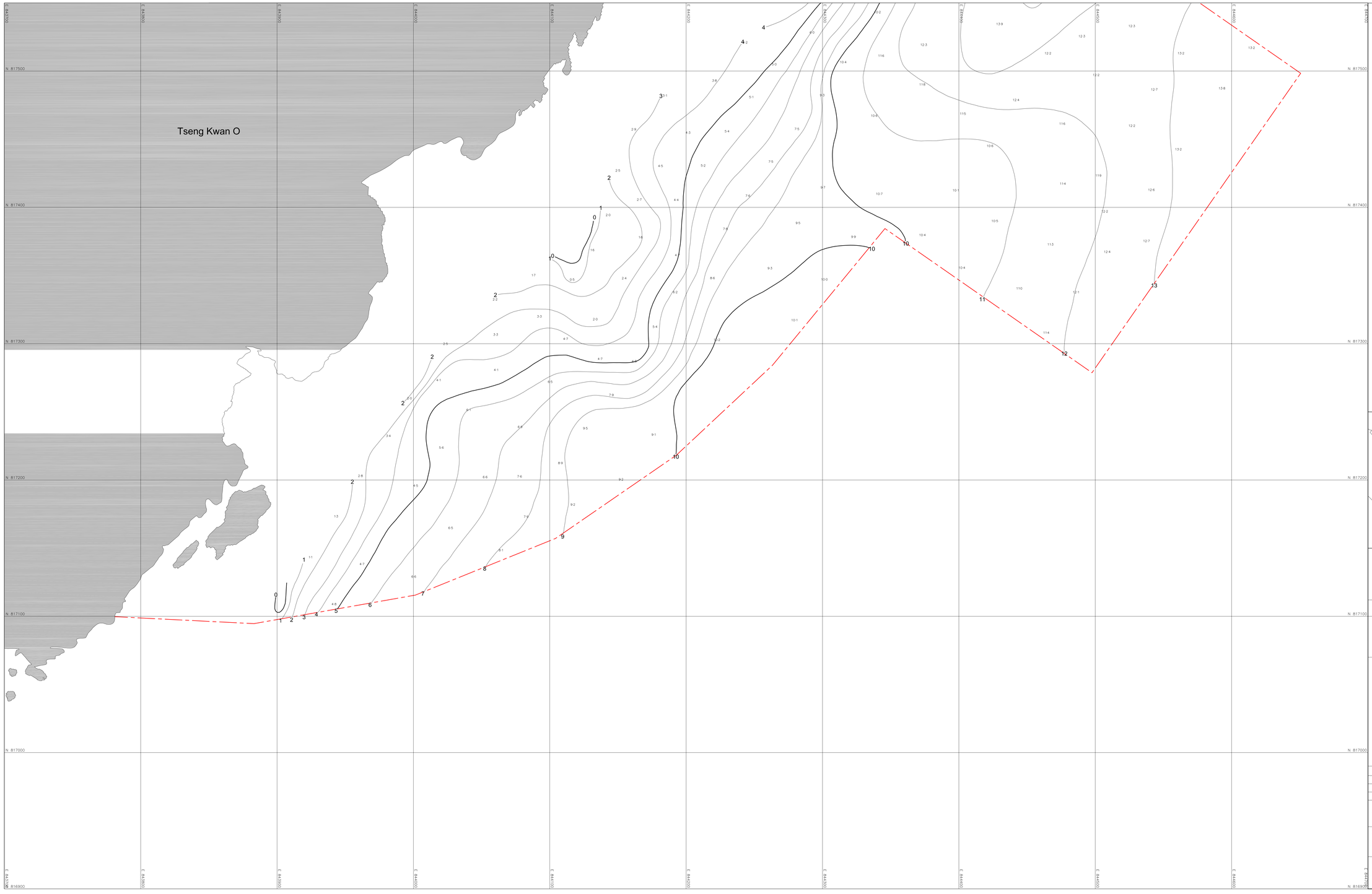
Web: www.egssurvey.com
EARTH SCIENCES & SURVEYING

JOB NO. : HK216609

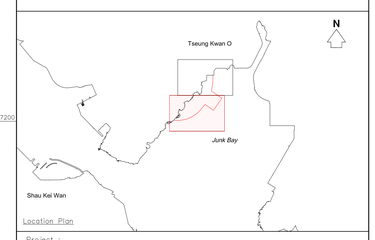


Legend :

9·5 Isopachs value in metres

Contour at 1 metre interval

Survey boundary



Location Plan

Project :

WORKS ORDER NUMBER GE/2007/04.27
AGREEMENT NO. CE 42/2008 (CE)
TSEUNG KWAN O - LAM TIN TUNNEL AND ASSOCIATED WORKS -
FIRST STAGE G.I. REQUEST FOR GEOPHYSICAL SURVEY
AT WEST COAST OF TSUENG KWAN O

FIGURE NUMBER : 8.2

Drawing Title :

CONTOURED ISOPACHS OF MARINE DEPOSITS

Notes :

1. Survey Date : 25-26th June, 2009
2. Survey Grid : Hong Kong Metric Grid
3. Survey Datum : Hong Kong Principle Datum
4. Positioning : C-Nav GcGPS (Globally corrected GPS)
5. Equipment : EGS Boomer System
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   Knudsen 320M Dual Frequency Echo Sounder
   Odom Echo Sounder
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6. Coastline taken from 1:1,000 Survey Sheets, Survey and Mapping Office, Lands Department

Revision No.	Date	Drawn by	Checked by	Approved by	Remarks
0	09/07/2009	Clarence Siu	W L Lam	Margie Chen	Preliminary

METRIC SCALE 1:1,000

50 40 30 20 10 0 50 100

Client :

Civil Engineering and Development Department

Surveyor :

EGS (ASIA) LIMITED
6/F SOUTH, SUNFIRST HOUSE,
TAKOO PLACE, 979 KING'S ROAD,
QUARRY BAY, HONG KONG
Tel: (852) 28948823
Fax: (852) 25763590
Web: www.egssurvey.com

