

**Project Profile**

**Proposed Improvement Works**  
**at**  
**Ma Wan Tung Wan Beach**

**Reference : R0148-3.DOC**

**Date : February 2005**

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## **1 BASIC INFORMATION**

### **1.1 Project Title**

1.1.1 Proposed Improvement works at Ma Wan Tung Wan Beach (hereafter referred to as “the Project”).

### **1.2 Purpose and Nature of the Project**

1.2.1 The design and construction of the Project will be carried out by the Sun Hung Kai Real Estate Agency Limited (The developer), while the Leisure and Cultural Services Department (LCSD) will be responsible for the operation and maintenance of the Project. However, the developer will provide a 5-year Defect Liability Period for the sand filling work upon works completion and during which the required additional sand nourishment to preserve a satisfactory beach width will be arranged by them.

1.2.2 Ma Wan Tung Wan beach is a small gazette beach located in an inner bay at eastern side of Ma Wan Island comprising of large rock outcrops above the high-water mark level. The sandy area has an area of 3,400m<sup>2</sup> and is relatively small in comparison with the existing gazetted beach boundary (78,000m<sup>2</sup> approximately). The useable shadow zone and sand area for swimmers is small.

1.2.3 With the transportation infrastructure on Ma Wan being developed, accessibility to the gazette beach will improve significantly. The usage of Tung Wan Beach by the public is expected to increase significantly due to the improved access and the flourish development on the Ma Wan Island. Most importantly, seven of eight gazette beaches in Tsuen Wan area were closed in 2003 owing to very poor marine water quality. There is a need to improve the existing beach for increasing public demand.

### **1.3 Name of the Project Proponent**

1.3.1 Sun Hung Kai Real Estate Agency Limited will be responsible for the design and construction of the Project, as well as to provide a 5-year Defects Liability Period for the sand filling work upon works completion, while Leisure and Cultural Services Department (LCSD) will be responsible for the management and maintenance of the beach.

### **1.4 History of Site**

1.4.1 Tung Wan Beach is a gazetted beach at an inner bay of Ma Wan Island currently under the maintenance of LCSD. The gazette area of the beach is approximately 7.8 hectare, with a sandy area comprising about 3,400m<sup>2</sup>. Existing facilities include three life savers' towers and a main beach building. The main beach building accommodates facilities including bathroom changing room, toilet, first aid room and office.

1.4.2 The Tung Wan Beach has been in use for more than 20 years and the recreational facilities are relatively aged. In the past, because of the scarce population of the Ma Wan Island and the limited external transport infrastructure, Tung Wan Beach's utilisation has been relatively low. With recent occupation of the high rise residential development on the island and enhanced external transportation network, there will be more people using the beach. Therefore, the upgrading of the beach will be beneficial to both the resident in the vicinity and the general public.

### **1.5 Location and Scale of the Project**

1.5.1 The existing Tung Wan Beach is an existing gazette beach at an inner bay on the eastern side of Ma Wan Island. Location plan of the Project is presented in Appendix I. The improvement works would include the provision of the beach recreational facilities and increase the sandy area. The existing gazetted beach boundary and the extent of the proposed sand filling area of the beach are presented in Appendix II. Detail of the proposed improvement works of the beach will comprise

of the following items, which are also presented in Appendix II.

- Expansion of beach area to about 15,000m<sup>2</sup> as shown in Appendix II;
- Provision of additional life-guard tower(s) with details to match the existing one, quantity and location to be agreed with LCSD;
- Provision of step access from the Oval Plaza of Park Island to the beach area; and
- Provision of the beach recreational facilities, such as one number of beach volley ball court and its associated accessories with the final location to be agreed with LCSD.

## **1.6 Number and Types of Designated Projects to be covered by the Project Profile**

1.6.1 According to Schedule 2 Part 1 Section C.2 (Reclamation, Hydraulic and Marine Facilities, Dredging and Dumping) of the Environmental Impact Assessment Ordinance (EIAO), the sand filling exercise of the proposed beach improvement works is classified as a Designated Project as it will be more than 1ha in size with its boundary less than 500m from the nearest existing bathing beach. Only one Designated Project is involved in the Project.

## **2 OUTLINE OF PLANNING IMPLEMENTATION PROGRAMME**

### **2.1 Implementation and Programme of the Project**

2.1.1 The design and construction works of the project will be carried out by the Sun Hung Kai Real Estate Agency Limited under the agreement with the Leisure and Cultural Services Department. Afterwards, LCSD will be responsible for the operation and maintenance of the beach. The sand filling construction work of the Project is expected to commence during the non-bathing season of 2005 or 2006 (around November 2005 / 2006), subject to the actual situation and the final agreement between the developer and the LCSD. It is anticipated the sand filling work will take around 5 months to complete. Therefore, the beach shall be re-opened for the public in the following bathing season. The beach will be closed to the public during the construction period of the Project.

2.1.2 There is no interaction with other infrastructure projects in close vicinity of the proposed works.

## **3 POSSIBLE IMPACT ON THE ENVIRONMENT**

### **3.1 Implementation Process**

#### Sand Filling Process

3.1.1 Sand filling process will be conducted during non-bathing season with the beach being closed during the whole construction period.

3.1.2 Sand will be placed on top of the existing beach surface and no dredging work of the seabed will be involved. An inspection on the proposed sand filling area shall be carried out before the sand filling works to manually remove any large stone at the shallow area as required. Sand filling will be carried out by a delivery vessel or a hopper tug boat (vessel) installed with pump sprayers, which have a filling rate of about 3,000m<sup>3</sup> to 4,000m<sup>3</sup> per day. The estimated volume of sand to be filled is about 75,500m<sup>3</sup>. The whole filling exercise shall be conducted at the marine side of the beach due to restricted land side transportation of the sand to the isolated Ma Wan Island.

3.1.3 The filling material will be marine sand with the average grain size of about 300µm to 800µm in diameter sourced from the marine borrow area in Mainland China. A standing silt curtain will be erected to fully enclose the marine side of the Tung Wan Beach prior to the sand filling exercise. The vessel will stop in front of the silt curtain and pump the sand material onto the target filling area.

