Appendix A

Assessment of Option Layouts

[Extracted from Feasibility Study for Proposed Beach Improvement Works at Lung Mei Beach – Final Report (June 2001)]

3. PRELIMINARY LAYOUT DESIGN

3.1 Introduction

3.1.1 According to design specification as stipulated in the Study Brief, the improvement work includes construction of sand retaining structures, seawalls, laying of imported sand on seashore and provides a beach area of 6,000 sq.m. above high water mark and a parking area for 200 cars which has been subsequently reduced to 105 due to site constraint. A beach building providing changing facilities for visitors will be constructed on the reclamation land. The design capacity of the beach is 2,000 per day with a maximum load of up to 4,000 to cater for the peak period.

3.1.2 An extensive area of mangrove fed by several streams stretches along the coast to the west of Lung Mei to Ting Kok. The avoidance of potential impact on this mangrove area is a major concern. The most significant part of this falls within the Ting Kok Site of Special Scientific Interest (SSSI) whose eastern boundary is about 500m west of the proposed site.

3.2 Option layouts

3.2.1 Several options of beach layout have been investigated to meet the above requirements and constraints. After evaluation, the selected option has been chosen for more detailed modelling and study.

3.2.2 The key parameters used for the design of option layouts are shown in **Table 3-1**. As some of these parameters are not specified in the Study Brief, relevant information is taken from other beaches as reference to work out the corresponding requirements.

Table 3- 1 : Design Parameters for Option Layouts

Parameter	Requirements/ Assumptions
Forecasted number of user	The Study Brief specifies the estimated numbers of users are 2,000 and 4,000 nos. per day for non-swimming and swimming season respectively.
Dry sand area	The dry sand area is interpreted as the area at elevation above the highest watermark. It is stated in the Study Brief that a beach area of 6,000 sq.m above high water mark is required. As it is assumed that 4000 beach goers in the swimming season, the dry sand area is estimated to be 1.5 sq.m per bather. There is no formally established standard for occupation area of dry sand beach per bather in Hong Kong. In the United States of America, a rule of thumb of 7 to 9 sq.m of dry beach per bather is used. This figure is considered high, given the population density and living standard between Hong Kong and the States are significant different. A comparison is therefore made to other beaches in Hong Kong, it is found that the figure of 1.5 sq.m per bather is higher than those of the existing beaches at Casam, Kiu Tsui, Turtle Cove and Big Wave Bay.
Car park spacing	The Study Brief specifies that 200 no. car pots are required.
Floor area of facilities house	No standard and guideline has been published for reference. The relevant figures of the existing beach at Casam are therefore used as a reference.

3.2.3 Various constraints on the beach location and option layouts have been identified. These constraints are summarised in **Table 3-2**:

Table 3- 2 : Constraints on Design of Optional Layout

Boundaries of Proposed Beach	**Constraints**
East	Seawall along Tin Kok Road and stormwater outfalls being constructed. A lay-by for bus stop is to be built adjacent to the seawall under the project of Ting Kok Road upgrading work. There is the nearest boundary line in a distance of 500m away the existing pond designated as conservative area.
South	Cost and quantity of borrow materials for sand filling onto the beach become higher as beach extend further to the south. The shoreline of the beach extension would be susceptible to higher erosion, especially during typhoon period. It is better to minimise the extension to south in order to provide more buffer distance between the sand beach and the existing activity zone designated by Tai Mei Tuk Water Sport Centre. More existing mooring facilities would be required to be relocated as the beach extends in south.
West	It is required to minimise the impact of the beach improvement works on the potential seasonal wetland and the proposed beach should be kept away from the SSSI as far as possible. The existing natural stream mentioned above is a natural barrier to beach users. If any beach improvement works encroach into the stream, it would disturb or damage the existing ecological important area. (Note: This constraint makes the equilibrium orientation of the proposed beach shoreline not in the order of 140 to 150^{0}N as suggested in the Hydraulic Modelling Studies)
North	Seawall being constructed along Ting Kong Road forming a natural boundary.

3.2.4 The above design parameters and site constraints have been duly considered. The location of the proposed beach is confined within the region to the east of the existing Lo Tsz stream and committed box culvert outfall at east of the beach site. Four option layouts are evaluated as shown in **Figure Nos. 3-1, 3-2, 3-3** and **3-4** with reference to the above criteria. It should be noted that there is no significant variation of the location of the proposed beach as the various site constraints depict its location.