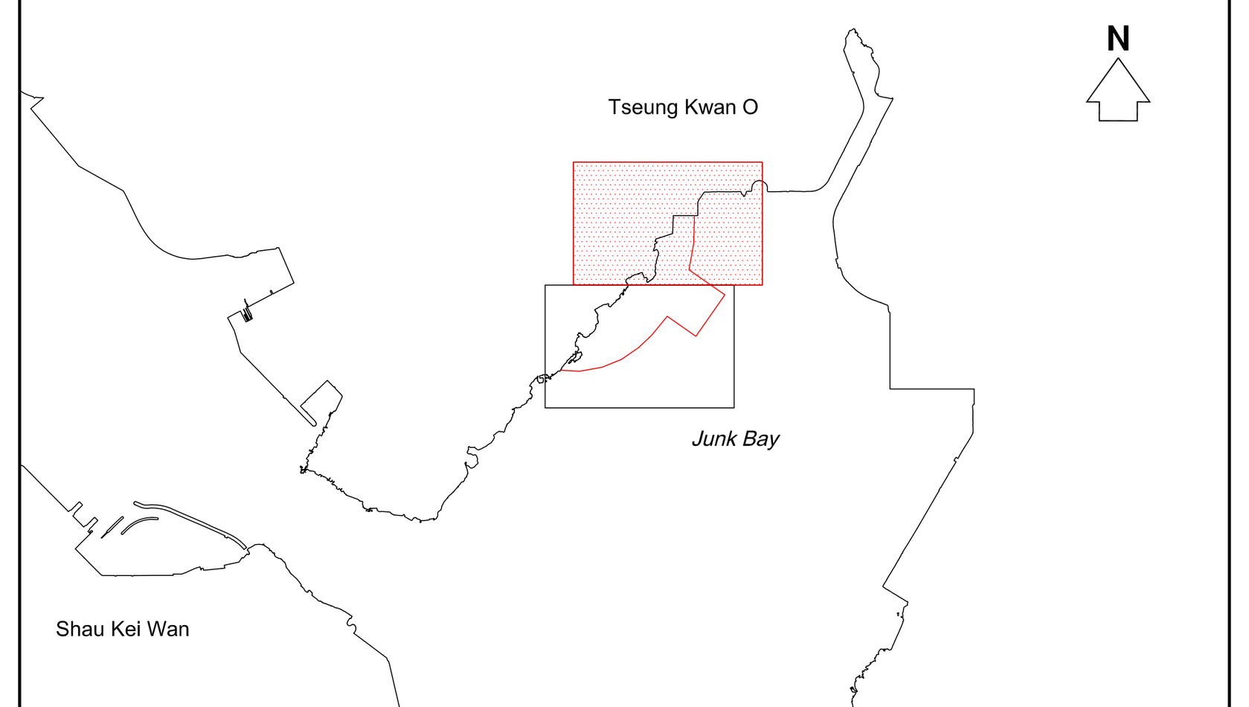
JOB NO. : HK216609

Legend :

9.5 Isopachs value in metres

Contour at 2 metre interval

Survey boundary



Location Plan

Project :

WORKS ORDER NUMBER GE/2007/04.27
AGREEMENT NO. CE 42/2008 (CE)
TSEUNG KWAN O - LAM TIN TUNNEL AND ASSOCIATED WORKS -
FIRST STAGE G.I. REQUEST FOR GEOPHYSICAL SURVEY
AT WEST COAST OF TSEUNG KWAN O

FIGURE NUMBER : 9.1

Drawing Title :

CONTOURED ISOPACHS OF ALLUVIUM

Notes :

1. Survey Date : 25–26th June, 2009
2. Survey Grid : Hong Kong Metric Grid
3. Survey Datum : Hong Kong Principle Datum
4. Positioning : C–Nav GcGPS (Globally corrected GPS)
5. Equipment : EGS Boomer System
   Reson 8125 Multibeam Echo Sounder
   Knudsen 320M Dual Frequency Echo Sounder
   Odom Echo Sounder
   Klein 2000 Side Scan Sonar System
6. Coastline taken from 1:1,000 Survey Sheets, Survey and Mapping Office, Lands Department

Revision No.	Date	Drawn by	Checked by	Approved by	Remarks
0	09/07/2009	Clarence Siu	W L Lam	Margie Chen	Preliminary

METRIC SCALE 1:1,000

50 40 30 20 10 0 50 100

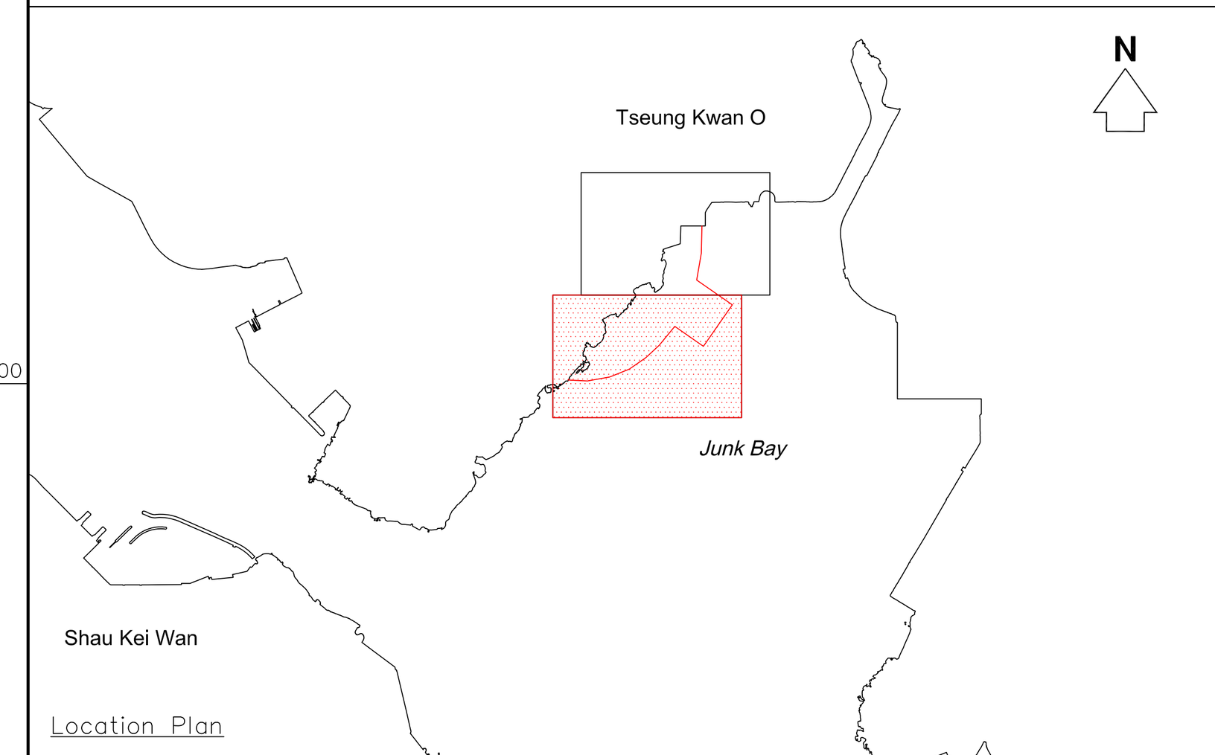
Client :

Civil Engineering and Development Department

Surveyor :

EGS (ASIA) LIMITED

JOB NO. : HK216609



Project :

WORKS ORDER NUMBER GE/2007/04.27
AGREEMENT NO. CE 42/2008 (CE)
TSEUNG KWAN O - LAM TIN TUNNEL AND ASSOCIATED WORKS -
FIRST STAGE G.I. REQUEST FOR GEOPHYSICAL SURVEY
AT WEST COAST OF TSUENG KWAN O

FIGURE NUMBER : 9.2

Drawing Title :

CONTOURED ISOPACHS OF ALLUVIUM

Notes :
1. Survey Date : 25–26th June, 2009
2. Survey Grid : Hong Kong Metric Grid
3. Survey Datum : Hong Kong Principle Datum
4. Positioning : C–Nav GcGPS (Globally corrected GPS)
5. Equipment : EGS Boomer System
   Reson 8125 Multibeam Echo Sounder
   Knudsen 320M Dual Frequency Echo Sounder
   Odom Echo Sounder
   Klein 2000 Side Scan Sonar System
6. Coastline taken from 1:1,000 Survey Sheets, Survey and Mapping Office, Lands Department

