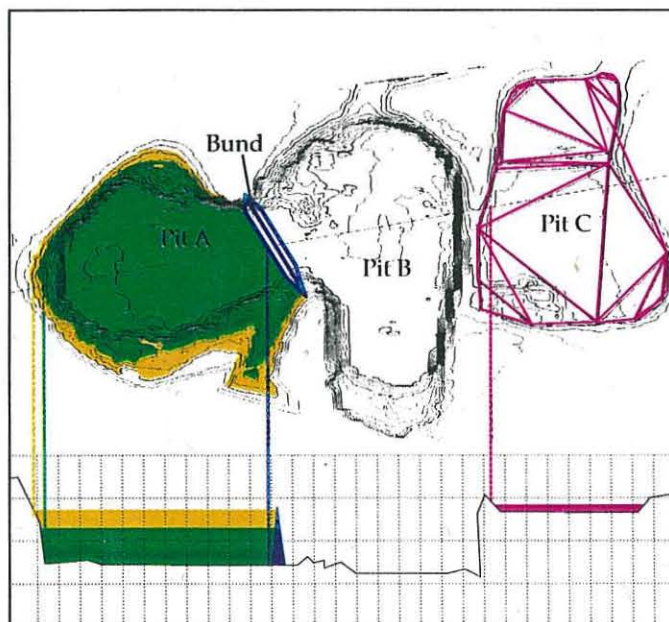


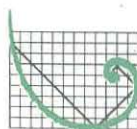
Civil Engineering Department



Environmental Impact Assessment Study for Disposal of Contaminated Mud in the East Sha Chau Marine Borrow Pit

10 February 1997

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ERM

EXECUTIVE SUMMARY

Civil Engineering Department

Environmental Impact Assessment
Study for the Disposal of
Contaminated Mud in the East Sha
Chau Marine Borrow Pit

10 February 1997

For and on behalf of ERM-Hong Kong, Ltd

Approved by: CHANDRAJI NAIR

Signed: C. Nair

Position: MANAGING DIRECTOR

Date: 10 FEBRUARY 1997

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Disposal of Contaminated Mud in the East Sha Chau Marine Borrow Pit Environmental Impact Assessment

- Executive Summary -

INTRODUCTION

This Executive Summary presents the main findings and recommendations of the Environmental Impact Assessment for the proposed disposal of contaminated mud in the East Sha Chau marine borrow pits (the proposed CMP IV).

BACKGROUND

The East Sha Chau marine borrow pits (CMP IV) were created by sand dredging undertaken by the Airport Authority (AA) between April 1994 and February 1995 and are located to the north of Chek Lap Kok Airport and Lantau Island (Figure 1). At present, contaminated mud is deposited in the East Sha Chau Contaminated Mud Pit facilities (CMPs I-III), however the disposal capacity in this site is expected to be exhausted by mid-1997. If put into operation, CMP IV will provide contaminated mud disposal capacity for the Territory until the year 2002.

A recent review of continuous monitoring data collected at the existing CMPs I-III from 1992 to 1995 concluded that current disposal operations are environmentally acceptable. Hence, the EIA focuses on specific features of CMP IV which differ from those of CMPs I-III. These features include: 1) a potentially more variable current regime in both velocity and direction, which may influence sediment transport and deposition, and 2) greater depth and surface area of pits, which may influence erosional patterns and have implications for cap design and placement.

The purpose of the EIA is to provide information on the nature and extent of environmental impacts arising from the proposed disposal activities in CMP IV. Issues addressed include identification and evaluation of direct and indirect impacts to water quality, sensitive receivers, marine habitats, and human health from a variety of operational design elements. Cumulative impacts, as well as the potential benefits, of the proposed reinstatement of the seabed are also addressed.

THE PROPOSED PROJECT

The engineering design for the three contiguous pits A, B and C of the proposed CMP IV is based on the Proposed Operational Scheme presented in the Study Brief. The key elements of the scheme, from an environmental perspective are as follows:

- Following the construction of a bund to separate Pits A and B, Pit A will be filled with contaminated mud to a maximum level of -14 mPD.
- When Pit A has been filled and disposal operations transfer to Pit B, an initial cap of 3 metres thickness will be formed over the contaminated sediment in Pit A using clean mud.

