PERMANENT SITE FOR MID-STREAM OPERATION AT STONECUTTER'S ISLAND

EXECUTIVE SUMMARY

OCTOBER 1995

Mott Connell Limited

COPY NUMBER :

DISTRIBUTION AND REVISION :

PROJECT TITLE **PERMANENT SITE FOR MID-STREAM OPERATION AT STONECUTTERS' ISLAND**
EXECUTIVE SUMMARY
PROJECT NO. T411

Controlled Copy Distribution

Copy No.	Position	Name	No. of Copy Held	Contact Tel No
1	Director in Charge	G W Lovegrove	1	2828 5707
2	Project Director	R M Bradley	1	2828 5733
3	Project Manager	P R Smith	1	2828 5895
4	Environmental Project Manager	C J M Whiteford	1	2828 5738
5	Client (TDD-NTWDO)	P S Li	3	
6	EPD	K F Tang Arthur Lee	5	
7	Library	S Hung	1	2828 5890

Revision	Date	Approval (Project Director)	Remarks
00	12 October 1995		Draft Issue
01	26 October 1995		Final Issue

COPY NUMBER :

DISTRIBUTION AND REVISION :

PROJECT TITLE **PERMANENT SITE FOR MID-STREAM OPERATION AT STONECUTTERS' ISLAND**
EXECUTIVE SUMMARY
PROJECT NO. T411

Controlled Copy Distribution

Copy No.	Position	Name	No. of Copy Held	Contact Tel No
1	Director in Charge	G W Lovegrove	1	2828 5707
2	Project Director	R M Bradley	1	2828 5733
3	Project Manager	P R Smith	1	2828 5895
4	Environmental Project Manager	C J M Whiteford	1	2828 5738
5	Client (TDD-NTWDO)	P S Li	3	
6	EPD	K F Tang Arthur Lee	5	
7	Library	S Hung	1	2828 5890

Revision	Date	Approval (Project Director)	Remarks
00	12 October 1995		Draft Issue
01	26 October 1995		Final Issue

1.0 INTRODUCTION

1.1 Background

Due to the increasing demand for land and berthing facilities to support midstream operations, it was proposed as part of the CT8 study that the reclamation formed for CT8 should be extended at the south-western corner of Stonecutters' Island. A full Environmental Impact Assessment (EIA) was carried out for the provision of reclamation to site these facilities as part of the Study. Under the Terminal 8 Entrustment, Site for Midstream Operations Initial Design, Final Report both the noise and water quality impacts were reviewed using the preliminary design assumptions contained therein.

The purpose of this supplementary EIA is to assess the likely environmental disturbances which arise from the construction methods and programmes for the Stonecutters' Island Midstream Operations Site and public Cargo Working Area (PCWA) access road based on the assumptions and requirements of the detailed design.

1.2 The Site

The trapezoidal site which encompasses an area of 7 hectares is to be formed at the southwestern corner of Stonecutters' Island, as illustrated on Figure 1. An access road associated with the adjacent Naval Base is presently being formed on reclamation involving about 15% (1 hectare) of the total area of the site for the Midstream Operation's. The site boundary to the north abuts the CT8 reclamation with an access road to the PCWA being constructed at the extremity of the CT8 reclamation. Both the western and southern seawalls, which are 230m and 276m in length respectively, will provide berthing facilities for barges.

1.3 Scope of Work

This Supplementary EIA was charged with identifying the extent of environmental impacts arising from the construction of the site for the Midstream Operations and PCWA access road and to review the conclusions drawn from the foregoing EIA in which the operational impacts were assessed.

In the Initial Design Report it was identified that marine deposits in the Study Area were severely contaminated with heavy metals. In keeping with Government policy the design principles were initially based on the minimisation of dredging of marine mud prior to forming the seawalls and reclamation. Methods which could achieve this objective were reviewed and included the application of the deep chemical mixing technique, which essentially involves the injection of concrete into the marine deposits to provide the necessary stabilisation for the foundation of the seawalls and reclamation. Adoption of this method significantly reduces the displacement of marine deposits and confers an implicit environmental benefit on the overall design. However the detailed review of this technique led to the conclusion that it would be too expensive for such a small reclamation in addition to which it was considered that it would not provide the most reliable engineering solution for the formation of land at this site.

Both the partial dredge and fully dredge options prior to land formation were subsequently assessed as part of the detailed engineering design. The detailed analyses of the partially dredge solution identified, inter alia, the amount of surcharge which would need to be placed over the reclamation to accelerate the settlement of the marine

1.0 INTRODUCTION

1.1 Background

Due to the increasing demand for land and berthing facilities to support midstream operations, it was proposed as part of the CT8 study that the reclamation formed for CT8 should be extended at the south-western corner of Stonecutters' Island. A full Environmental Impact Assessment (EIA) was carried out for the provision of reclamation to site these facilities as part of the Study. Under the Terminal 8 Entrustment, Site for Midstream Operations Initial Design, Final Report both the noise and water quality impacts were reviewed using the preliminary design assumptions contained therein.

The purpose of this supplementary EIA is to assess the likely environmental disturbances which arise from the construction methods and programmes for the Stonecutters' Island Midstream Operations Site and public Cargo Working Area (PCWA) access road based on the assumptions and requirements of the detailed design.

1.2 The Site

The trapezoidal site which encompasses an area of 7 hectares is to be formed at the southwestern corner of Stonecutters' Island, as illustrated on Figure 1. An access road associated with the adjacent Naval Base is presently being formed on reclamation involving about 15% (1 hectare) of the total area of the site for the Midstream Operation's. The site boundary to the north abuts the CT8 reclamation with an access road to the PCWA being constructed at the extremity of the CT8 reclamation. Both the western and southern seawalls, which are 230m and 276m in length respectively, will provide berthing facilities for barges.