Revision No.	Date	Drawn by	Checked by	Approved by	Remarks
0	09/07/2009	Clarence Siu	W L Lam	Margie Chen	Preliminary

METRIC SCALE 1:1,000

50 40 30 20 10 0 50 100

Client : Civil Engineering and Development Department

Surveyor : EGS (ASIA) LIMITED
9/F SOUTH, SOMERSET HOUSE,
TAIKOO PLACE, 979 KING'S ROAD,
QUARRY BAY, HONG KONG
Tel: (852) 28948622
Fax: (852) 25763590
Web: www.egssurvey.com
EARTH SCIENCES & SURVEYING

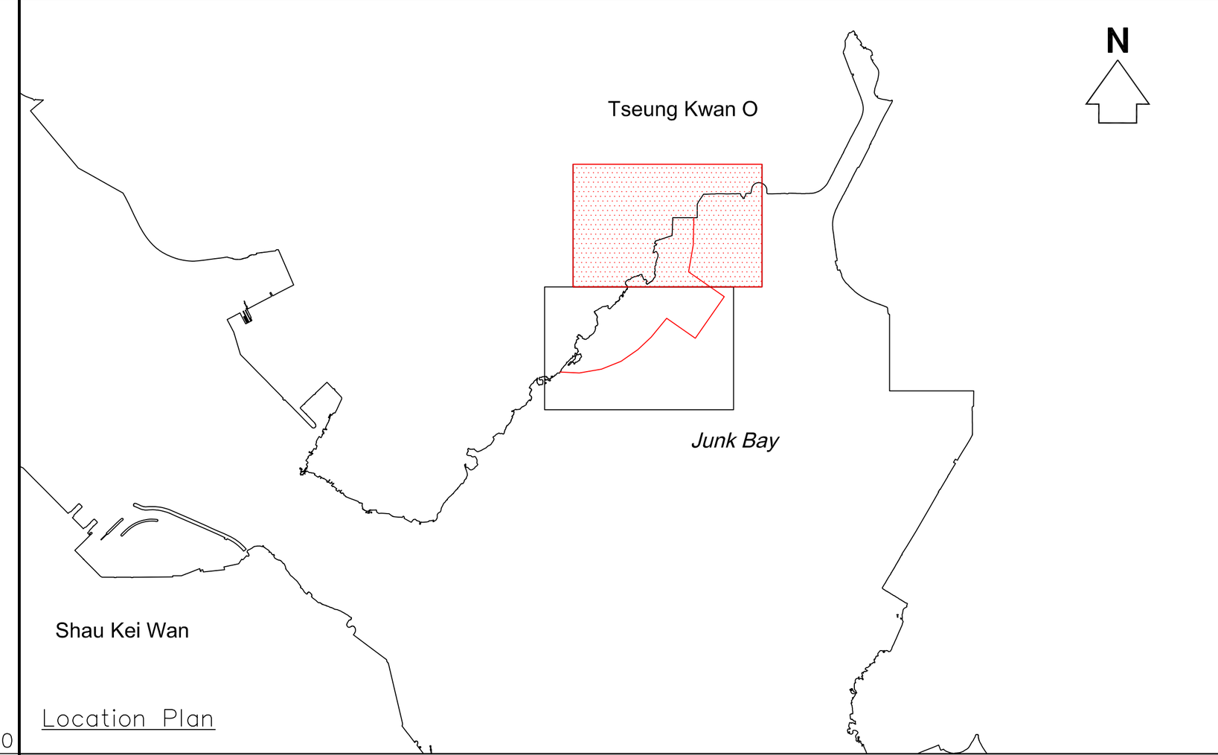
JOB NO. : HK216609

Legend :

95 Isopachs value in metres

Contour at 5 metre interval

Survey boundary



Location Plan

Project :

WORKS ORDER NUMBER GE/2007/04.27
AGREEMENT NO. CE 42/2008 (CE)
TSEUNG KWAN O - LAM TIN TUNNEL AND ASSOCIATED WORKS -
FIRST STAGE G.I. REQUEST FOR GEOPHYSICAL SURVEY
AT WEST COAST OF TSEUNG KWAN O

FIGURE NUMBER : 10.1

Drawing Title :

CONTOURED ISOPACHS OF ROCK IN ANY STATE OF DECOMPOSITION

Notes :

1. Survey Date : 25–26th June, 2009
2. Survey Grid : Hong Kong Metric Grid
3. Survey Datum : Hong Kong Principle Datum
4. Positioning : C–Nav GcGPS (Globally corrected GPS)
5. Equipment : EGS Boomer System
   Reson 8125 Multibeam Echo Sounder
   Knudsen 320M Dual Frequency Echo Sounder
   Odom Echo Sounder
   Klein 2000 Side Scan Sonar System
6. Coastline taken from 1:1,000 Survey Sheets, Survey and Mapping Office, Lands Department

Revision No.	Date	Drawn by	Checked by	Approved by	Remarks
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METRIC SCALE 1:1,000

50 40 30 20 10 0 50 100

Client : Civil Engineering and Development Department

Surveyor : EGS (ASIA) LIMITED
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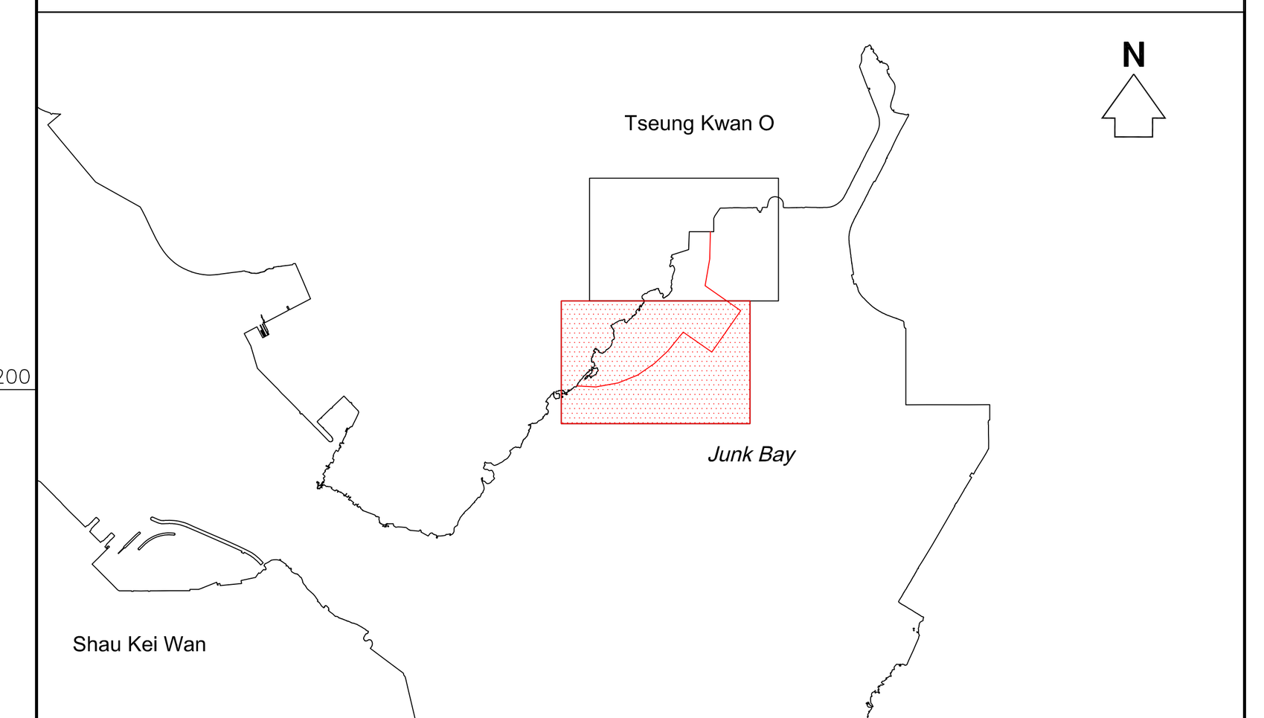
Web: www.egssurvey.com