- 3.1.4 During the initial mass filling stage, on-shore discharge of the sand is carried out by the floating pipeline method in which the sand material is pumped from the vessel via a floating pipeline onto the target location of the beach. The discharge end of the floating pipe shall be supported by a pontoon or a mini-barge to assist in manoeuvring. Though the floating pipeline is self-supporting, a pontoon can also be positioned to provide interim support of the pipeline on top of the silt curtain to prevent local sinking of the curtain caused by the weight of the pipeline, if necessary. The schematic layout of the floating pipeline method is presented in Appendix III-A.
- 3.1.5 Sand discharge for the formation of the beach profile will be carried out by the “rainbowing” method. This will involve the spraying of sand material from a pump nozzle mounted at the bow of the vessel. The vessel will be positioned adjacent to the silt curtain to ensure all sand material will be discharged into the enclosed works area of the beach. The schematic layout for the “rainbowing” method is presented in Appendix III-B.
- 3.1.6 Afterwards, the new sand filling area will be finally re-profiled and an inspection shall be conducted on the sand filling area to manually remove any small rocks left on the beach.

#### Recreation and Sewerage Facilities

- 3.1.7 Upon completion of the sand filling exercise, recreational facilities including beach volley facilities shall be installed onto the extended beach area. Construction activities for the installation of the recreational facilities are likely to involve only minimal powered mechanical equipment. The existing sewage outfall at the beach, which was sub-standard has been disconnected and demolished in January 2004. The effluent from the future beach visitors will be discharged to the existing Ma Wan Sewage Treatment Plant at Pak Wan Service Area through a new sewer of 450 mm in diameter, which had been built under a separate contract.

### **3.2 Environmental Impacts**

- 3.2.1 Various environmental impacts have been considered in relation to works for this Project. Due to the nature of the Project as described in the above sections, certain environmental concerns are too remote to render further considerations. These include gaseous emissions, odour nuisances, traffic related generation, surface runoff, manufacture, storage, use, handling, transport, or disposal of dangerous goods. The potential environmental concerns that render more detailed investigation due to the project can be found in the following sections.

#### Construction Phase Water Quality Impact

- 3.2.2 Tung Wan Beach is an inner bay bounded by land on three-sides (northern, western and southern). During sand filling period, a silt curtain is proposed to erect at the eastern side of the beach. Therefore, the works area will be totally enclosed during the sand filling process that the existing marine water is unlikely significantly changed.
- 3.2.3 The beach improvement works will not involve any dredging activities and hence the marine sediment will not be heavily disturbed. The sand filling process involves only the ejection of sand from the vessel, which berthed outside the work boundary, onto the water surface. The sand will then settle to the seabed by gravity, which is a relatively quick but gentle process. Due to the relatively light-weight of the filling material and coupled with the buoyancy of seawater, the physical impact of the sand onto the seabed is expected to be low. For such reasons, the existing seabed shall not subject to any significant disturbance from the marine construction works, and the rise of any significant amount of suspended solid due to the sand filling process is expected to be acceptable. The filling activity is not anticipated to increase substantially the turbidity of the marine water.
- 3.2.4 In addition, sand will be pumped to the target area by the floating pipe during mass filling process. This process will enhance the settlement rate of the sand and therefore, further minimizing the potential upsurge of the suspended solid.
- 3.2.5 Most importantly, the beach at the time of the works shall be closed to public with the works area to be enclosed by a silt curtain throughout the whole filling exercise as a mitigation measure. Therefore, any possible suspended solid arising during the sand filling process is expected to be

confined within the works area. The water outside the silt curtain is unlikely to be adversely affected. A water quality environmental monitoring and audit, as presented in Appendix V, has been suggested to ensure the effectiveness of the proposed mitigation measure.

- 3.2.6 Also, according to Figure 5.1 of the Hong Kong Planning Standard and Guideline (HKPSG) Chapter 9 Environment – Water Quality Constraint, the water body between the Ma Wan Island and Tsing Yi Island (east of the Ma Wan) is one of the main tidal streams in Hong Kong and its dispersion power is expected to be huge. Any potential impact on the water outside the silt curtain due to the sand filling of Project, although is unlikely to be happened, will be quickly diluted by the tidal effect. The least possible water quality impact on the sensitive receivers will be further minimized.
- 3.2.7 The nearest water sensitive uses are the marine culture zones as shown in Appendix IV located on the western part of the Ma Wan Island. These marine culture zones are physically separated from the Project by the Ma Wan Island itself and they shall not affect by the construction works.

#### Disruption of Water Movement or Bottom Sediment

- 3.2.8 The sand filling work will be within the existing gazetted beach boundary, which is bound by land on three-sides. Hence, neither the sand filling works nor the extended beach is expected to cause many changes to the existing seawater movement.

#### Fugitive Dust Impact

- 3.2.9 The filling material chosen to be used for the Project is common beach sand, which has a size average of 300µm to 800µm in diameter. The standard procedure is to extract the sand with water from the marine borrow area in Mainland China, and the sand will be in a slurry form or contains high moisture content. Due to the slurry nature of the sand during the spraying process, fugitive dust emission is not expected to be of any significance. Furthermore, as shown in Appendix III-A for the floating pipe method, the slurry sand will be pumped out at a low position and concentrated to a particular area. The sand will settle into the water quickly. For the rainbowing method that applies for finalizing the sand profile at the outer bound area, the sand spraying process is a rapid one with a relatively high settling rate is expected because of the slurry nature of the sand. Hence any chance of fugitive dust emission during the filling process is not anticipated.
- 3.2.10 The sand filling process described above is a common engineering practice in Hong Kong for land formation exercises, including the Container Terminal 9 Development and the Penny's Bay contract. These past projects' experiences have found to create minimal fugitive dust nuisance to the surrounding sensitive receivers.

#### Construction Noise Impact

- 3.2.11 All the land side works and sand filling activities will be confined to daytime only. On Ma Wan Island, Park Island is located to the west of Tung Wan Beach and it is the nearest Noise Sensitive Receiver (NSR).
- 3.2.12 Other NSRs identified are the village houses to the east of Ma Wan Town, the Fong Yuen School, Kei Wai Primary School, C&MA Ma Wan Alliance Church, Tin Hau Temple, the village houses in Tin Liu Village and the existing camp site areas. Amongst these village houses, the nearest NSR is located at the Tin Liu Village which is about 220m away from the boundary of the Tung Wan Beach with Park Island sandwiched in between.
- 3.2.13 Other remote sensitive receivers, such as the Golden Villa on Sham Tseng side, are about 1km to the north and the Mount Haven in Tsing Yi is over 2km to the East. Construction noise impact upon these distant NSRs is not expected.
- 3.2.14 Majority of the construction activities for the Project is sand filling which involves a vessel with pump sprayers. This is a process with negligible noise except for the tug boat engine and the sand pumps. The pumps are located on the tug boat with berths just outside the silt curtain. To minimize the cumulative noise impact, there will not be any other construction activities

involving heavy mechanical powered equipment during the sand filling process. Other construction activities such as construction of the lifeguard tower are in a very short period and relatively small scale. The potential construction noise nuisance arising from these minor construction works is expected to be acceptable and the potential cumulative construction noise impact upon the NSRs is insignificant.