1.3 Scope of Work

This Supplementary EIA was charged with identifying the extent of environmental impacts arising from the construction of the site for the Midstream Operations and PCWA access road and to review the conclusions drawn from the foregoing EIA in which the operational impacts were assessed.

In the Initial Design Report it was identified that marine deposits in the Study Area were severely contaminated with heavy metals. In keeping with Government policy the design principles were initially based on the minimisation of dredging of marine mud prior to forming the seawalls and reclamation. Methods which could achieve this objective were reviewed and included the application of the deep chemical mixing technique, which essentially involves the injection of concrete into the marine deposits to provide the necessary stabilisation for the foundation of the seawalls and reclamation. Adoption of this method significantly reduces the displacement of marine deposits and confers an implicit environmental benefit on the overall design. However the detailed review of this technique led to the conclusion that it would be too expensive for such a small reclamation in addition to which it was considered that it would not provide the most reliable engineering solution for the formation of land at this site.

Both the partial dredge and fully dredge options prior to land formation were subsequently assessed as part of the detailed engineering design. The detailed analyses of the partially dredge solution identified, inter alia, the amount of surcharge which would need to be placed over the reclamation to accelerate the settlement of the marine

clay was untenable in engineering terms and a delay of 21 months in the commissioning of the facilities would ensue.

Assessment of the environmental implications associated with these dredging options led to conclusion that:

(i) the difference in dredging volumes between the full and partial dredge options is small (674,000m^3 compared to 554,000m^3 respectively).

(ii) environmental benefits accrued from leaving the additional marine mud in place are minimal compared to the engineering difficulties to be surmounted;

(iii) water quality impacts can be controlled through the implementation of stringent criteria in the Contract Documents and reinforced through monitoring and audit; and

(iv) additional noise and air quality impacts would be expected if the partial dredge solution was adopted.

Furthermore it was concluded that with the full dredge option the current programme can still be met and the environmental impacts can be controlled to acceptable levels.

The detailed findings of this Supplementary EIA have thus contributed to the decisions on:

(i) the acceptability of any adverse environmental consequences associated with the development;

(ii) the conditions and requirements for the detailed design, construction and operation of the proposed development; and

(iii) the acceptability of any residual impacts after mitigation measures are implemented.

1.4 Assumptions Adopted for the Assessments

The following fundamental assumptions were adopted for use in this Supplementary EIA:

(i) the construction period is assumed to be between 0700 and 1900 hours for all activities except sandfilling which will be undertaken 24 hours per day;

(ii) the Contractor will need to obtain a Construction Noise Permit (CNP) in order to carry out sandfilling activities between the period 1900 and 0700 hours;

(iii) dredging of the existing seabed will be carried out prior to forming the seawalls using 3 closed end grab dredgers and 8 barges and tugs. Dredging will take place over a period of 60 days;

(iv) an estimated 674,000m^3 of marine deposits will require disposal, of which a total of 328,000m^3 is defined as contaminated and thus requires disposal at the East Sha Chau Contaminated Mud Pits;

(v) 600m of new seawall will be formed with a piled deck constructed over sloping revetments;

(vi) marine sand will be used for the formation of land and will be placed by barge and bulldozer. Filling will take place in three stages with 1.3million m^3 placed by 10 pelican barges up to +2.5mPD, and by bulldozer between +2.5mPD and +5.2mPD. Surcharge will be then be placed to a level of +9.2mPD involving a total volume of 160,000m^3.

2.0 ENVIRONMENTAL FRAMEWORK

2.1 Sensitive Receivers

Possible sensitive receivers for air and noise impacts are listed on Figure 2. All these sensitive receivers are out of sight of the mid-stream operations cargo handling area. The hill at the west end of Stonecutter's Island is a natural barrier between the mid-stream operations cargo handling area and the sensitive receivers. Figure 2 shows the location of Sensitive Receivers and provides a summary of details regarding the sensitive receivers.

Beneficial uses including "marine life", "navigation and shipping" and aesthetic quality are all ascribed to the Victoria Harbour Water Control Zone. There are no sensitive uses close to or in within the area of influence of this Project nor are there any fish spawning grounds.

2.2 Existing Environmental Conditions

2.2.1 Background Noise Levels

The study site until recently was a rural area where there were no dominant noise generating sources however, the character of the rural area has been changed by the surrounding development. On the western extremity of the island CT8 has been largely completed. The government Dockyard is located on the north shore of the island in the East Basin but are sheltered from the study site by a steep hill.

Noise from these sources will therefore not be included in the cumulative assessment. The adjacent South Shore Naval Facility is now under construction and will still be under construction during the construction period for this site. This will therefore be taken into account in the cumulative construction assessment.

Routine noise monitoring data collected by the Contractor for the South Shore Naval Facility has been reviewed to provide background data within the site. A summary of these results are included in Figure 2.

At present the only noise sources besides construction of the South Shore Naval Facilities are from ferries, shipping, aircraft, and helicopters. The background noise, however, due to the construction noise associated with the South Shore Naval Facilities is relatively high, even during the night time period.

2.2.2 Background Air Quality

Background levels of air pollution in the study area are determined by the following three factors.

- Construction activities associated with the South Shore Naval Facilities as a result of emissions from barges/dredgers, placement of fill and site traffic. Reclamation activities for the access road to the South Shore Naval Facilities - these abut the north eastern portion of the site.

- There are no industrial/commercial land uses in the area. The other existing air quality impacts arise from the operation of CT8 and the Government Dockyard on the North Shore. These sites have some impact on the environment particularly in terms of dust impact. However, prevailing winds are such that dust from these sources are carried away from the sensitive receivers.

- Roads on the island are only used for local transportation between Military locations. The island is so small that access to most points is easily attained by foot.