EARTH SCIENCES & SURVEYING

JOB NO. : HK216609

Legend :

9·5	Isopachs value in metres
(line)	Contour at 5 metre interval
(red dashed line)	Survey boundary



Location Plan

Project :

WORKS ORDER NUMBER GE/2007/04.27
AGREEMENT NO. CE 42/2008 (CE)
TSEUNG KWAN O - LAM TIN TUNNEL AND ASSOCIATED WORKS -
FIRST STAGE G.I. REQUEST FOR GEOPHYSICAL SURVEY
AT WEST COAST OF TSUENG KWAN O

FIGURE NUMBER : 10.2

Drawing Title :

CONTOURED ISOPACHS OF ROCK IN ANY STATE OF DECOMPOSITION

Notes :

1. Survey Date : 25–26th June, 2009
2. Survey Grid : Hong Kong Metric Grid
3. Survey Datum : Hong Kong Principle Datum
4. Positioning : C–Nav GcGPS (Globally corrected GPS)
5. Equipment : EGS Boomer System
   Reson 8125 Multibeam Echo Sounder
   Knudsen 320M Dual Frequency Echo Sounder
   Odom Echo Sounder
   Klein 2000 Side Scan Sonar System
6. Coastline taken from 1:1,000 Survey Sheets, Survey and Mapping Office, Lands Department

Revision No.	Date	Drawn by	Checked by	Approved by	Remarks
0	09/07/2009	Clarence Siu	W L Lam	Margie Chen	Preliminary

METRIC SCALE 1:1,000

50 40 30 20 10 0 50 100

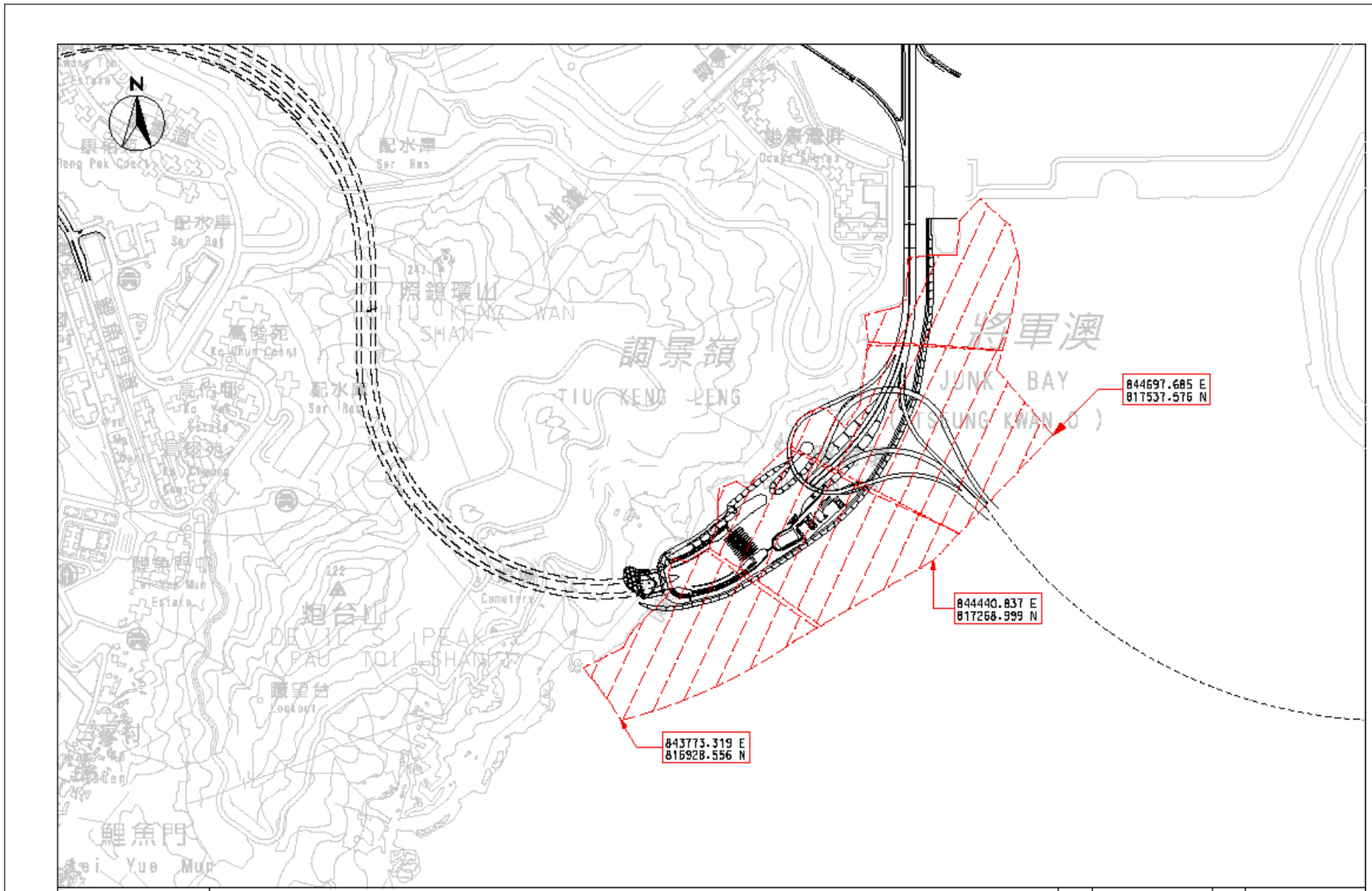
Client : Civil Engineering and Development Department

Surveyor : EGS (ASIA) LIMITED
9/F SOUTH, SOMERSET HOUSE,
TAIKOO PLACE, 979 KING'S ROAD,
QUARRY BAY, HONG KONG
Tel: (852) 28948622
Fax: (852) 25763590
Web: www.egssurvey.com
EARTH SCIENCES & SURVEYING

JOB NO. : HK216609

Figures

Figure 1: MAI Study Area.



. Figure 2: Study Area for 2004 Marine Archaeological Investigation (Archaeo-Environments, 1994. Page 11.).