- 3.2.15 The predicted noise level at the closest representative sensitive receiver on the Ma Wan Island, which is at about 45m away from the pump sprayers is shown in Table 3-1 at below.

Table 3-1 Predicted Unmitigated Noise Level at the representative NSR

Noise Sensitive Receiver	Shortest Distance from the Project (m)	Powered Mechanical Equipment / Sound Power Level dB(A)	Identification Code	No. of Equipment	Predicted Sound Pressure Level at the NSR in dB(A) Leq(30min)
Park Island	45	Pump of the Sprayer 103 dB(A)	CNP282	2	68 dB(A)
	45	Tug Boat 110 dB(A)	CNP221	1	72 dB(A)
	Overall				73 dB(A)

- 3.2.16 The sand filling process for the extension of the sand area, using pump sprayer, will generate some noise but the levels are well within the daytime construction noise guideline of 75dB(A) as stipulated in the Technical Memorandum on Environmental Impact Assessment Process. Therefore, other sensitive receivers, such as village houses, with much larger separation (> 200m) are expected not to have any unacceptable construction noise impact. In addition, these remote sensitive receivers are separated from the works area by the residential buildings of Park Island as well as the topography. No adverse construction noise impact would be expected.

- 3.2.17 Because of sufficient distance separation between the proposed construction site and the sensitive receivers, no unacceptable construction noise impact due to the sand filling work is anticipated.

#### Night-Time Construction Impact

- 3.2.18 All works are confined to day-time operations (7:00a.m. to 7:00p.m. for normal weekdays). There will be no construction operation at any other times unless a valid Construction Noise Permit is obtained from EPD prior to the works.

#### Generation of Waste or by-Products

- 3.2.19 The extension of sandy area of Tung Wan beach by sand filling process does not generate any construction waste or by-products. The construction of the recreation facilities will only create an insignificant amount of construction and demolition waste and they will be disposal of at the Landfill or Government designated facilities.

#### Ecological Impact

- 3.2.20 The marine work involves only sand-filling and re-profiling of an existing gazetted beach. No gazetted areas of conservation interest, such as Site of Special Scientific Interest and marine parks, have been identified within and/or close to the project area. Hence, no ecological value species are expected to be presented. Moreover, as no dredging operations on the seabed or breaking of outcrops will be carried out for the beach improvement works, disturbance to the marine environment is expected to be no more than other similar maintenance work carried out at existing LCSD gazetted beaches in Hong Kong. Most importantly, a silt curtain will be erected to enclose the works area during the sand filling process. The water quality outside the works area is not expected to be adversely affected.

- 3.2.21 Being an existing gazetted beach, the sea bed in Tung Wan beach contains mainly soft muds and sands. The loss of the benthic habitat from the sand-filling process is likely to be of low nature conservation value.

- 3.2.22 Ecological impact due to the beach improvement works, if any, is expected to be minimal.

### Landscape and Visual Impact

- 3.2.23 The Project involves mainly sand-filling and minor construction works, which are only temporary activities with limited amount of machineries involved. Therefore, the potential landscape and visual impact due to the construction phase of the Project is expected to be minimal, temporary and localized.
- 3.2.24 The Tung Wan Beach improvement scheme is a positive environmental gain in terms of increasing the sandy area and upgrading of the beach recreational facilities, an overall visual enhancement of the existing beach will be resulted. Detail recreational facilities will be submitted to LCSD for final approval before the commencement of the improvement works. The visual and landscape quality due to the Project is considered an environmental enhancement.

### Cultural Heritage Impact

- 3.2.25 It has been checked with the Antiques and Monuments Office that the project boundary does not fall within the any sites of cultural heritage. No cultural heritage impact is expected.

### Cumulative Environmental Impact

- 3.2.26 As the project is located at an isolated island far away from any existing construction projects, it is not anticipated to have any cumulative environmental impacts upon the existing sensitive receivers on the Ma Wan Island nor at Sham Tseng or Tsing Yi side.
- 3.2.27 Due to the small scale of the sand filling process in the Project, an average of two sand vessels trip per day is required so that the potential en-route environmental and marine traffic impacts shall be negligible. The cumulative impact due to the sand transportation process should be unlikely.

### Operational Phase Water Quality Impact

- 3.2.28 The future extended sand area of the Tung Wan Beach shall not generate any uncontrolled effluent from the visitors. A new sewage pipe had been constructed connecting the beach house to the existing Ma Wan Island Treatment Plant operated by Drainage Services Department. The planning and design of the treatment plant, together with all other infrastructure facilities on the Ma Wan Island, has a reserve treatment capacity to handle the increased population for the beach visitors together with other planned developments on the Island. The effluent shall be treated by the sewerage treatment plant up to the standards as stipulated in Technical Memorandum made under the Water Pollution Control Ordinance prior to discharge into the Ma Wan Channel via an outfall. Therefore, the water quality impact associated with the sewage generated from the Project is expected to be acceptable.
- 3.2.29 A Supplementary Beach Stability Study Report (Issue 5) for the new extended sand area has been submitted and approved by the Civil Engineering Development Department in 2002, indicating the extended beach is stable. It is expected that there is unlikely to have any unacceptable water quality impact resulted from the operational phase of the beach.
- 3.2.30 If there is a need to maintain the sand profile in the future, similar to the existing beaches re-profiling works carried out in other parts of Hong Kong, no mitigation measures is necessary as the potential impact on the water quality is expected to be temporary, minimal and very localised. There is unlikely to have any unacceptable or insurmountable impact.

## **4 MAJOR ELEMENTS OF THE SURROUNDING ENVIRONMENT**

### **4.1 Sensitive Receivers**

#### Park Island

- 4.1.1 Existing medium and high rise residential developments on Ma Wan Island is about 20m from the Tung Wan Beach and presented in Appendix III. The construction noise and dust impact due to the sand filling process has been identified in the previous sections and found to be within an



acceptable level.