3.2.5 The option layouts therefore focus on different orientations of car park, beach building, sea wall requirements, etc in order to facilitate the beach users, reduce construction cost and minimise the environmental and engineering impacts.

3.2.6 It is anticipated that the key construction activities for the proposed beach will include:

- dredging and sand borrowing and filling;
- decking for car park area;
- construction of beach building;
- construction of an engineering channel to divert the Lo Tsz stream;
- diversion of the existing outfall(s) that are protruding into the existing beach area;
- construction of a seawall to protect car park decking (optional); and
- construction of groins to enhance stability of sand filling (optional).

3.2.7 For all options, it is recommended to provide about 10m wide buffer zone with soft or hard landscape on the beach area to screen the ancillary facilities such as carriageway, car park and beach building off the sand area.

3.2.8 It is to be noted that the profiles of high water mark for all beach layouts are indicative only. Their exact shapes depend on the specific conditions at the site, e.g. the variations in the wave climate. The beach orientation will in the long run adapt to changes in the local wave climate. This means that the shape of the beach would show some variation with the season if the prevailing wave direction is different. It is therefore necessary to carry out a computation of the long-shore sediment transport based on the normal wave climate in order to give a better indication of the orientation (e.g. shape) and to provide further guideline for the beach layout.

3.3 Option Evaluation

3.3.1 The comparison is based on an evaluation of the following factors:

- utilisation of beach area and facilities
- extent of sand filling work on the seaward
- sand stability control
- construction cost
- impact on environment
- air pollution to beach users
- traffic circulation
- channelisation of natural stream and maintenance.

3.3.2 Considering the various pros and cons listed in **Table 3-3**, we have recommended that Option 1 is to be adopted for further investigation and development. This option has a better utilisation of the beach area and the extent of sand filling work on seaward is smaller than that required for Options 2 and 3. The sand stability is better control with the provision of a groin. The construction cost is moderate in comparison with those required for options 2 and 3. As regards the potential nuisance of traffic air to the beach users, a wider buffer zone with appropriate landscaping would reduce the impact.

3.3.3 Further development on Option 1 revealed that a better balance of the areas between the proposed sandy regions and car park site was required. The number of car parking stalls was consequently reduced from 200 to 105. In addition, the car park site and beach building were shifted eastward to avoid decking over the Lo Tsz Stream. The final recommended beach layout is shown in **Figure 3-5**. The car park and beach building layouts are shown in **Figure Nos. 3-6** and **3-7** respectively.