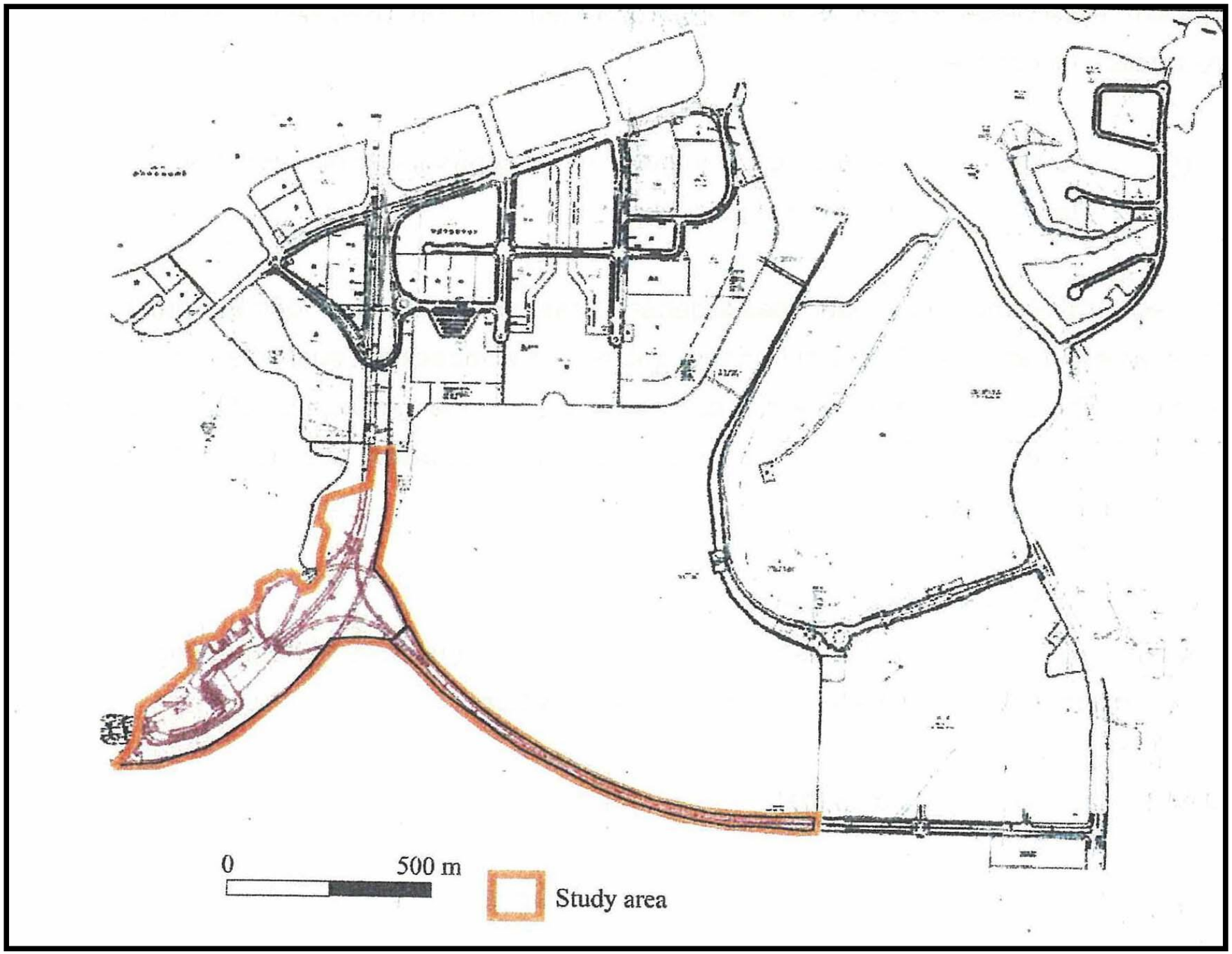
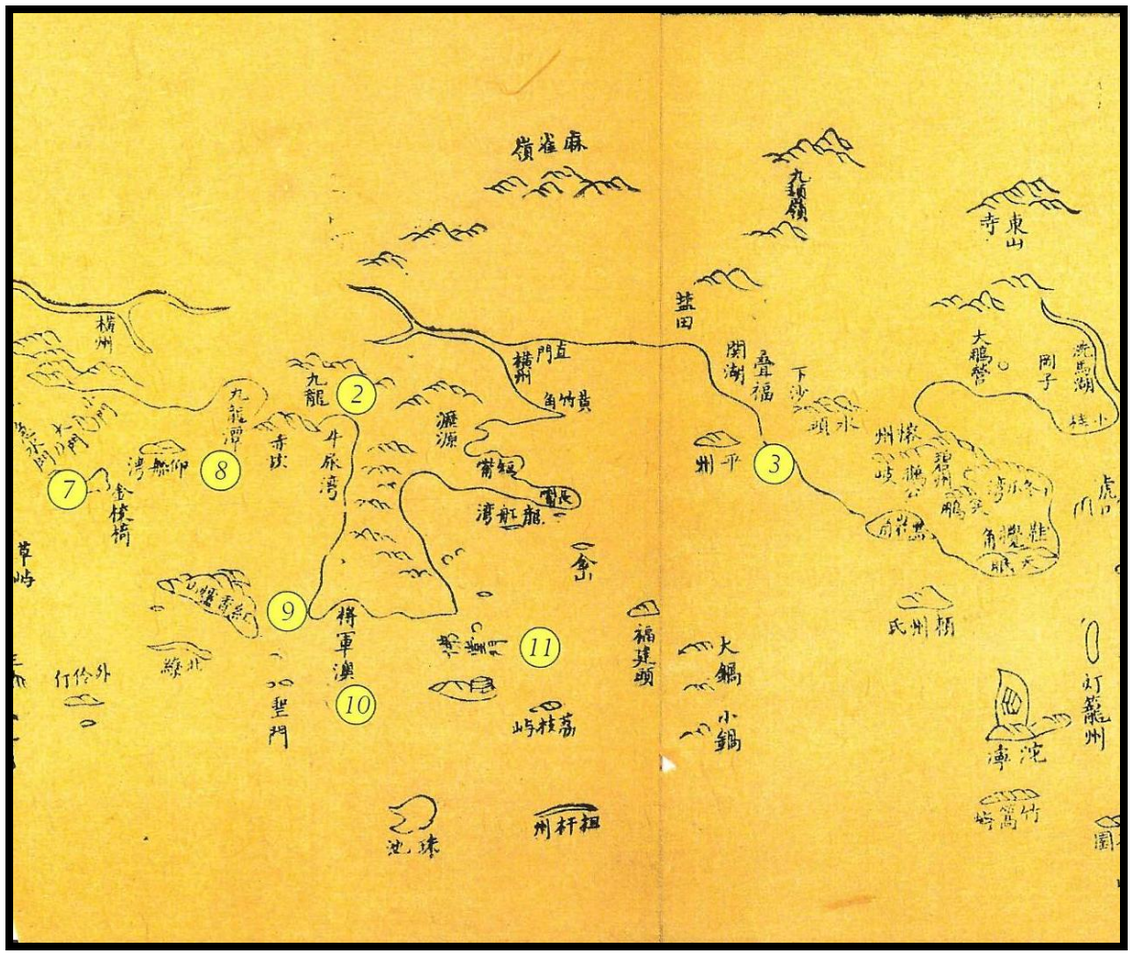