- Pit B will also be filled to -14 mPD before capping with 3 metres of clean mud. The mud required to form the caps to Pits A and B will be sourced from Pit C.
- Additional disposal capacity could be formed in Pit C, if required, by raising the level of the Pits A and B caps to the level of the original seabed using material dredged from Pit C.
- Pit C will be backfilled to a level of -14 mPD and capped with clean material as in Pits A and B.
- In order to ensure restoration of the natural seabed and avoid generating a different wave climate over the CMP IV, it will be necessary to continue to hydraulically place clean material in Pits A, B and C as previously placed materials consolidate over time.

STUDY FINDINGS AND RECOMMENDATIONS

The EIA conducted assessments in the areas of marine traffic, water quality, commercial fisheries, marine ecology, air quality and noise. The findings of the assessments are summarised below.

Marine Traffic

Backfilling is expected to terminate in 2003 with the completion of the Pit C cap. Backfilling operations will be well clear of the major shipping route through Urmston Road and are not expected to significantly impact traffic along this route. In addition, the present usage of Urmston Road as a waiting and typhoon anchorage area for large vessels will not be affected.

Water Quality

Water quality impacts associated with the proposed disposal of contaminated material in the East Sha Chau CMP IV were evaluated through use of a three-dimensional hydrodynamic model, TELEMAC, which predicts concentrations of suspended sediment, dissolved oxygen, nutrients and contaminants resulting from various operational scenarios. Disposal of material from both barges and trailers was modelled for Pits A, B and C at both empty and full phases. Validation of TELEMAC was achieved through comparison of modelled current velocities against those observed in the field.

All modelled scenarios complied with both the water quality objectives and an assessment criterion of 10 mg l⁻¹ suspended sediment. The scenario with the maximum elevation in suspended sediment concentration was selected as a representative case on which to base contaminant modelling for seven metals, four PAHs and PCBs and TBT. All contaminants for which data on ambient concentrations were available showed that predicted concentrations would not result in any measurable increase in ambient levels. Similarly, the predicted levels are negligible when compared to EC Water Quality standards and US EPA Aquatic Life Advisory Concentrations. Modelling of pore water advective and diffusive flux rates indicated that contaminant fluxes due to pore water expulsion are very low with rates decaying rapidly and having a negligible effect on water quality.