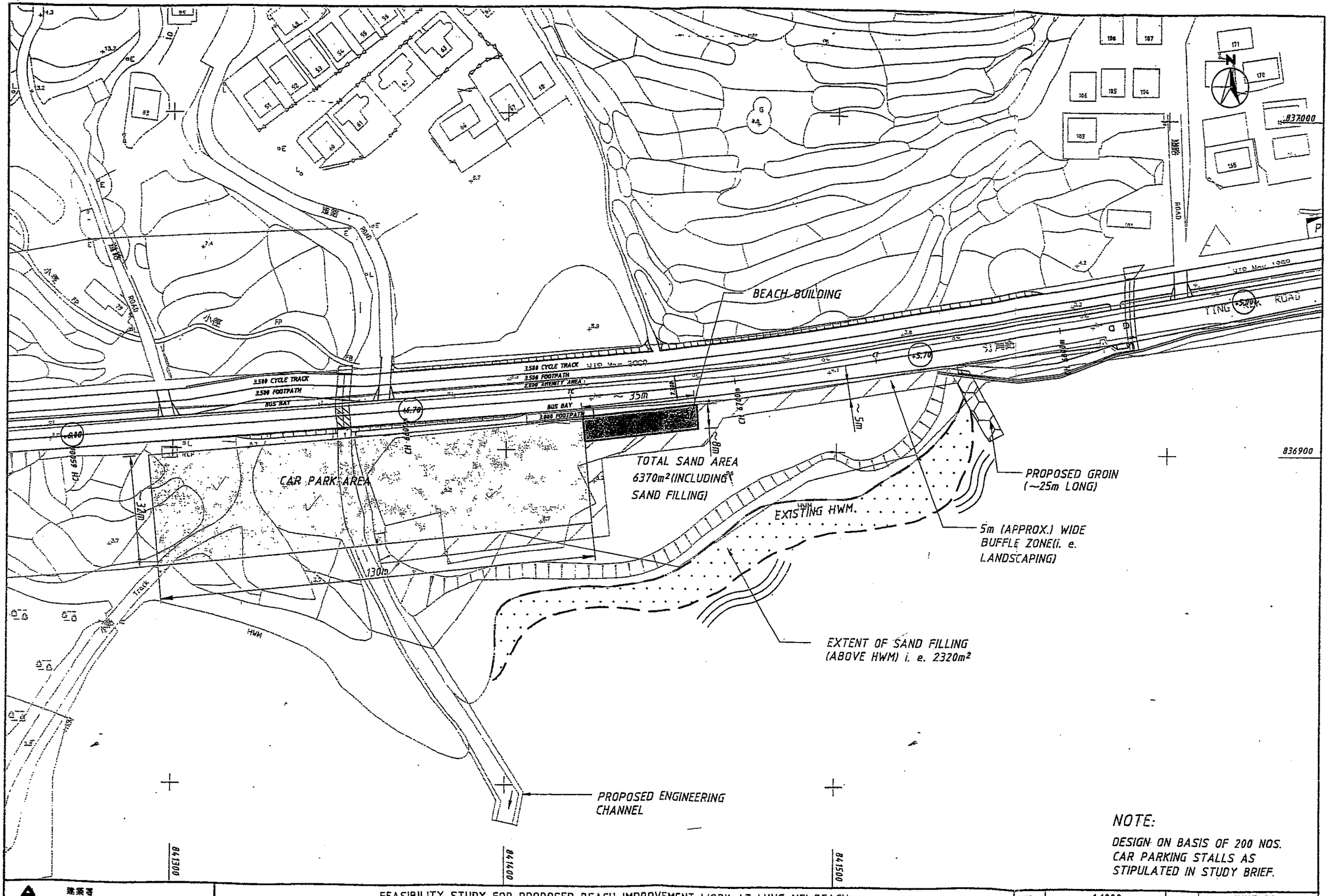
Table 3- 3 : Comparison for Proposed Beach Option Layouts above Highest Water Mark

Review on	Option 1	Option 2	Option 3	Option 4
Utilisation of beach area and facilities	As the car park sets back from the beach area, a longer waterline is provided, this may be of interest from recreation point of view. Eastern half of parking area to be probably occupied first, as it is closer to the facilities house and the beach area. Longer walk is required for other users coming late.	The car park is close to the main beach area. It is more convenient for beach users. As compared to Option 1, the facilities house has a longer distance to the main beach area. Also a shorter waterline is provided.	The car park is split into two portions and the facilities house is located at midway between the two parking areas. It is convenient for beach users to park their cars and access to the facilities house. The facilities house is close to the main beach area; however, a shorter waterline is provided as compared to Option 1.	Two rows instead of four car pots are provided. This provides more usable beach area, and results in a long waterline. Eastern half of parking area to be probably occupied first. Longer walk from west of the car park area for other users coming late
Extent of sand filling work on seaward	Approximate 2,000m^2	Approximate 4,000m^2	Approximate 4,000m^2	Approximate 2,000m^2
Sand stability control	Better because of presence of revetment or groin.	Wave turbulence likely created at southeast corner of car park resulting in local scouring and increasing the loss of sand. A groin may be required to overcome this situation.	Same as Option 2	A groin likely to be required to prevent the loss of sand.
Construction cost	Moderate. Groin construction is required.	Expensive because of seawall construction and either regular replenishment of sand or provision of a groin.	Same as Option 2	Cheaper.

Review on	Option 1	Option 2	Option 3	Option 4
Impact on environment	Construction of car park decking close to the SSSI and wetland.	A longer distance to the SSSI and wetland.	Same as Option 2	Same as Option 1
Air pollution to beach user due to traffic at Ting Kok Road	Poor because sand area closed to Ting Kok Road.	Better because of car park area and the facilities house shield away the Road	Same as Option 2	Same as Option 2
Traffic control	Better traffic circulation flow inside car park. Alternative route available for diversion traffic flow if one of the routes is blocked.	Same as Option 1	Same as Option 1 but increase in junctions of car park exit and entrance interfere the traffic flow at Ting Kok Road	Poor traffic circulation inside car park.
Channelisation of natural stream and maintenance	A section of some 35 m long channel will be decked. Maintenance of the decked channel may be of concern.	Channel will not be decked.	Same as Option 2	Same as Option 1

Appendix A1

Figures for Beach Option Layouts



NOTE:

DESIGN ON BASIS OF 200 NOS. CAR PARKING STALLS AS STIPULATED IN STUDY BRIEF.