#### Village Houses on Ma Wan Island

- 4.1.2 Existing village houses are located to the west of the Ma Wa Island as presented in Appendix IV. Since the construction noise impact upon the nearest NSR located in the Park Island development, which is about 45m to the construction site, has been identified as acceptable, the impact upon the village houses should also be acceptable.

#### Fish Culture Zones

- 4.1.3 Three Fish Culture Zones are located on the western side of the Ma Wan Island near Tam Shui Wan, Shek Tsai Wan and Kung Tsai Wan as presented in Appendix IV. As the Fish Culture Zones are all located on the western side of the Ma Wan Island, adverse water quality impact from the proposed sand filling work is highly unlikely.

#### Schools

- 4.1.4 Two existing schools are located to the east of the Ma Wa Island as presented in Appendix IV. Kei Wai Primary School is about 80m from the construction site, and Fong Yuen School is about 350m from the construction site. Owing to the distance and the topography separating the construction site to the schools, construction impacts upon the existing schools shall be negligible. In addition, Kei Wai Primary School is enclosed by the existing high rise residential buildings away from the construction site, if there is any potential impacts, it shall be further minimised.

#### Campsite Areas

- 4.1.5 There are two existing campsites occupied by the Salvation Army and the International Mission on the western side of the Ma Wan Island as presented in Appendix IV. Both campsites are more than 600m from the construction site, any potential impacts upon the campsite areas should also be negligible.

## **5 ENVIRONMENTAL PROTECTION MEASURES**

### **5.1 Against Water Quality Impact**

#### Erection of silt curtain

- 5.1.1 In order to prevent the dispersion of sand into the marine water during the filling works, a standing type silt curtain will be erected to fully enclose the Tung Wan Beach prior to the marine work. The silt curtain shall be a proprietary product, fabricated from tough and abrasion resistant materials and will be impermeable to sand. The curtain will be installed from the water surface to the seabed level to achieve full enclosure of the sand filling area as indicated in Figure III-A and III-B in Appendix III. Regular maintenance of the silt curtain will be carried out by the contractor under the supervision of the developer to ensure their expected effectiveness. Sufficient spare silt curtain shall be stored within the construction work site for emergency use.

#### Exercising good housekeeping

- 5.1.2 The Contractor shall exercise and implement the following good housekeeping:
- The size of sand delivery vessel / hopper tug boat should be selected to maintain adequate clearance between vessel and the seabed during sand filling process ensuring turbidity is not generated by turbulence generated from vessel movement.
  - The sand stored onto the delivery vessel / hopper tug boat should be well covered by waterproof materials in order to avoid any potential fugitive dust or water quality impact from the vessel during the transportation and sand filling process.
  - Marine works at all time should not generate any visible foam, oil, scum, grease, litter or other objectionable matters to be present in the water body within the work site.

- The exhaust from the pumps for the sand filling process should be discharged upward and kept at a distance away from the water surface to minimize turbulence.

#### Marine Water Quality Monitoring

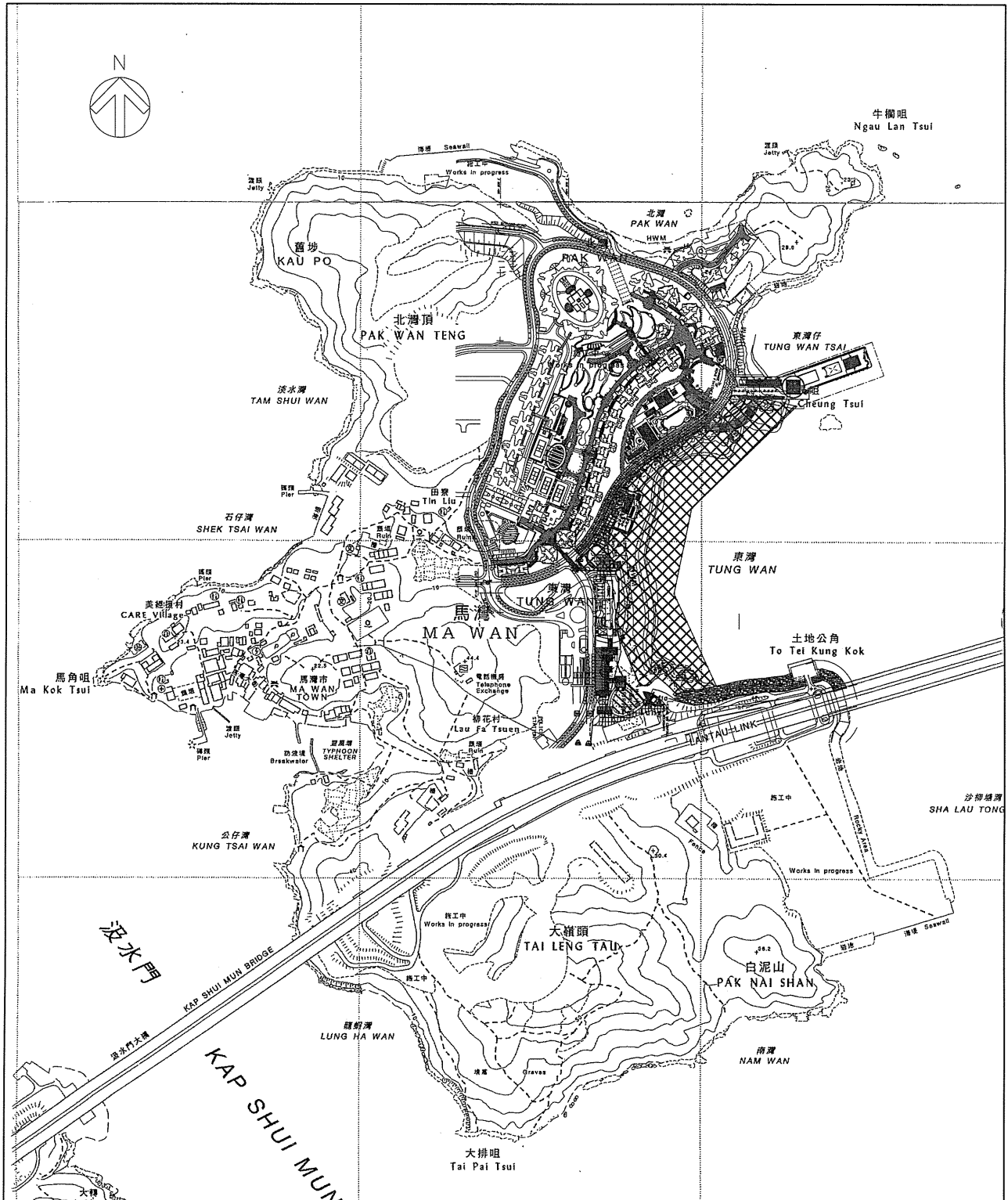
- 5.1.3 During sand filling process, water quality monitoring exercise will be carried out at designated locations. The proposed water quality monitoring and control stations for the project together with the sampling parameters and frequency are shown in Appendix V for reference.
- 5.1.4 A project specific Environmental Monitoring and Audit (EM&A) Manual shall be prepared by the contractor no later than 2 weeks before the commencement of the sand filling works of the project. The EM&A manual shall make reference to the “Guidelines for Development Projects in Hong Kong – Environmental Monitoring and Audit” published by the EPD. The project specific EM&A Manual and the monthly monitoring report shall be verified by an Independent Environmental Checker, whom has no contractual relationship with the contractor, prior to submission to EPD for information.