At present routine air quality monitoring data being collected by the Contractor for the adjacent South Shore Naval Facility, currently under construction, have been reviewed to provide background data within the site. The background 24 hour TSP level is 130 $\mu g/m^3$, this is well within the AQO.

It is recommended that 1 hour and 24 hour TSP monitoring should be carried out for at least two weeks immediately prior to the start of the works to establish updated background levels for monitoring during construction.

2.2.3 Existing Water Quality

Routine water quality monitoring data collected by the Contractor for the adjacent Naval Facility, which is currently under construction, have been reviewed to provide reference data for this Study. A summary of the baseline and impact monitoring data are provided in Table 2.1.

Table 2.1 Water Quality Monitoring Data Provided for Background and Control Measurements at Stonecutters Island Naval Facility

Parameter	Range of Baseline Values at M1 (refer to Figure 5.2)	Typical Values Recorded During Impact Monitoring at M1 when Dredging Uncontaminated Mud at West and North Seawalls
DO	(S) 4.1 - 11.4 mg/l mean 6.7 mg/l (B) 3.8 - 10.9 mg/l mean 6.5 mg/l	(S) 6.3 mg/l (mid flood) 6.4 mg/l (mid ebb) (B) 5.9 mg/l (mid flood) 5.9 mg/l (mid ebb)
SS	(S) 4.6 - 32.2 mg/l mean 13.7 mg/l (B) 6.4 - 42.2 mg/l 18.7 mg/l	(S) 15.6 mg/l (mid flood) 16.7 mg/l (mid ebb) (B) 19.3 mg/l (mid flood) 21.5 mg/l (mid ebb)
Turbidity	(S) 3.7 - 22.3 NTU mean 9.5 NTU (B) 3.5 - 32.8 NTU 12.8 NTU	(S) 9 NTU (mid flood) 12 NTU (mid ebb) (B) 13 NTU (mid flood) 14 NTU (mid ebb)

While the results of the baseline monitoring suggest there may have been problems with the initial calibration of equipment (exceeding high DO levels indicating extreme supersaturation) the inclusion of the above Table is useful in that it indicates the general quality of water in the immediate area of this Site.

2.2.4 Sediment Quality and Fill Material

Data collected under the Terminal 8 Entrustment Site for the Midstream Operations, Initial Design Final Report, March 1995, revealed significant contamination by heavy metals in the sediment samples collected. Site investigations indicated severe contamination, to varying degrees, in the marine clay layers which is approximately 11m thick. Sediment quality has a considerable impact on, inter alia, the type of dredging equipment employed on site and the disposal arrangements. Thus this Project was charged with defining the extent of the contamination and the necessary mitigation measures, providing conditions of contract to ensure acceptable environmental conditions would prevail during and following this activity, and to identify any constraints on the programme.

3.0 NOISE IMPACT

3.1 Construction Phase

Basic assumptions for this assessment were that with the exception of sandfilling construction, works would be confined to between 0700 and 1900 hours. It was assumed for this assessment that two sets of piling rigs could be used at any given time during the unrestricted hours. On this basis the predicted noise level at all the noise sensitive receivers (NSR's) was 69dB(A) which is well below the Acceptable Noise Level (ANL) of 85dB(A) which is permitted under the Noise Control Ordinance for this activity.

For construction activities other than percussive piling, which include reclamation and road construction, the predicted noise levels indicated the maximum noise level would be 59dB(A) for the daytime and evening and 41dB(A) for the nighttime, which would not exceed the standards during either the periods between 0700 and 1900 hours or 1900 and 2300 hours which are 75dB(A) and 45dB(A) respectively.

When the ongoing construction activities at the adjacent Naval Base are modified in concert with those programmed for the Midstream Operations the cumulative noise levels at NSR 1, 2, 3 and 7 are forecast to exceed the 75 dB(A) level permitted during the periods between 0700 and 1900 hours.

The noise emission from the construction activities associated with the Midstream Operations site is negligible compared to those for the construction of the adjacent Naval Base. Its maximum contribution to the overall noise levels is only 0.15dB(A) as such no mitigation measures are required for works at the Midstream Operation Site.

3.2 Operational Phase

The Interim Design Final Report reviewed the traffic noise impact as a result of the additional traffic noise generated from this site and concluded that there would be negligible traffic noise impact.

4.0 AIR QUALITY

4.1 Construction Impacts

Air quality assessments were undertaken using the Fugitive Dust Model (FDM) to predict the levels of dust which could be generated as a result of the construction activities. Impacts on the predefined sensitive receivers were assessed and referenced against background TSP levels which were assumed to be 130$\mu g/m^3$ based upon the routine air quality monitoring data collected by the Contractor for the adjacent South Shore Naval Facility Site.

At ASR2 the maximum predicted 1 hour TSP levels was 218 $\mu g/m^3$ and the maximum predicted 24 hour TSP level was 135 $\mu g/m^3$ which was predicted at ASR4. Comparison of these results with the guidelines provided by EPD for allowable levels of dust at the site boundary (500 $\mu g/m^3$ (1hr) and 260 $\mu g/m^3$ (24hr)), during construction, it is apparent that there will be no exceedance of either guidelines nor of the AQO's.

Cumulative assessments were also carried out to define the extent of the impacts associated with the concurrent construction of the Naval Base and the Midstream Operations Facilities. Interpretation of the model predictions indicates that the elevation in TSP levels at ASR2 and ASR4 are 392 $\mu g/m^3$ (1hr) and 167 $\mu g/m^3$ (24hr) respectively. It may therefore be concluded that even when the two projects are being concurrently constructed there will be no exceedance of the AQO's.

4.2 Operational Phase

It has been identified that once the Midstream Operations facilities are completed there will be no sensitive receivers affected by the operational activities. Only a small number of vehicles will enter and leave the site on a daily basis and thus the contribution of these emissions on ambient air quality will be minimal.