建築署 ARCHITECTURAL SERVICES DEPARTMENT

Maunsell

FEASIBILITY STUDY FOR PROPOSED BEACH IMPROVEMENT WORK AT LUNG MEI BEACH

PROPOSED BEACH LAYOUT - OPTION 1

SCALE	1:1000	DATE	JUNE 2001
CHECK	-	DRAWN	TSG
JOB No.	97099	FIGURE No.	3.1
		REV	-

BEACH/BUILDING

3.500 CYCLE TRACK
3.500 FOOTPATH
BUS BAY

3.500 CYCLE TRACK
3.500 FOOTPATH
2.000 AMENITY AREA
BUS BAY
3.500 FOOTPATH

35m

32m

CAR PARK AREA

TOTAL SAND AREA 6370m² (INCLUDING SAND FILLING)

PROPOSED SEAWALL

EXISTING HWM

5m (APPROX.) WIDE BUFFLE ZONE

EXTENT OF SAND FILLING (ABOVE HWM) i. e. 4010m²

PROPOSED ENGINEERING CHANNEL

TING KAU ROAD

836900

841300

841400

841500

NOTE:

DESIGN ON BASIS OF 200 NOS. CAR PARKING STALLS AS STIPULATED IN STUDY BRIEF.

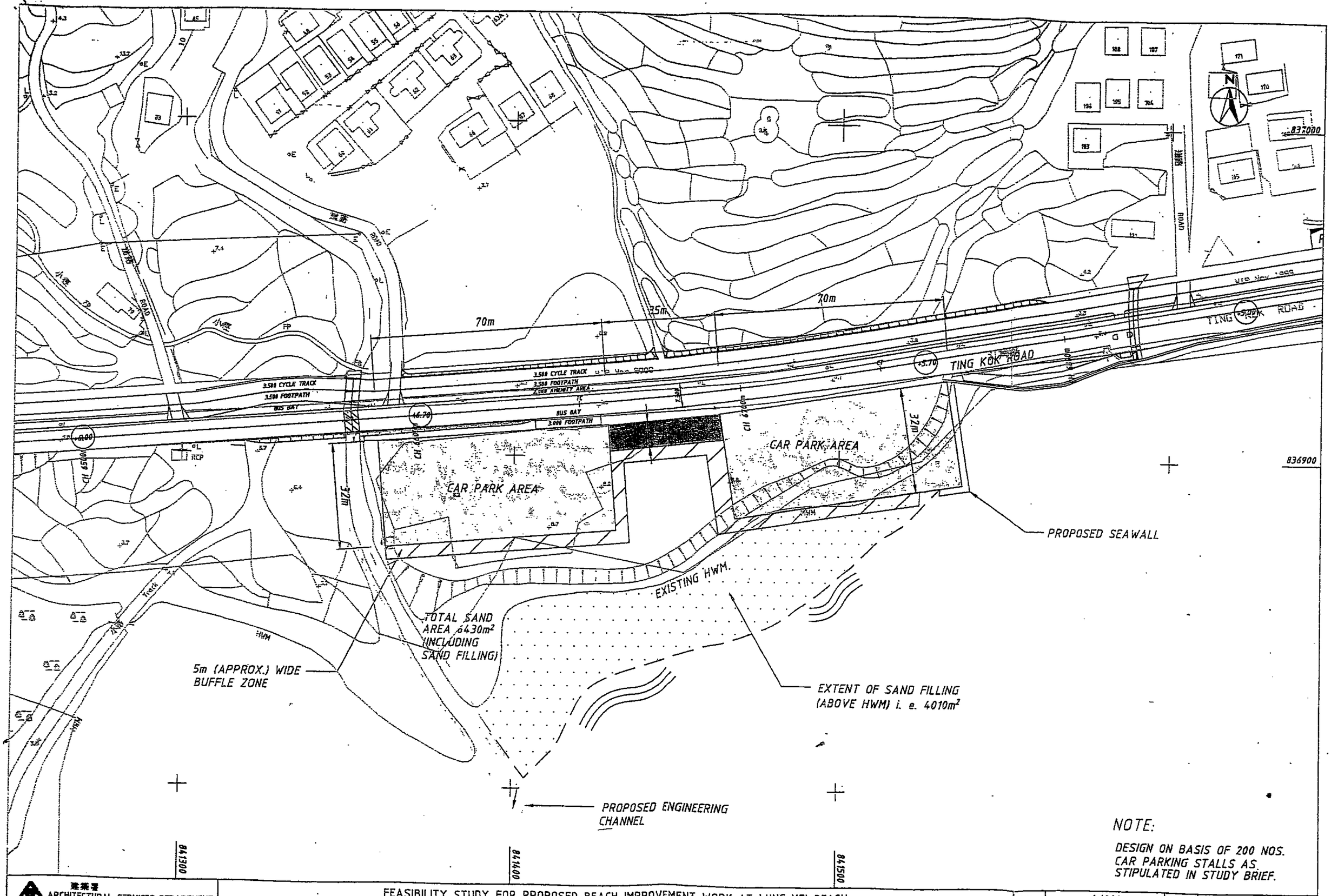
建築署
ARCHITECTURAL SERVICES DEPARTMENT

Maunsell
茂盛(亞洲)工程顧問有限公司

FEASIBILITY STUDY FOR PROPOSED BEACH IMPROVEMENT WORKS AT LUNG MEI BEACH

PROPOSED BEACH LAYOUT - OPTION 2