## **6 USE OF PREVIOUSLY APPROVED EIA REPORTS**

- 6.1.1 No previous approved EIA reports were referenced to for this Project.

## **APPENDIX I**

### **Location Plan of the Project**



Title: Location Plan of the Project

CH2M-IDC Hong Kong Limited

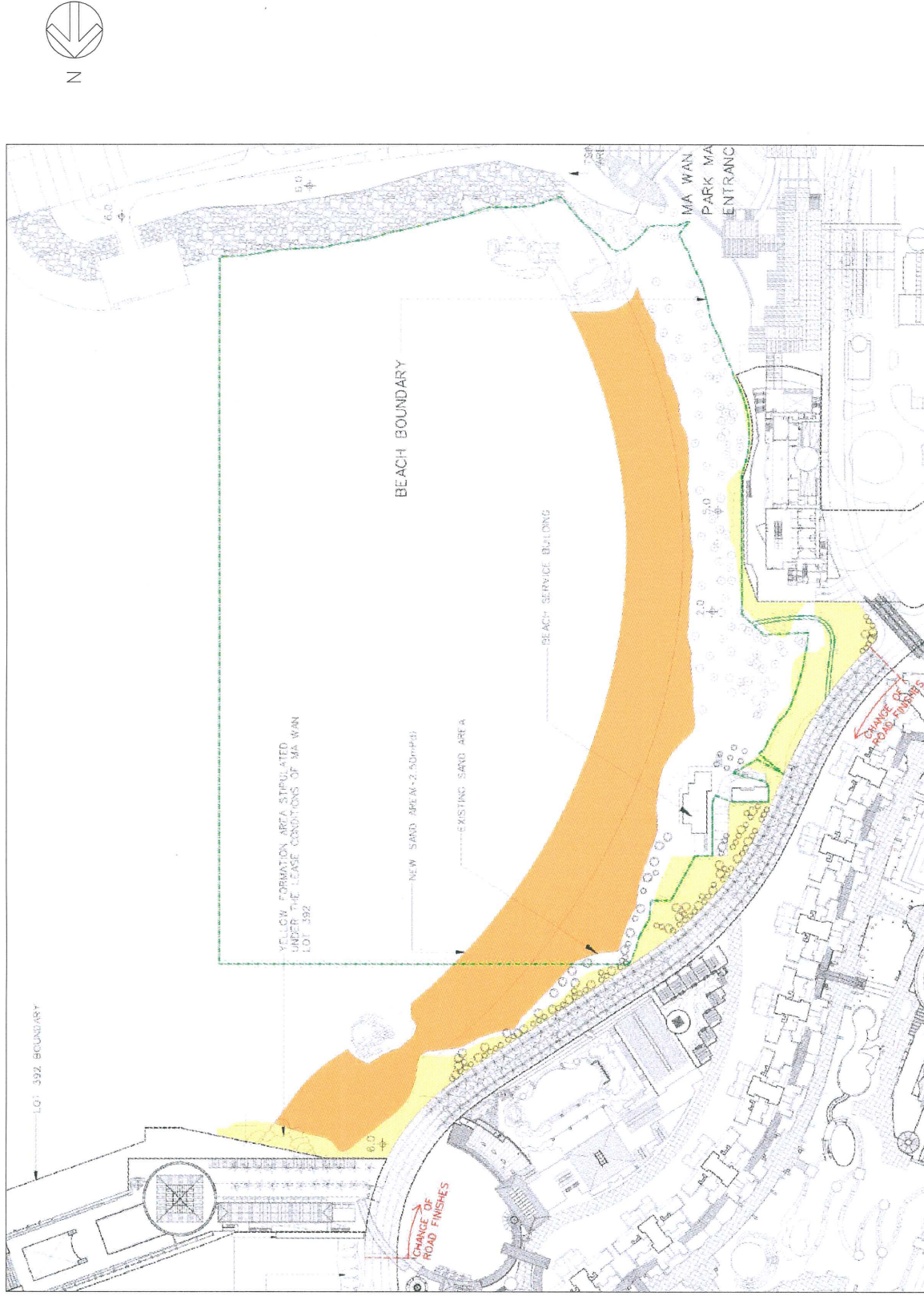
Project: Proposed Improvement Works at Tung Wan Beach, Ma Wan