5.0 WATER QUALITY

5.1 Construction Phase Impact Assessment

Activities which could adversely affect water quality during the formation of this site primarily relate to the dredging and disposal of marine mud and the placing of fill for the reclamation of land for the Mid Stream Operations. Other water quality issues include uncontrolled runoff from the partially formed site and spillages of washwaters or other liquid or solid wastes into the receiving waters. All of these issues were addressed as part of the overall environmental assessment to ensure that all practical provisions have been made for the minimisation of marine pollution during the construction phase of this Project.

5.1.1 Dredging

Key issues which were addressed via this assessment include the definition of the extent of potential sediment contamination, determination of the response of the marine environment to the potential release into the water column of trace metals and organic micropollutants from the material being dredged and the definition of the mitigation measures necessary to minimise the impacts of dredging to the lowest acceptable levels.

An integral component of the water quality assessments was the adoption of mathematical modelling techniques which were employed to:

(i) determine the potential for migration of sediments from the dredging site;

(ii) define the extent of the near field impacts; and

(iii) identify the potential for off-site impacts through transportation and redeposition of sediments which could potentially contain contaminants which were not released during dredging.

Sediment sampling and testing carried out for the Initial Design Final Report revealed abnormally high levels of heavy metals in the marine clays in the Study Area compared to adjacent sites. The decision was made to undertake additional tests to define more accurately the extent of the vertical and horizontal contamination and to determine the potential for release of the pollutants during dredging.

The two tier testing procedure was formulated to

(i) establish the quantity of sediment which was contaminated, via bulk sediment analyses, and thus to identify the quantities which require to be disposed of to the East Sha Chau Contaminated Mud Pits;

(ii) define the concentration of metals and persistent pollutants which could be released to the water column as a consequence of dredging via elutriate tests.

From the results of the laboratory analyses on bulk sediment samples it was concluded that contamination is widespread throughout the Study Area and that the average base of contamination is approximately -14.5mPD, as illustrated on Figure 3. It was hypothesised that given the sedimentation rates in the area (about 40mm per annum) and the sharp changes in the degree of contamination in individual vibrocores, that the contamination is anthropogenic.

An estimated 328,000m^3 of marine deposits are defined as contaminated, with zinc, copper, lead and chromium being the dominant contaminants. Using the combined results from the bulk sediment analyses and the elutriate tests it is possible to estimate the extent of the transfer of contaminants from the (bulk) solid to liquid phase. It was estimated that cadmium most readily transcended from solid to liquid phase with an estimated 4% release rate, followed by nickel with a release rate of 0.1%. All other metals predominantly remained bound into the solid phase with less than 0.01% release reported. It is pertinent to note that the tests used for this assessment were based on the process of hydraulic dredging which will cause a greater release of material to the water column than grab dredgers. Thus it may be concluded that even though the sediments are contaminated the amount of pollutant released to the water column during dredging will be minimal.

In order to determine the extent of the potential effect of dredging on the receiving water quality, recourse was made to the sediment plume model from the WAHMO suite of models using input data including the number of dredgers active on site, the dredging rate and the sediment losses to the water column. Interpretation of the results indicated that the effects of dredging will be confined to the water body local to the dredging activities (radius of 250m), and that there will be no adverse impacts on the nearest fish culture zone or at the seawater intake. Figure 3 shows an outline of the maximum

extent of impact resulting from dredging activities as reflected by suspended sediment concentrations both during the wet and the dry season.

Notwithstanding the foregoing it was identified that measures to minimise the impacts of dredging on the receiving waters can be minimised in various ways without having any adverse impact on the Contractors working methods or the programme. Methods include the use of the special plant, closed end grab dredgers which is required for dredging contaminated mud for all of the dredging works. This will reduce sediment losses to the water column by at least 50% compared to the situation if clamshell grab dredgers were employed. The implementation of closed end grab dredgers will also minimise the cumulative impact of dredging at the adjacent Naval Base.

It is not anticipated that the organic micropollutants will be released during dredging using closed end grabs at a level which could be detected. It is therefore considered that the potential risk of bioaccumulation of these pollutants by any marine mammal or benthic species is extremely remote.

5.1.2 Measures to Reduce the Impact of Construction on the Marine Environment

Notwithstanding the foregoing the following measures have been included in the Detailed Design or provisions have been made in the Particular Specifications for Environmental Protection for the minimisation of impacts on the marine environment during construction:

Dredging

- reduction of sediment losses through application of low impact dredging methods. Sediment losses estimated herein could be reduced by about 70% through employment of cutter suction dredgers, and grab dredgers could reduce the impact by approximately 50%. It is recommended that closed end grabs are used as these can attain a high vertical accuracy which will further reduce the sediment losses. Turbidity generation may still be high during closing and hoisting due to improper closing or debris/silt sticking to the sides of the grab. This can be countered by working within a siltscreen if, and when, required.

- siltscreens have been proven to be effective in the prevention of off-site transportation of fines and are available in various designs. Modifications to dredging plant such as the attachment of a flexible hood on the head of the dredger has been proven to be very successful in the clean-up of Rotterdam Harbour. On this basis it is recommended that the Contractor should review methods for the minimisation of sediment losses which are available and should use these if required (based on the water quality monitoring results) during daily operations.

- sediment losses during dredging should be controlled through the Conditions of Contract to less than 5% of the dredging rate.

- residual impacts can be controlled through inter alia, the use of silt curtains; dredging only on a slack tide or by reducing the actual production rate.

Reclamation

- the Contractor shall, wherever practical, not practical within current programme minimise the release to the water column of fine particles contained within the fill material and possibly being transported off-site. Due to engineering and time constraints it is not possible to fill behind a seawall however other measures such as the use of silt curtains may need to be considered if the water quality monitoring results indicate a deterioration in water quality.