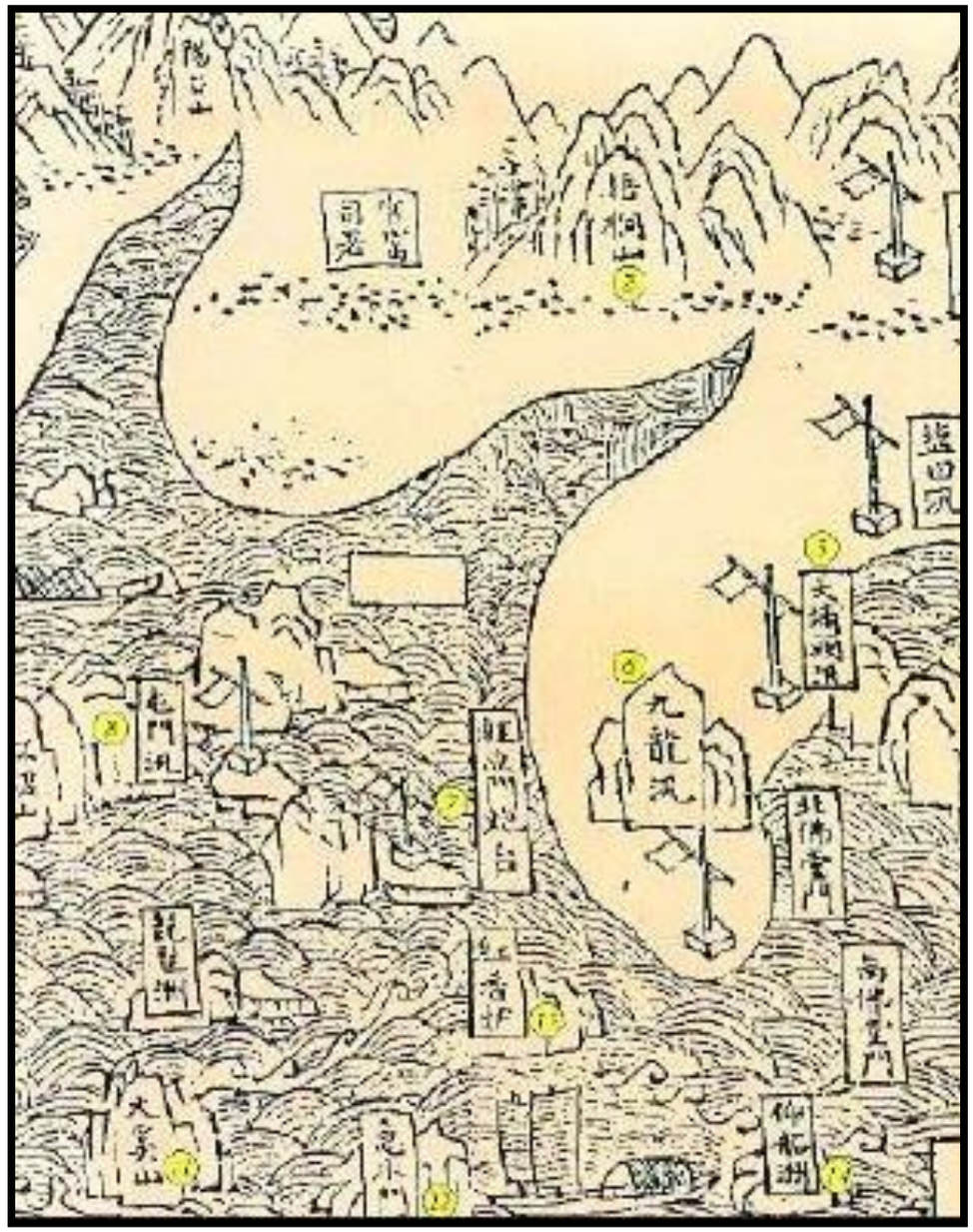
Figure 3. Section of the Map of the Entire Coastline by Chan Lun Kwing in Hoi Kwok Man Kin Luk (Record of the Countries of the Sea) printed by Ngai Hoi Chu Chan in 1744.



Key to place names:

2	Kowloon
3	Ping Chau
7	Kap Shui Mun
8	Ngong Shue Chau (Stonecutters Island)
9	Red Incence Burner Hill (Hong Kong Island)
10	**Tseung Kwan O**
11	Fat Ton Mun

Figure 4: 1819 San On Yuen cartogram from the Directory of San On County.



Key to place names

2 Wung Tung City
3 Tai Po Tai (Tai Po)
6 Kowloon
7 Lei Yue Mun
8 Tuen Mun
11 Tai Hai/Kai Shan (Lantau)
12 Kap Shui Mun
13 Red Incence Burner (Hong Kong)

Figure 5: Sun on District from a Kwang Tung Gazetteer, c. 1864

Figure 6: Section of marine chart prepared for the East India Company by Daniel Ross and Philip Maughan, Lieutenants of the Bombay Marine.