Scale: NTS

Figure: Appendix I

## **APPENDIX II**

### **Proposed Improvement Scheme**



Title: Details of the Proposed Improvement Works at Tung Wan Beach, Ma Wan

Project: Proposed Improvement Works at Tung Wan Beach, Ma Wan

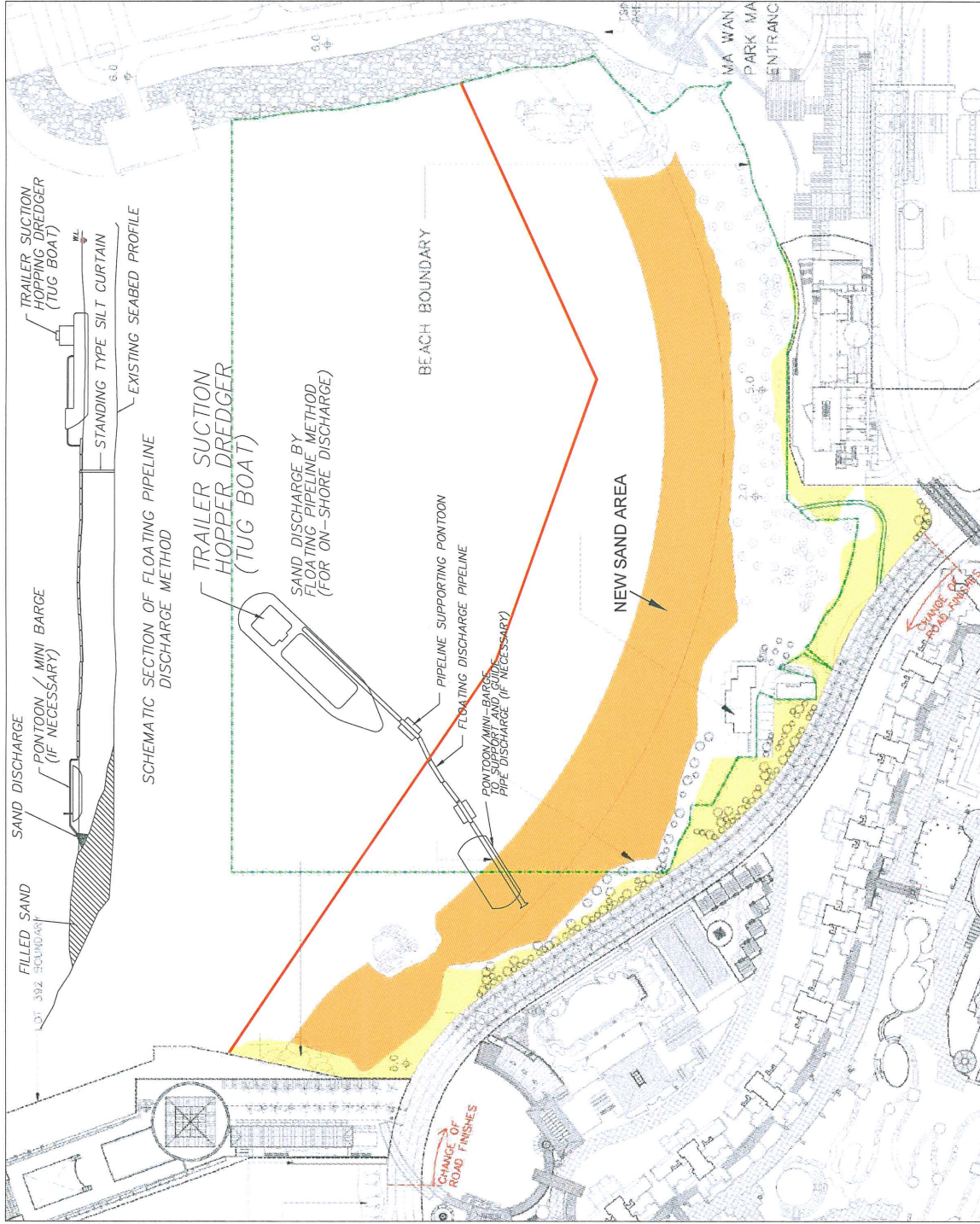
CH2M-IDC Hong Kong Limited

Scale: NTS Figure: Appendix II

**APPENDIX III**

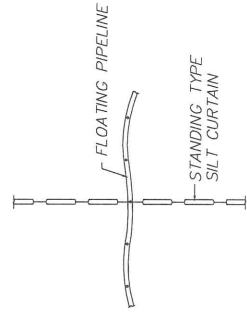
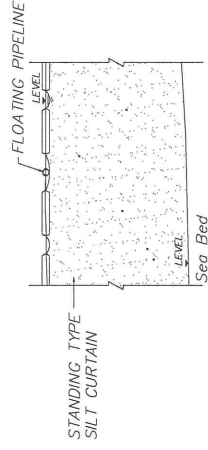
**Proposed Silt Curtain while Sand Filling  
at  
Tung Wan Beach**





**LEGEND**

— INDICATIVE LOCATION OF STANDING TYPE SILT CURTAIN



SCHEMATIC INTERFACE OF FLOATING PIPELINE AND SILT CURTAIN

Title: Sand Filling Schematic Layout (Floating Pipeline Method)