- losses during placement of fill should be controlled through Conditions of Contract to be less than 1% of the filling rate.

- minimise the amount of overburden in the fill material by stripping out the fines at source (as far as practical) before dredging for sand.

- control the rate at which filling takes place.

- modify the rate of filling if wind speed is such that the fugitive dust emissions create a problem.

Domestic Effluent

- discharge to the foul sewer at CT8 which connects to the NW Kowloon Pumping Station and STW.

Disposal of Spoil

- Specific routes for the disposal of spoil should be defined and used by all vessels to and from the spoil disposal grounds and should be specified in the Contract Document.

- control the discharge rate and increase the accuracy when dumping. At the contaminated spoil disposal grounds the disposal of spoil is strictly controlled through licensing and monitoring procedures.

Control of Floating Litter and Refuse

- The Contractor will be required to comply with the provisions of the Summary Offences Ordinance particularly in respect of marine littering.

- The Contractor will also be required to provide and install refuse booms before commencing dumping from barge or direct land dumping of fill material into the sea. The Contractor shall properly maintain and operate refuse booms to the satisfaction of the Engineer and, as instructed by him throughout the progress of the reclamation work, shall replace the same if necessary when they are under repair. In the event of typhoon conditions or any other circumstances as may in the opinion of the Engineer cause damage to the installed refuse booms, the Engineer may instruct or order the Contractor to temporarily dismantle the refuse booms and re-install the same thereafter.

- Sufficient boats and labour will be provided for collecting floating refuse and preventing floating refuse within the site area from drifting into adjacent waters. Floating refuse collected shall be removed to landfill sites by the Contractor.

Silt Curtains

- When dredging or placing fill the Contractor shall surround any seawater intakes within the area of influence with suitable silt curtains to prevent excess silt contaminating the water drawn into the intakes. The silt curtain shall be designed to ensure that indrawn water shall contain less than 140 mg/l of suspended solids. The Contractor shall be responsible for providing and installing silt curtains where required which shall be formed from tough, abrasion resistant, permeable membranes suitable for the purpose, supported on floating booms in such an a manner as to ensure that the ingress of turbid waters to the enclosed waters shall be restricted.

- The bottom of the curtain shall be formed and installed to accommodate the tidal rise and fall, and that ingress of turbid waters is limited. The Contractor shall regularly inspect the silt curtains and shall ensure that they are adequately moored and marked to avoid any danger to marine traffic.

Land Based Sources

- The amount of water used to dampen any surfaces or stockpiles (to minimise fugitive dust emissions) is kept to a minimum and the perimeter drains are provided to minimise surface water runoff.

- Any liquid waste generated on-site as a consequence of this Project will require to be treated and disposed of in accordance with the provisions of the Technical Memorandum on Standards for Effluents Discharged into Drainage, Sewerage, Inland and Coastal Waters (TM) and includes water expelled from wick drains.

- Any special works areas which may be provided for material storage or mixing, will be surrounded by bunds and will have special drainage collection systems to contain any spillages.

- Under the provisions of the WPCO, the WQO's and the Shipping and Port Control Ordinance, no discharges of oily or fuel based wastes are permitted to be made to coastal waters or to the Victoria Harbour Water Control Zone. The Contractor will be required to provide a spill response plan covering all areas in which he will be operating (dredging and disposal sites) which will define his plan of action for dealing with spillages and accidents.

5.2 Operational Impacts

Once the seawall has been formed this structure will have only minimal impact on existing tidal flows.

The operation of the mid-stream facilities will inevitably involve risks, in terms of both chronic (long term low intensity pollution incidents such as surface runoff contaminated with oil) and acute (short term high intensity pollution incidents such as an oil spill) sources of water pollution. Such risks can to a large extent be minimised through appropriate design, of the facilities and reinforced via operational procedures.

It is recommended that all measures to include pollution control facilities into the layout of this site should be undertaken during the detailed design of the land based operations. Pollution control measures should also be incorporated into the daily operations manual and items of equipment which should be provided should include sea witches or similar for the collection of debris and other floatables.

Pollution problems could occur as a result of leakage or spillage of materials while moving containers or due to accidental collisions involving vessels in the berthing areas or approach the site for the Mid Stream Operations. The existing response capability present in Hong Kong to deal with oil related spillages to the marine environment is very efficient at present but with the increase in the port operations/facilities these facilities could be placed under stress and it is recommended that the operator of SIMSO should include pollution response measures in the operations manual for on-site staff.

Maintenance dredging is unlikely to be required for access to this site. The infrequency of this activity, if ever required, and the relatively small quantities of marine deposit removal will, on the basis of the model predictions, have negligible impact on the marine environment.

The following mitigation measures are proposed for consideration in the detailed design of the land based facilities.

- incorporation of adequately sized oil and silt traps to control the migration of such pollutants into the drainage system and ultimately to the marine environment; and

- provision of ship to shore or, at minimum, shore based liquid and solid waste reception facilities.

Other mitigation measures include:

- provision of pollution/incident response team with well defined chain of command and equipment appropriate for any anticipated event;

- access to water witches or similar for removal of "floatables" from the water body.

6. SOLID WASTE

6.1 Waste Arisings

During construction solid waste arisings will include contaminated and uncontaminated marine mud, surplus fill material following consolidation of the reclamation and general waste material associated with road construction and the provision of stormwater drains.

Liquid waste arisings will include domestic effluent from the workforce, runoff from the site between the decommissioning of the stormwater drain on Container Port Road and the provision of new facilities, uncontrolled runoff from the reclamation during consolidation and liquids used for finishing works.