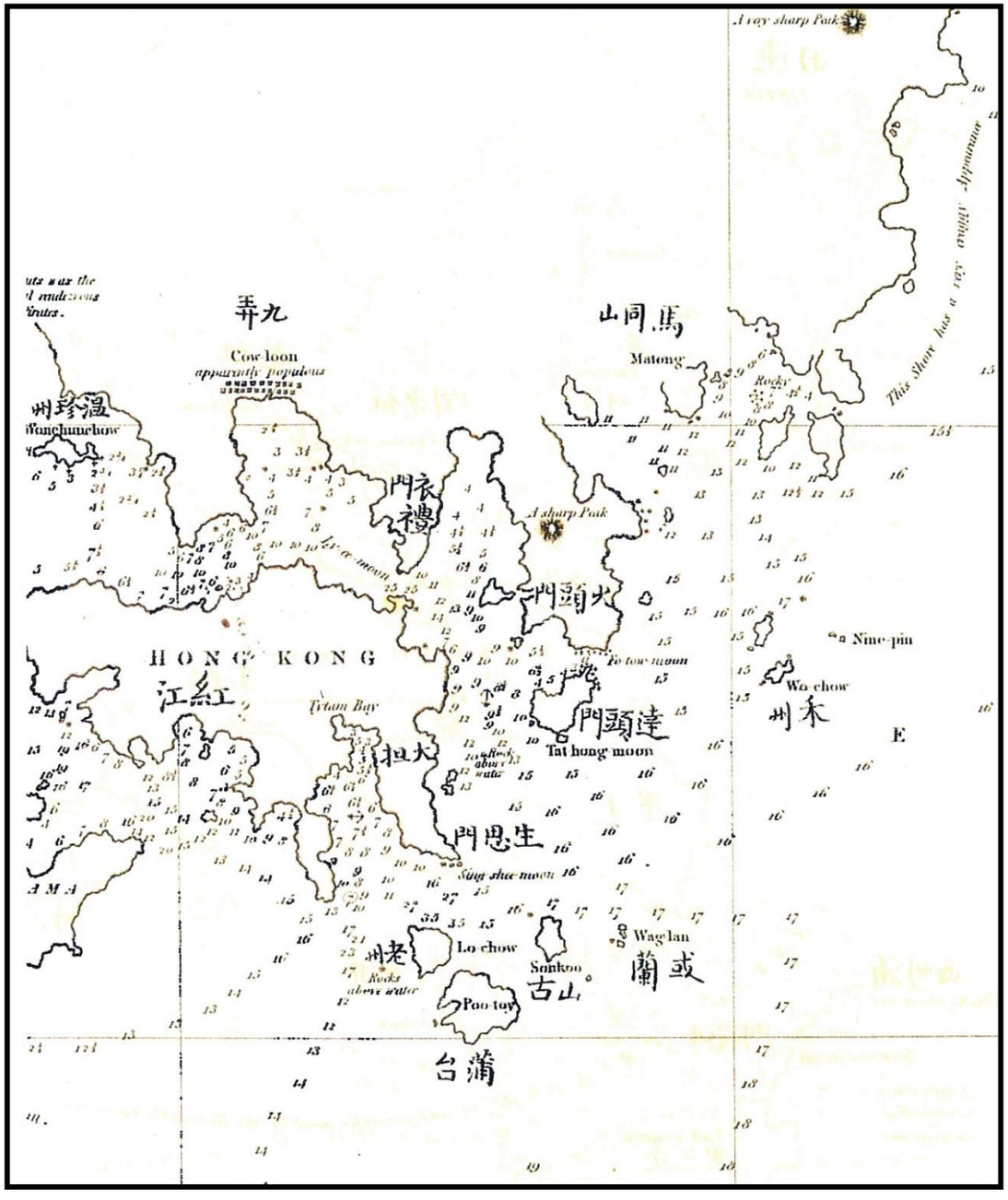


Figure 7: 1841 British Admiralty Chart prepared following hydrographic surveys by Sir Edward Belcher.

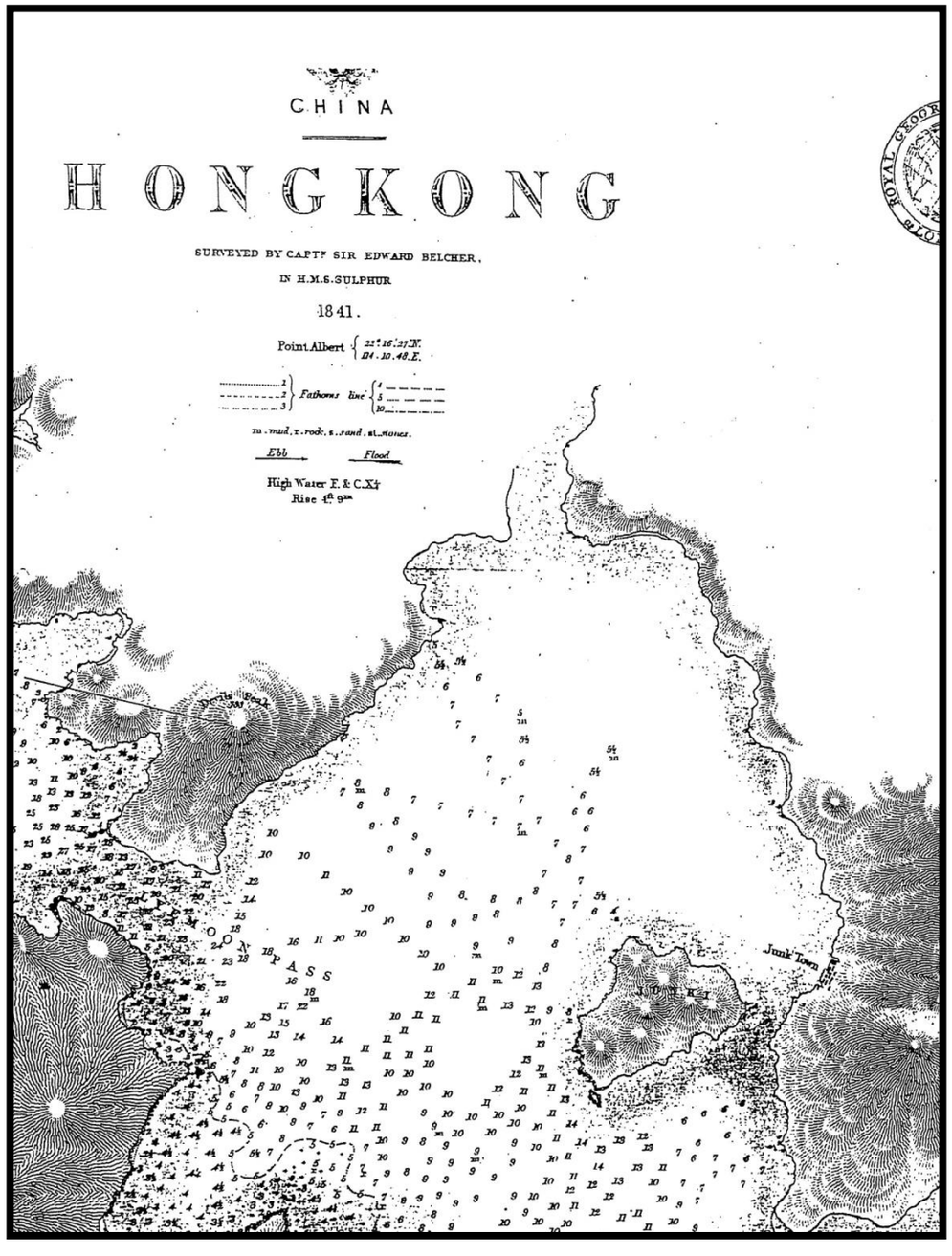


Figure 8 : Hydrographic Chart No. 3279 showing two shipwrecks in Tseung Kwan O.