SCALE	1:1000	DATE	JUNE 2001
CHECK	-	DRAWN	TSG
JOB No.		FIGURE No.	3.2



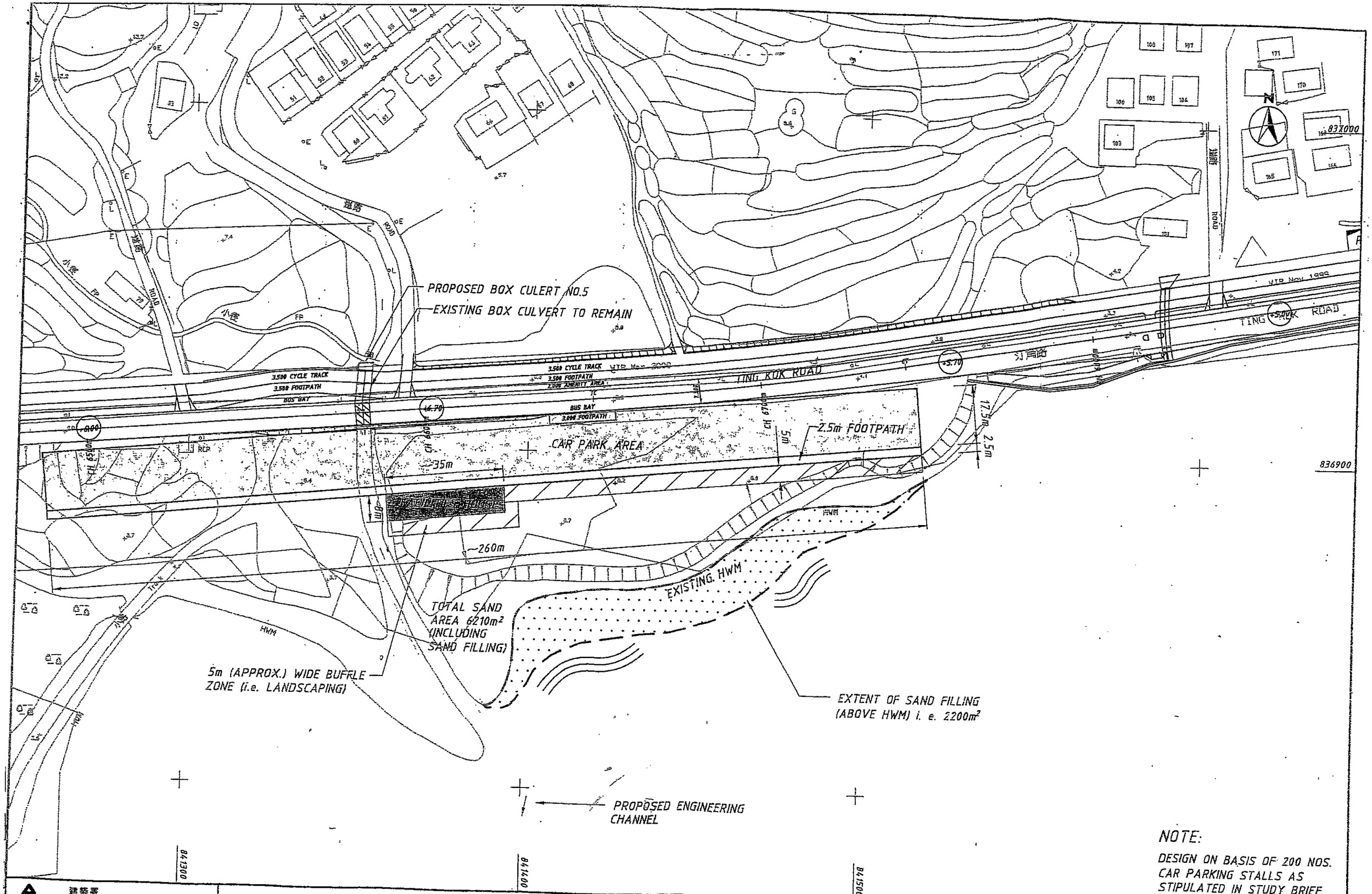
建築署 ARCHITECTURAL SERVICES DEPARTMENT

Maunsell 茂盛(亞洲)工程顧問有限公司

FEASIBILITY STUDY FOR PROPOSED BEACH IMPROVEMENT WORK AT LUNG MEI BEACH

PROPOSED BEACH LAYOUT - OPTION 3

SCALE	1:1000	DATE	JUNE 2001
CHECK	-	DRAWN	TSG
JOB No.	97000	FIGURE No.	3.3
		REV	



NOTE:

DESIGN ON BASIS OF 200 NOS. CAR PARKING STALLS AS STIPULATED IN STUDY BRIEF.

建築署 ARCHITECTURAL SERVICES DEPARTMENT

Maunsell 茂盛(亞洲)工程顧問有限公司

FEASIBILITY STUDY FOR PROPOSED BEACH IMPROVEMENT WORK AT LUNG MEI BEACH

PROPOSED BEACH LAYOUT - OPTION 4

SCALE	1:1000	DATE	JUNE 2001
CHECK	-	DRAWN	TSG
JOB No.	97099	FIGURE No.	3-4
		REV	-

P:\PROJECTS\97099\DWG\3-4.DWG

FUTURE BOX CULVERT NO.5 (BEING CONSTRUCTED UNDER TP 29/97)
EXISTING BOX CULVERT TO REMAIN
DIVERSION DRAINAGE PIPE
DWARF WALL
3.5m CYCLE TRACK
3.5m FOOTPATH
BUS BAY
2.0m AMENITY AREA