The following measures were considered when preparing the Contract Documents with specific reference to environmental protection:

(i) all solid wastes will be disposed of according to the requirements of the Fill Management Committee and the Environmental Protection Department, the location and the methods adopted for dredging and disposing of marine deposits will be in agreement with the DEP;

(ii) all liquid wastes will be disposed of in accordance with the provisions of the WPCO, its Technical Memorandum and the Practice Note ProPECC PN1/94 relating to Construction Site Drainage;

(iii) temporary sewerage will connect to the existing pit adjacent to the entrance of CT8 whence it shall be conveyed to the North West Kowloon Sewage Treatment Works;

(iv) if canteen facilities are provided on-site for the workforce, all wastewater will be conveyed to the foul sewer via a grease trap with a 20 minute retention period;

(v) bunds and dedicated drainage channels should be provided round any stockpiled areas to prevent uncontrolled runoff charged with solids being discharged to the receiving waters;

(vi) any liquids stored on-site (especially fuels and petroleum based liquids) should be stored in a dedicated area with inbuilt collection pits to collect and properly dispose of any accidental spillages;

(vii) specific controls will be applied to any concrete batching plants which may be located on-site which include the reduction of washout water and its treatment to ensure compliance with the WPCO and its Technical Memorandum; and

(viii) any chemical wastes will be disposed of at the Chemical Waste Treatment Facility at Tsing Yi.

7.0 CONCLUSIONS AND RECOMMENDATIONS

On the basis of the foregoing assessments it may be concluded that for the construction method of the fully dredged option:

(i) construction noise levels from the Midstream Operations site are unlikely to exceed the standards during the daytime and evening. Although the cumulative noise level with the Naval Base works will exceed the 75 dB(A) limit during daytime, the contribution to the overall construction noise level is negligible, only up to 0.15dB(A);

(ii) the construction of the Midstream Operations site and the PCWA access road will not cause significant air quality impact at the sensitive receivers;

(iii) operational air and noise quality impacts as a result of the generation of traffic from this site have been found to be negligible;

(iv) there is considerable contamination of the marine clay in the Study Area both vertically and horizontally;

(v) the base of the contamination is at about -14.5mPD and a total volume of 328,000m^3 is contaminated and requires disposal at the East Sha Chau Contaminated Mud Pits;

(vi) the relative release of contaminants from the sediment to aqueous phase was calculated to be less than 4%;

(vii) the impacts of dredging will be confined to the local area and will be acceptable in terms of achieving the WQO's assuming closed end grab dredgers are used and sediment losses to the water column are less than 5%;

(viii) the rate of filling proposed is also acceptable in terms of the impacts on receiving water quality;

(ix) an estimated of contaminated spoil will be disposed of at the Contaminated Mud Pits at East Sha Chau with the remaining material disposed of at South Cheung Chau; and

(x) once the seawall has been constructed this newly created land will have minimal impact on existing tidal flows.

Furthermore it is recommended that :

(i) the Contractor uses the closed end grab & dredgers required for dredging contaminated mud for all of the marine works thereby minimising the impacts at source;

(ii) while dredging is being carried out the monitoring programme is extended to encompass dissolved oxygen, suspended solids, turbidity and ammoniacal nitrogen levels. The latter has been included to confirm that the release of ammonia predicted in the elutriate tests is indeed an over-estimate; it is recommended that one water sample is collected in the vicinity of the dredging activity each week that this activity is taking place (up to a maximum of twenty samples);

(iii) during the detailed design of the land based facilities particular attention will need to be given to the inclusion of pollution control facilities such as oil and grease traps (with at least 20 minute retention period) into the design to minimise the potential for off-site migration of spillages;

(iv) an estimated HK$17 million will be involved in the disposal of contaminated mud at the East Sha Chau Contaminated Mud with the uncontaminated mud disposed of at South Cheung Chau;

(v) during the construction phase bunds and dedicated drainage channels should be located around stockpiled materials, any areas where liquids are stored or around areas used for the application of finishes to materials;

(vi) drainage of wastewater from any canteen facilities located on site should be diverted through grease and sediment traps which are designed with a retention period of at least 20 minutes;

(vii) the operation of any concrete batching or pre casting facilities which are located on site should be controlled such that the amount of water used during washing out should be minimised; and

(viii) waste reduction measures should be adopted by the Contractor to minimise the amount of materials used and disposed of during the construction phase.