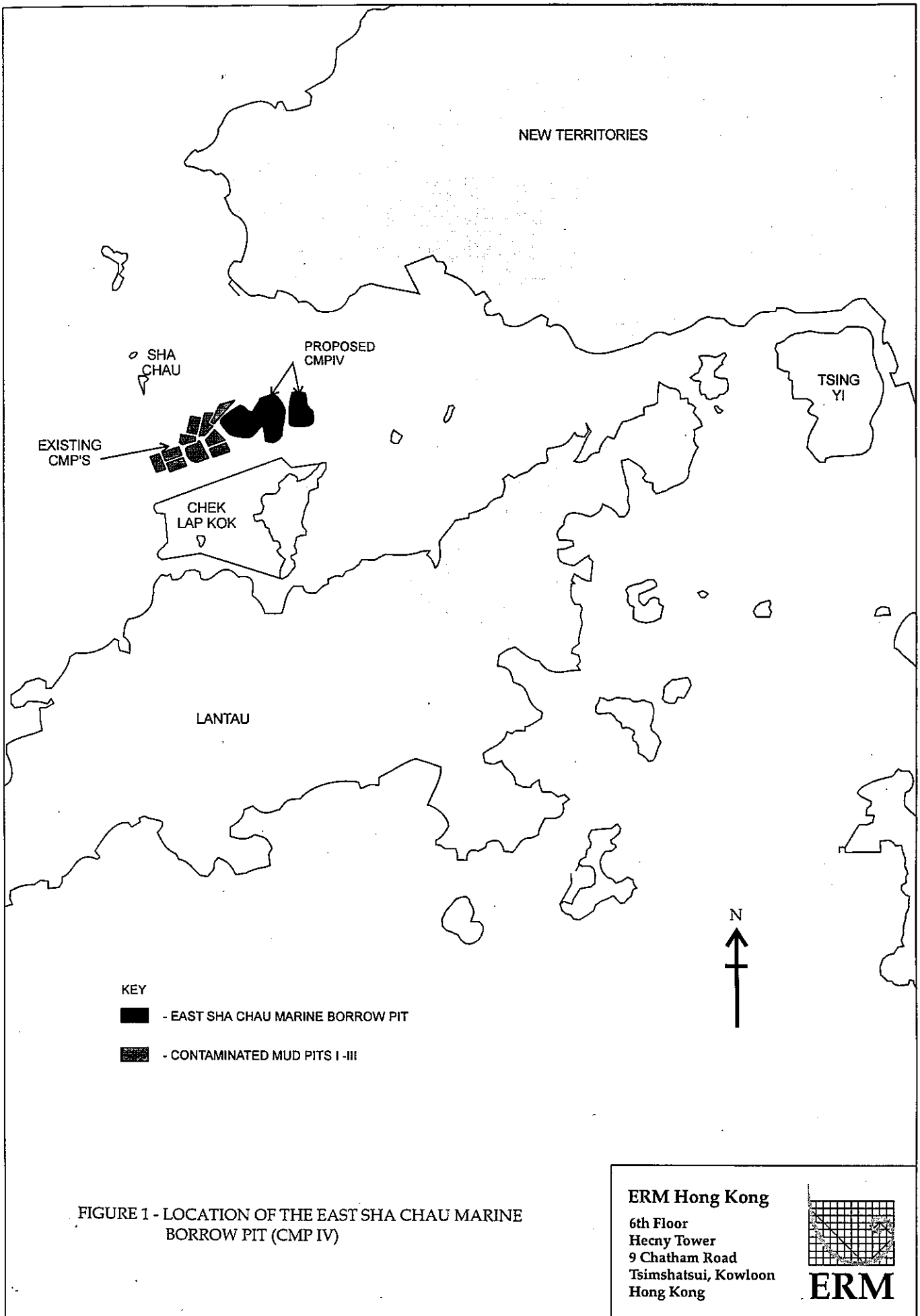


FIGURE 1 - LOCATION OF THE EAST SHA CHAU MARINE BORROW PIT (CMP IV)

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The potential for erosion of the uncapped contaminated mud and the cap itself has been investigated. Analyses have shown that adequate protection from mobilization of contaminated mud during storm events is provided by adopting a maximum backfilling level of -14 mPD. Analyses have also shown that even the erosional forces associated with the most severe storm events would be incapable of breaching the cap and that any erosion of the cap would be compensated by natural deposition processes.

Since predicted elevations/depletions in suspended sediment, dissolved oxygen, nutrients and contaminants will be negligible in comparison to both ambient levels and applicable water quality objectives and standards, it is unlikely that backfilling activities in CMP IV will contribute significantly to cumulative water quality impacts within the study area. Mitigation measures, in the form of operational design and management measures, have been defined. An environmental monitoring and audit programme, which represents a continuation of approved monitoring and audit practices in the CMPs, will be implemented to verify the findings of the EIA.

Commercial Fisheries

A review of existing information on commercial fisheries resources located within and around the ESC CMP IV has identified the area, relative to other areas in Hong Kong, as supporting low abundances of demersal fisheries resources and high abundances of pelagic fisheries resources. While earlier studies have indicated that the East Sha Chau area is an important nursery and spawning ground, initial results from ongoing studies show that the area supports a low abundance of juvenile fisheries resources. Disturbances to benthic habitats are predicted to be confined within the CMP IV, and as recolonisation of sediments is expected to occur following completion of works, the project will be of long term benefit in restoring benthic fauna, epifauna and consequently, demersal fisheries resources to the area.

Impacts arising from the proposed backfilling operations are predicted to be largely confined to the CMP IV, and will not cause adverse effects to any habitats or species of commercial or conservation importance. While no special mitigation measures are required for fisheries resources, mitigation measures recommended to reduce impacts to water quality to acceptable levels are also expected to mitigate impacts to fisheries resources.

Marine Ecology

A review of existing information on ecological resources located within and around the ESC CMP IV has identified the area as supporting soft bottom benthic fauna, fisheries resources and the Chinese white dolphin *Sousa chinensis*. Information on baseline ecological conditions suggests that no species of conservation importance have been recorded from the area, with the exception of *Sousa chinensis* and *Tachypleus gigas* (Chinese horseshoe crab). Sighting records of *Sousa chinensis* indicate that it is often located near the CMP IV, though it prefers habitat surrounding Sha Chau and Lung Kwu Chau, and ranges throughout the Pearl River Estuary. *Tachypleus gigas* has been recorded from trawl catches taken recently in the ESC region, though none have been taken directly from within CMP IV.