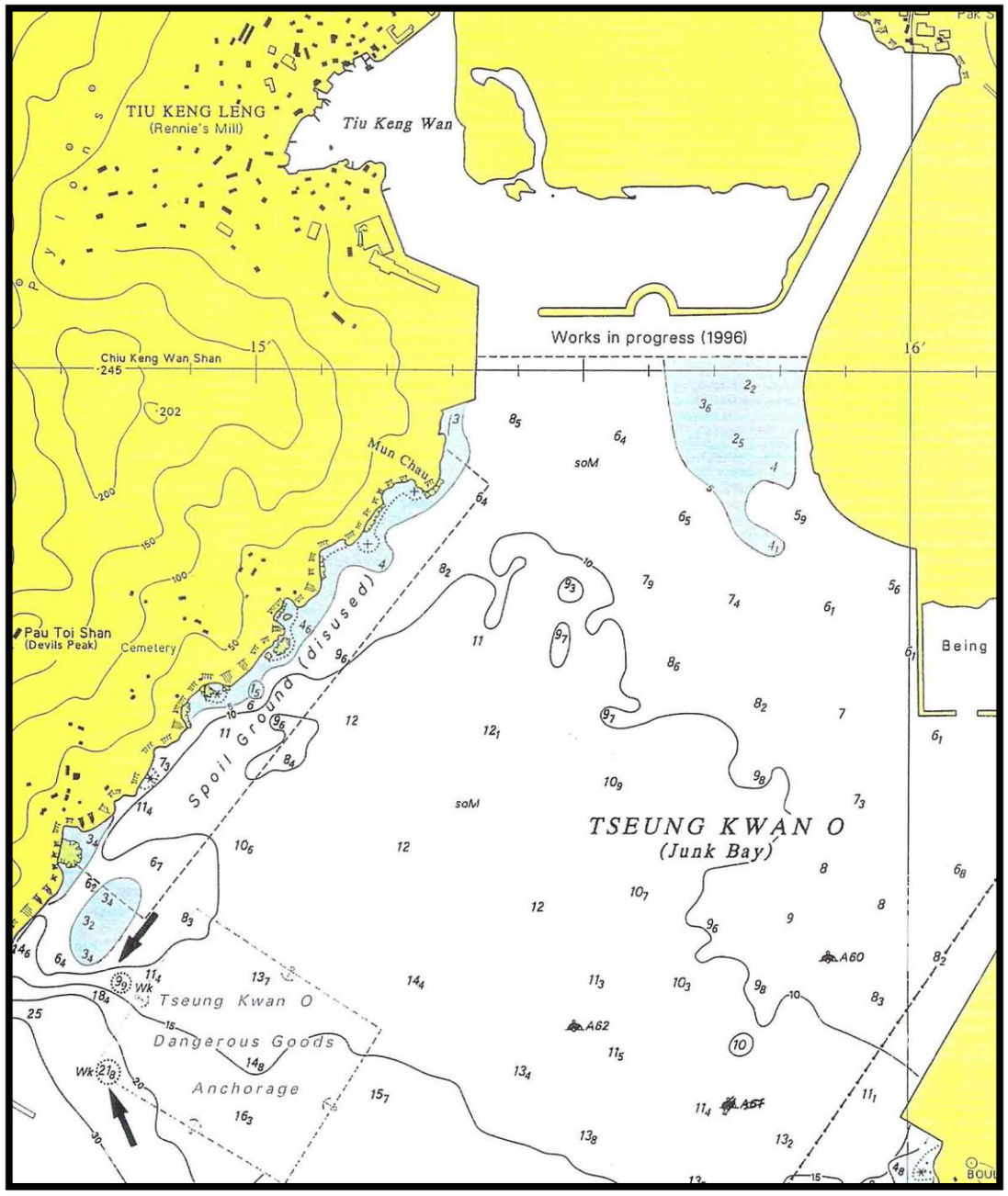
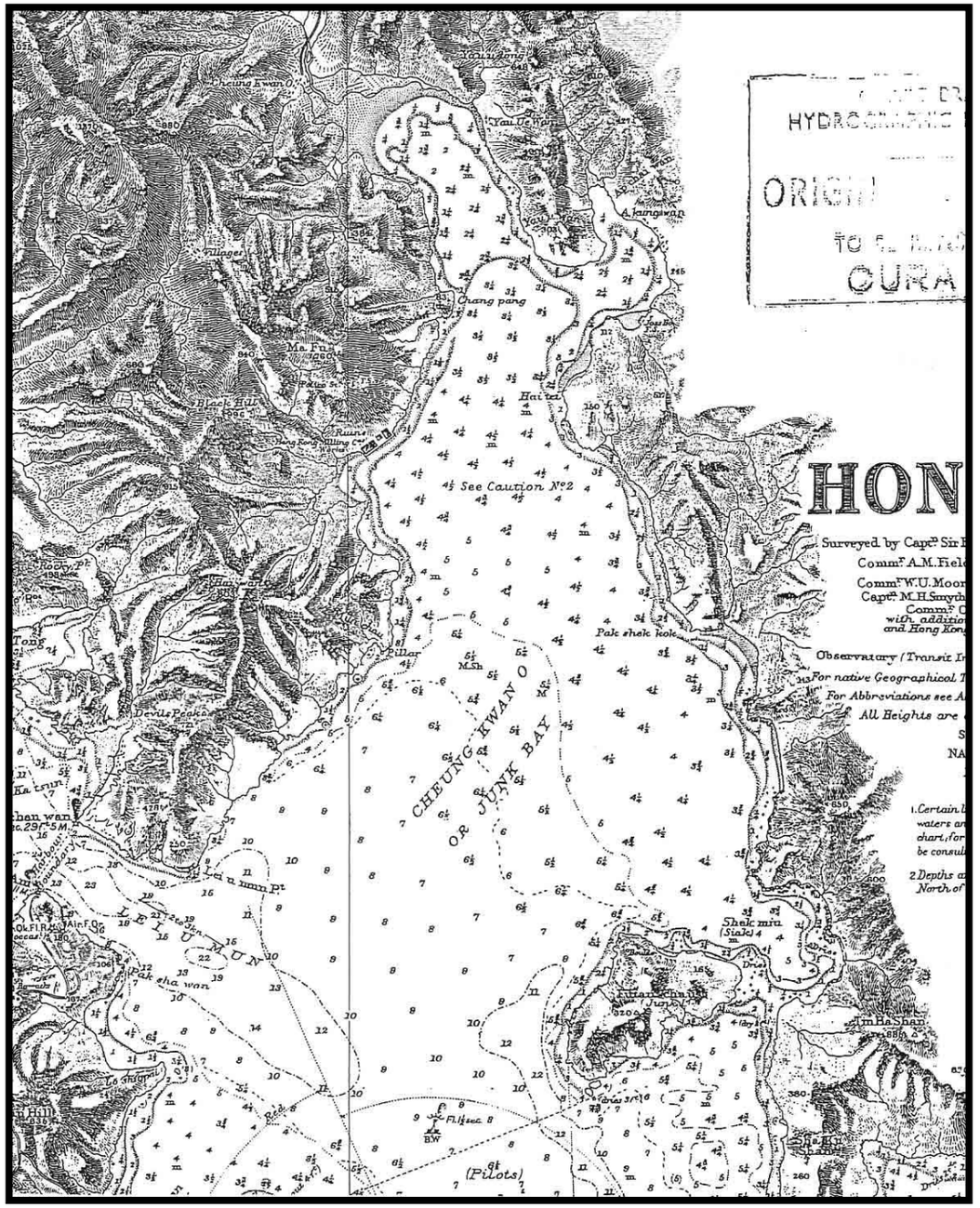


Figure 9: British Admiralty Chart, 1907.



N

4402
4202
4001
WH2-SC008
WH2-SC007
WH2-SC006
WH2-SC005
WH2-SC004
WH2-SC003
3401
EW29-22
SN62-31
SN62-34
2601
EW26-29
EW28-59
WH2-SEI003
2004
WH2-SEI004
WH2-SC002
WH2-SEI002
1804
1803
EW17-13
WH2-SC001
WH2-SEI005
WH2-SEI001
A39-45

Legend

- Undefined objects in 2004
- Undefined objects in 2009
- Boundary of MAI Study Area

AECOM

Agreement No. CE 42/2008 (CE)
Tseung Kwan O - Lam Tin Tunnel and Associated Works - Investigation

Distribution of Unidentified Objects across the Study Area

SCALE	1:7000	DATE	SEPT 2009
CHECK	--	DRAWN	LAULH
JOB No.	60098131	DRAWING No.	Figure 10
		REV	-