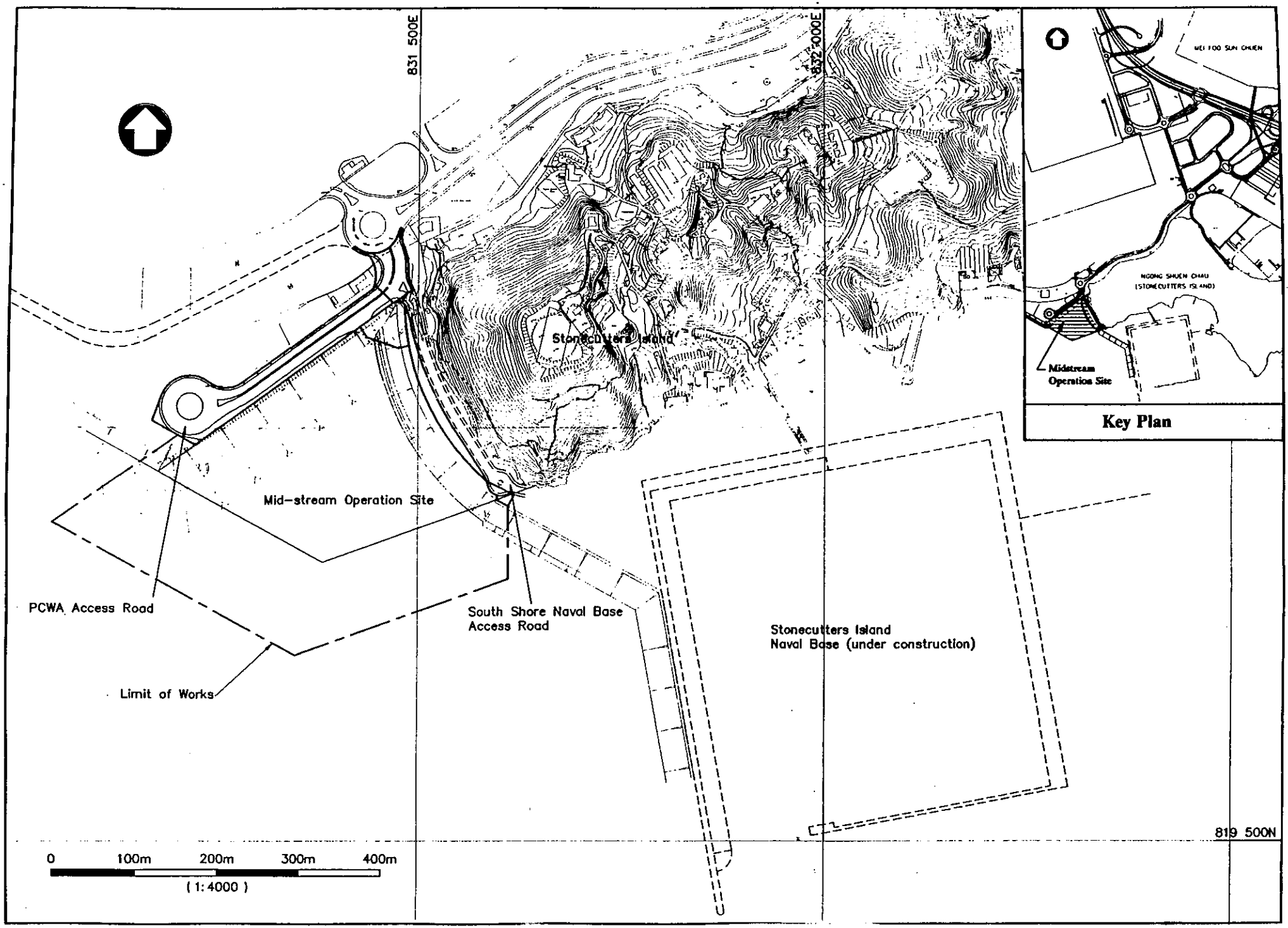
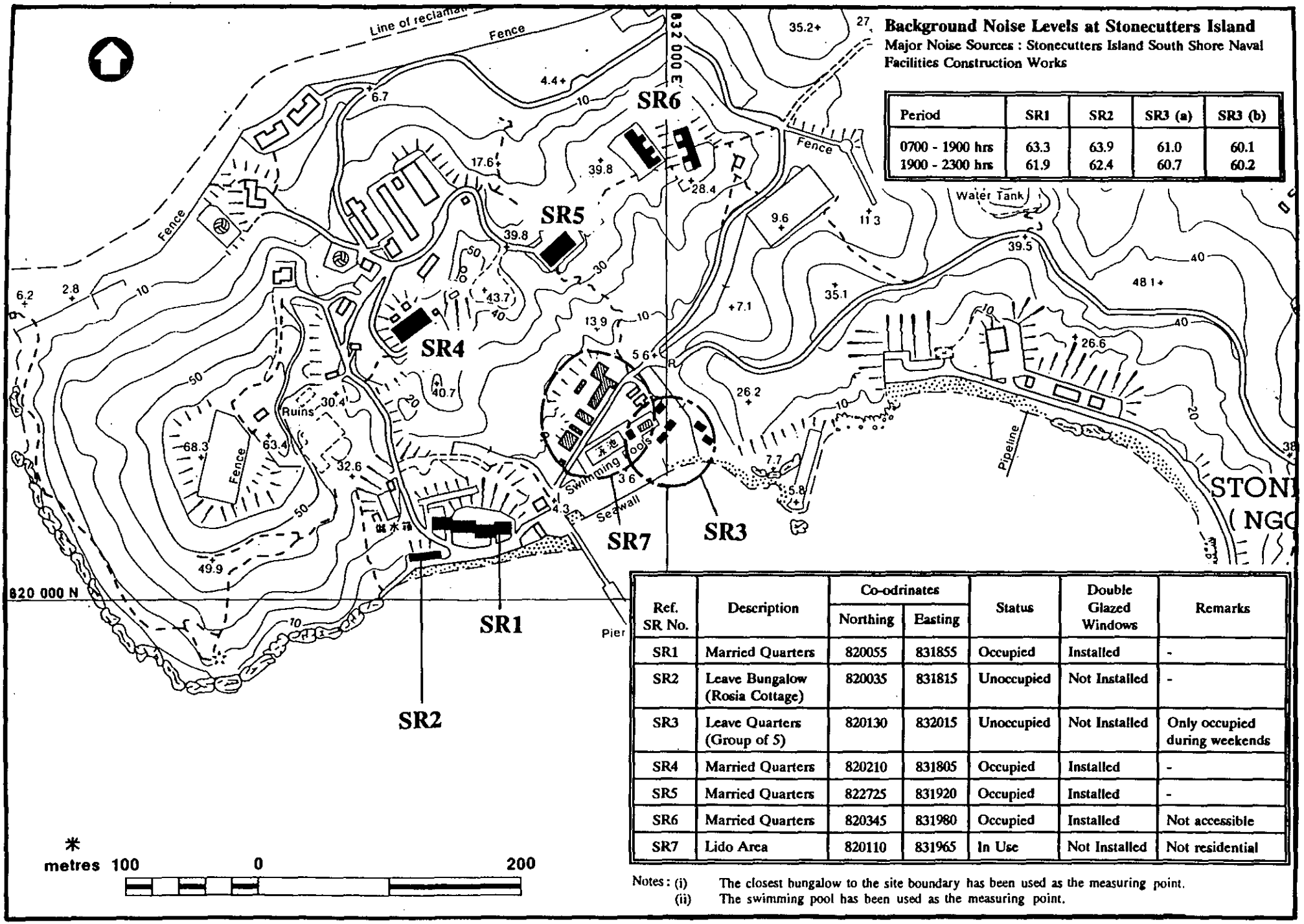