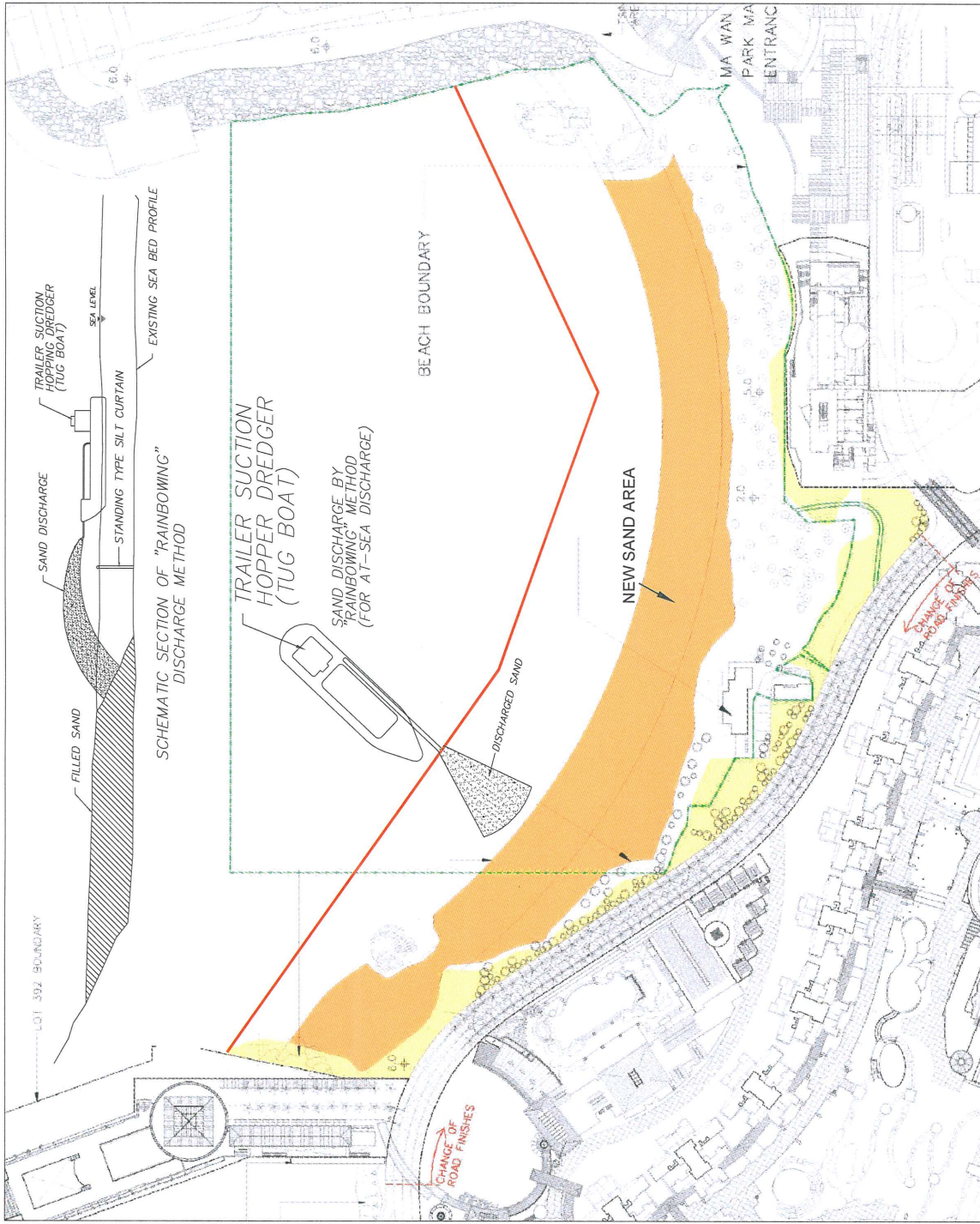
CH2M-IDC Hong Kong Limited

Project: Proposed Improvement Works at Tung Wan Beach, Ma Wan

Scale: NTS

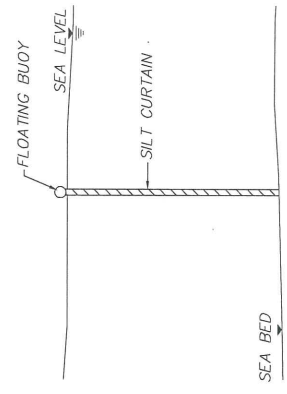
Figure: Appendix III-A





**LEGEND**

INDICATIVE LOCATION OF  
STANDING TYPE SILT CURTAIN



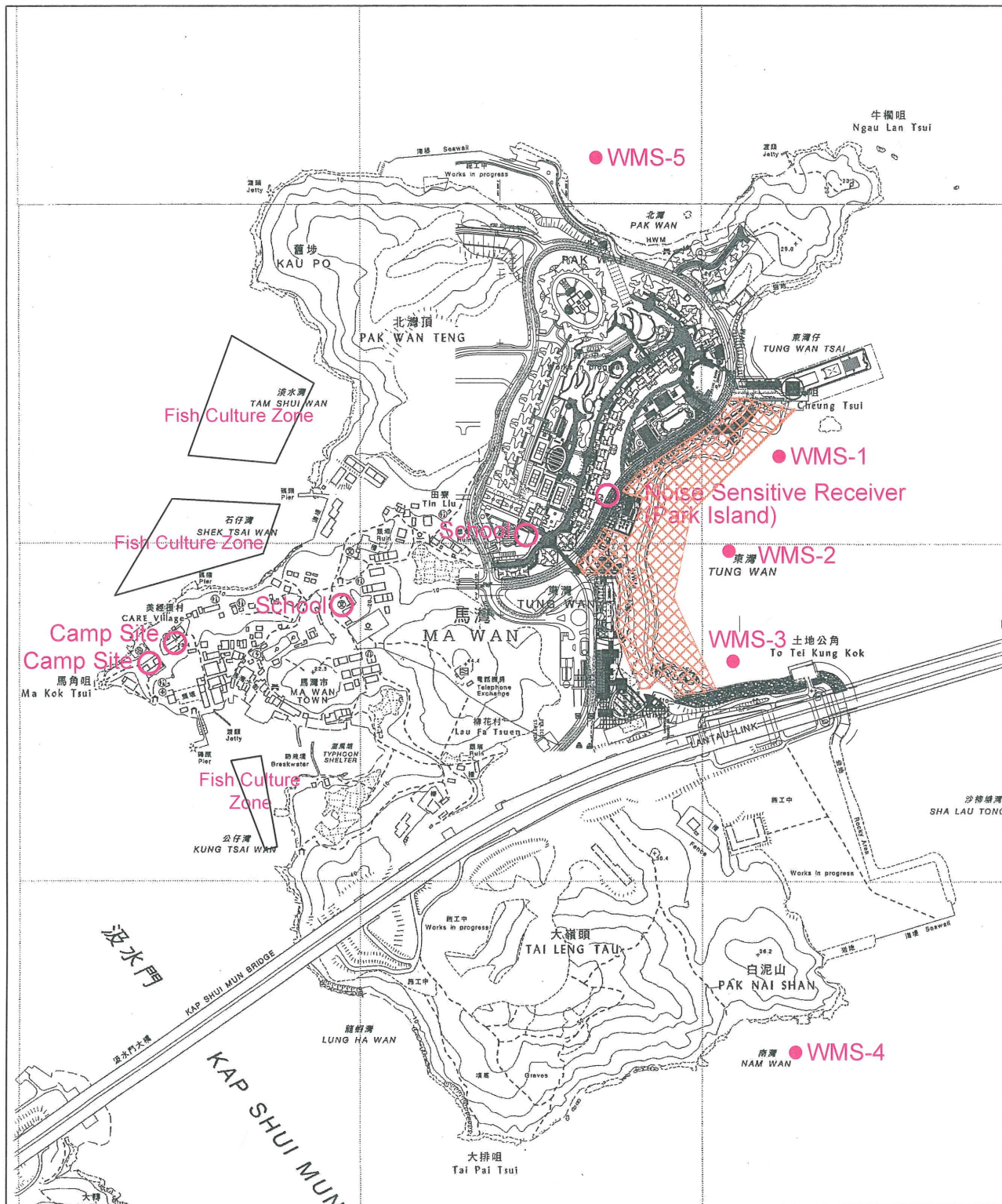
SCHEMATIC CROSS SECTION OF  
STANDING TYPE SILT CURTAIN

Title: Sand Filling Schematic Layout ("Rainbowing" Method)