TC
RAMP 1:12
SEAWALL (BEING CONSTRUCTED BY OTHERS)
PROPOSED GROIN
EXISTING HWM
PROPOSED SAFEGUARD LOOKOUT
PROPOSED NEW FRONT LINE ABOVE HWM
10.0m
EXISTING NATURAL STREAM
MIN. 10.0m
EDGE OF PROPOSED REVETMENT
EDGE OF EXISTING NATURAL STREAM
PROPOSED WATER ZONE FOR BEACH
136m
BOUNDARY LINE (SWIMMING BOOM LINE) OF PROPOSED WATER ZONE
PROPOSED RAFT
PLOVER COVE (SHUEN WAN HOI)
836900
836800
841400
841500
841600

NOTE:

1. SAND BEACH AREA ≈ 6300m².
2. SAND FILLING AREA ABOVE HIGH WATER MARK≈3,500m²

LEGEND:

- SOFT LANDSCAPING
- GROIN
- HWM : HIGH WATER MARK
- BOUNDARY LINE OF PROPOSED WATER ZONE/ SWIMMING BOOM LINES
- SHARK PREVENTION NET

建築署 ARCHITECTURAL SERVICES DEPARTMENT

Maunsell 茂盛(亞洲)工程顧問有限公司

FEASIBILITY STUDY FOR PROPOSED BEACH IMPROVEMENT WORK AT LUNG MEI BEACH

RECOMMENDED BEACH LAYOUT

SCALE	1:1000	DATE	JUNE 2001
CHECK	-	DRAWN	TSG
JOB No.	97099	FIGURE No.	3-5
		REV	-

Q:\PROJECTS\97099\DWG\3-5.DWG