Figure 1
Study Area



Background Noise Levels at Stonecutters Island

Major Noise Sources : Stonecutters Island South Shore Naval Facilities Construction Works

Period	SR1	SR2	SR3 (a)	SR3 (b)
0700 - 1900 hrs	63.3	63.9	61.0	60.1
1900 - 2300 hrs	61.9	62.4	60.7	60.2

Ref. SR No.	Description	Co-odrinates		Status	Double Glazed Windows	Remarks
		Northing	Easting			
SR1	Married Quarters	820055	831855	Occupied	Installed	-
SR2	Leave Bungalow (Rosia Cottage)	820035	831815	Unoccupied	Not Installed	-
SR3	Leave Quarters (Group of 5)	820130	832015	Unoccupied	Not Installed	Only occupied during weekends
SR4	Married Quarters	820210	831805	Occupied	Installed	-
SR5	Married Quarters	822725	831920	Occupied	Installed	-
SR6	Married Quarters	820345	831980	Occupied	Installed	Not accessible
SR7	Lido Area	820110	831965	In Use	Not Installed	Not residential

Notes : (i) The closest bungalow to the site boundary has been used as the measuring point.
(ii) The swimming pool has been used as the measuring point.

Figure 2
Location of Sensitive Receivers

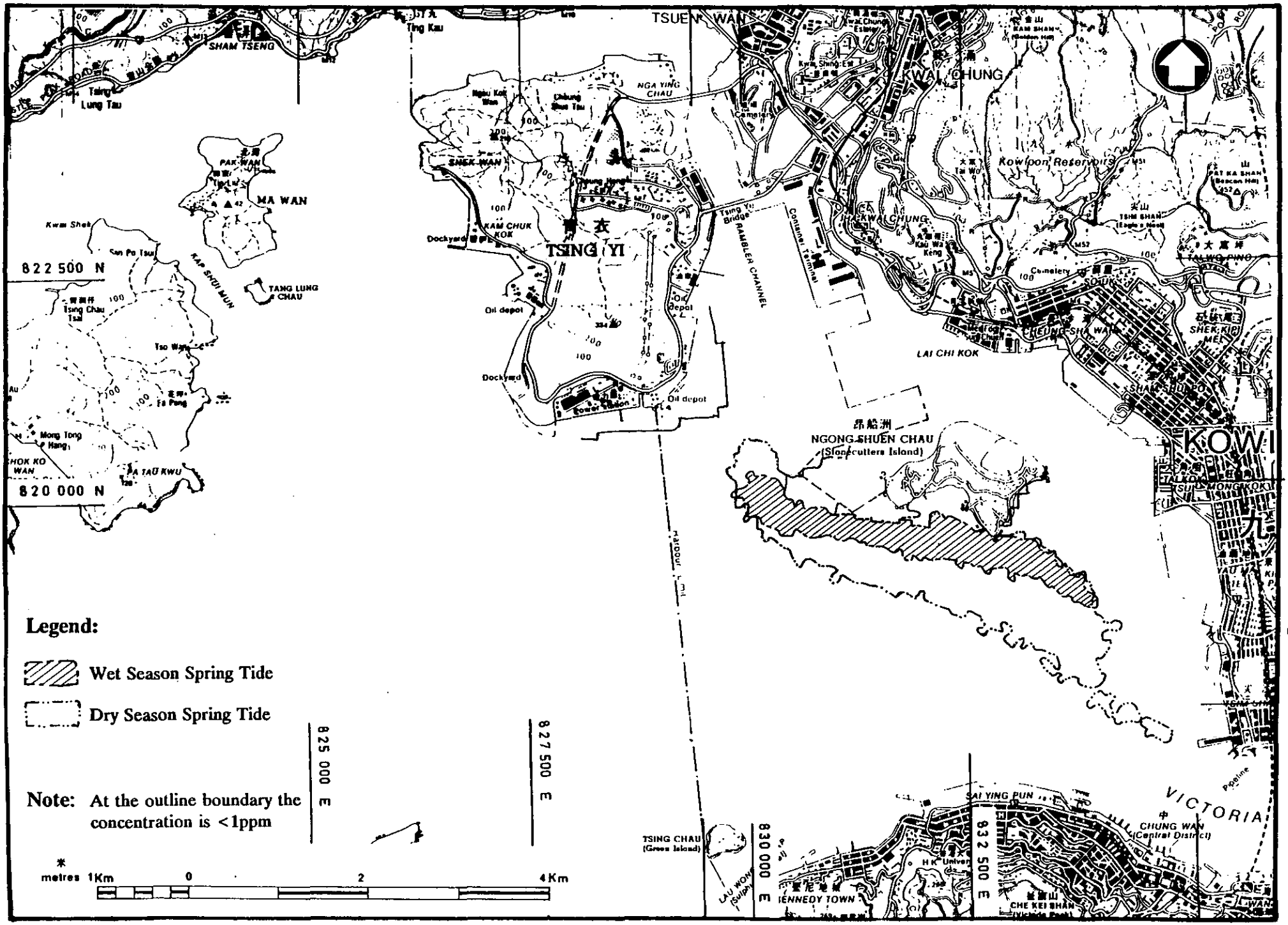


Figure 3
Extent of Dredging Impacts Related to Suspended Sediment Concentration