Following the completion of works at CMP IV, sediments are expected to be recolonized, encouraging the restoration of benthic fauna and epifauna in the area.

Although little information regarding the effects of noise on *Sousa chinensis* is available, the noise and underwater disturbances produced by the proposed activities are likely to be minor compared to current activities in the North Lantau area and hence are not expected to have an adverse impact on the species.

Potential impacts associated with contaminant release were examined through a review of several detailed risk assessment studies which indicated that minimal risk to human health and *Sousa chinensis* arises from metals release from contaminated sediments, via the food chain. Although elevated levels of organics in marine mammal tissue are of concern, the application of risk assessment techniques for organics is constrained by a lack of empirically-derived input data. Based on the available information, no unacceptable impacts to human health and *Sousa chinensis* are predicted to result from the disposal of contaminated mud in CMP IV.

Impacts arising from the proposed backfilling operations are predicted to be largely confined to the CMP IV, and will not cause adverse effects to any habitats or species of conservation importance. There are no predicted impacts to water quality or ecological resources within the marine park at Sha Chau and Lung Kwu Chau. Mitigation measures recommended to reduce impacts to water quality to acceptable levels are expected to also mitigate for effects on ecology. Therefore, no special mitigation measures are recommended for ecological sensitive receivers.

Air and Noise

No exceedances of the Air Quality Objectives have been predicted and thus no major impacts to air quality are expected during the disposal, capping and dredging operations, singly and in combination, at CMP IV. Therefore, no insurmountable air quality impacts associated with CMP IV operations are expected and mitigation measures and an air quality monitoring programme are not required for the disposal operations.

Similarly, the proposed disposal operations at East Sha Chau CMP IV will not lead to exceedances of the ProPECC daytime noise guideline and the NCO noise criteria at the nearby noise sensitive receivers in day or nighttime periods. Since no unacceptable impacts are predicted, no mitigation or monitoring measures are necessary.

OVERALL CONCLUSIONS

The detailed assessment of environmental consequences arising from backfilling of the CMP IV at East Sha Chau with contaminated mud indicates there are unlikely to be any insurmountable or unacceptable residual environmental impacts associated with the proposed operations. The operational design has been developed to incorporate mitigation measures as design features and is specified as follows:

- Backfilling level: the proposed backfilling level of -14 mPD will provide adequate protection against erosion of uncapped contaminated material and is thus acceptable;
- Cap thickness: a cap of at least 3m thickness will be resistant to erosion under even extreme storm events (ie similar to Typhoon Signal No 8) and is thus acceptable;
- Backfilling rates: average rates of 16,800 m³day⁻¹ for barges only, 16,000 m³day⁻¹ for trailers only and 16,000 m³day⁻¹ for barges and trailers combined, resulted in no exceedances of applicable water quality objectives and standards. Until higher rates are investigated through further modelling and agreed within Government, disposal rates should be limited to those stated above;
- Plant specifications: modelling of bottom-dumping of both barges and trailers showed no exceedances of applicable water quality objectives and standards and are thus acceptable;
- Temporal Restrictions on Disposal: all assessments indicated the operation of one vessel within each pit at any one time is acceptable;
- Spatial Restrictions on Disposal: disposal from vessels at points within the pit boundaries is acceptable.

Details of the operational procedures and controls are provided in the Operations Plan, which is released as a separate document to the EIA.

According to the detailed findings presented above, the proposed project is considered environmentally acceptable. The impact hypothesis, which represents a statement of the expected environmental consequences to be tested under the environmental monitoring and audit programme, is as follows:

*Impacts associated with disposal of contaminated mud in the East Sha Chau CMP IV are not expected to result in exceedances of water quality objectives at sensitive receivers nor cause exceedances of applicable water quality standards. The operational design has been specified such that disposal of sediments shall not cause a detectable deterioration in sediment quality outside the CMP IV. Physical impacts to fisheries and marine ecological sensitive receivers (eg *Sousa chinensis*) are not expected and no change in contaminant levels in marine organism tissue are predicted to arise from this project. Air and noise impacts are expected to be undetectable.*

This impact hypothesis has been tested under this EIA, and will be verified under the environmental monitoring and audit (EM&A) programme. This programme is defined in the EM&A Manual which is released as a separate document to this EIA.