Project: Proposed Improvement Works at Tung Wan Beach, Ma Wan

**APPENDIX IV**

**Location of Sensitive Receivers  
&  
Monitoring Stations**



- Legend:
- Sensitive Receiver
  - Proposed Monitoring/Control Station
  - ▨ Proposed Works Area

Title: Locations of Sensitive Receivers and Monitoring Stations

CH2M-IDC Hong Kong Limited

Project: Proposed Improvement Works at Tung Wan Beach, Ma Wan

Scale: NTS

Figure: Appendix IV

**APPENDIX V**

**Indicative Water Quality Monitoring Programme**



## **A5-1 Introduction**

As mentioned in the main text of the Project Profile, a project specific environmental monitoring and audit (EM&A) manual shall be prepared by the Contractor and submitted to the Independent Environmental Checker (IEC) to verify, only the IEC verified EM&A manual shall be submitted to the Environmental Protection Department (EPD) for information. The EM&A manual shall be prepared in accordance with the "Environmental Monitoring and Audit – Guidelines for Development Projects in Hong Kong," published by EPD, February 1998. This appendix summarises the key issues of the water quality monitoring programme proposed for the Project.

## **A5-2 Water Quality Parameters**

Monitoring of turbidity (Tby) in NTU, dissolved oxygen (DO) in mg/l and suspended solids (SS) in mg/l shall be carried out to ensure that any deteriorating water quality could be readily detected and timely action be taken to rectify the situation.

In association with the water quality parameters, some relevant data shall also be measured or recorded during the exercise, namely the monitoring location/position, time, water depth, water temperature, salinity, DO saturation, weather conditions, sea conditions, tidal stage, any special phenomena and the work activities during the monitoring.

## **A5-3 Monitoring Locations**

Three Monitoring Stations (WMS-1 to WMS-3) are located at about 50m away from the work boundary to cover the sand filling works at the Tung Wan Beach. Two Control Stations (WMS-4, WMS-5) are located to the south and the north of the filling works area near Nam Wan and Pak Wan for comparing the background water quality. The designated monitoring and control stations are listed this Appendix.

The status and location of the water quality monitoring stations should be reviewed by the contractor regularly. Any modifications to the EM&A Manual should be updated and recorded in the monthly EM&A report. All amendments to the EM&A Manual should seek the approval from the Independent Environmental Checker and Environmental Protection Department prior to implementation. Replicates in-site measurements and samples collected from each independent sampling event are required for all parameters to ensure a robust statistically interpretable dataset.

## **A5-4 Monitoring Frequency**

### Baseline Waster Quality Monitoring

Baseline monitoring shall be conducted to establish ambient conditions prior to the commencement of the works. The measurements shall be taken at all designated monitoring stations as presented in this appendix. , 4 days per week, at mid-flood and mid-ebb tides, for two weeks prior to the commencement of sand filling work, with the interval between 2 sets of baseline monitoring shall not be within the same tidal cycle or not less than 36 hours, where practical.

There should not be any marine construction activities in the vicinity of the stations during the baseline monitoring. In exceptional case when insufficient baselines monitoring data or questionable results are obtained, the contractor shall seek approval from EPD on an appropriate set of data to be used as baseline reference.

### Construction Phase Water Quality Monitoring

During the course of the sand filling work, monitoring shall be undertaken by the contractor three days per week, at mid-flood and mid-ebb tides, with sampling/measurement at the designated monitoring stations as listed in this appendix.

Measurements shall be taken at 3 water depths, namely, 1m below water surface, mid-depth and 1m above sea bed, except where the water depth is less than 6m, the mid-depth station may be

omitted. Should the water depth be less than 3m, only the mid-depth station will be monitored. The interval between two sets of monitoring shall not be less than 36 hours except where there are exceedance of Action and/or Limit levels, when the monitoring frequency will be increased. The Action and Limit Levels for water quality monitoring shall be derived through baseline monitoring as mentioned in previous section. A typical Action and Limit Levels is described at below.

Post Construction Phase Monitoring

Upon completion of the sand filling exercise, a post construction phase monitoring exercise on water quality shall be carried out for two weeks in the same manner as the impact monitoring.

**A5-5 Action and Limit Level**

The following table recommends the typical action and limit levels for the three main water quality monitoring parameters (DO, SS and Turbidity). The action and limit levels proposed by the contractor shall be finalized and presented in the baseline monitoring report and be endorsed by the IEC prior to the submission to EPD for information.

Table A5-1 Typical Action and Limit Level for Water Quality

Parameters	Action Level	Limit Level
DO in mg/l (Surface, Middle & Bottom)	<p><u>Surface &amp; Middle</u> &lt; 5%-ile of baseline data for surface and middle layer</p> <p><u>Bottom</u> &lt; 5%-ile of baseline data for bottom layer</p>	<p><u>Surface &amp; Middle</u> &lt; 4 mg/l; or &lt; 1%-ile of baseline data for surface and middle layer</p> <p><u>Bottom</u> &lt; 2 mg/l; or &lt; 1%-ile of baseline data for bottom layer</p>
SS in mg/l (depth-averaged)	<p>&gt; 95%-ile of baseline data; or &gt; 120% of upstream control station's SS at the same tide of the same day</p>	<p>&gt; 99%-ile of baseline data; or &gt; 130% of upstream control station's SS at the same tide of the same day and specific sensitive receiver water quality requirements</p>
Turbidity (Tby) in NTU (depth-averaged)	<p>&gt; 95%-ile of baseline data; or &gt; 120% of upstream control station's Tby at the same tide of the same day</p>	<p>&gt; 99%-ile of baseline data; or &gt; 130% of upstream control station's Tby at the same tide of the same day</p>

**A5-7 Event and Action Plan**

If the monitoring results exceed the action and limit level proposed in the baseline monitoring report and the EM&A manual, action should be taken to minimize or cease the impact due to the Project. The contractor shall be responsible for the design and implementation of the necessary mitigation measures within 2 days of the project related exceedance incident. All mitigation measures should be agreed by the IEC prior to implementation.

**A5-8 Documentation**

All the construction and post construction phase EM&A results and findings shall be documented in the monthly EM&A reports prepared by the contractor and verified by the IEC prior to the submission to the Environmental Protection Department for information within 2 weeks of each month.