

2 DESCRIPTION OF THE PROJECT

2.1 Site Location and Site History

The selected site for the TLCDGA is located to the south of Ma Wan Island, adjacent to Tang Lung Chau, and in close proximity to the Ma Wan Fairway (**Figure 2.1**). It is constrained by Kap Shui Mun Fairway on the west and Ma Wan Fairway on the east. The southern part of Ma Wan is currently zoned as Green Belt by the Outline Zoning Plan (OZP) No. S/I-MWI/2. There is a traditional burial area at the southern tip, which is unpopulated and away from any major developments. The main populated areas are in the west to north-west of the Island. A comprehensive residential development has been approved by the Town Planning Board (TPB) to accommodate a total population of 11,536 in the northeastern 'Comprehensive Development Area' (CDA). The adjacent 'Village Type Development' zone will be developed to accommodate about 2,817 people. A developer has proposed a theme park (Ma Wan Park) at the western CDA, to the north of Lantau Link. The planning application for this proposed theme park has been "approved with conditions" by the TPB. In addition, there is a proposal for a film city development at the 'Recreation Priority Area' zone to the south of the Lantau Link. However, the TPB rejected the Section 17 Review submitted by the proponent for this development in June 1998.

The site selected for the TLCDGA is currently being used for the Ma Wan Anchorage, which was designated by MD in 1994. The Ma Wan Anchorage is a temporary anchorage area for vessels waiting to use the Tsing Yi floating dock and also for vessels waiting the passage of large ocean-going vessels rounding the Ma Wan Fairway. The Ma Wan Anchorage is not for vessels working cargo. Prior to 1994, any vessel could anchor in this area of open marine waters to the east and south-east of Tang Lung Chau. The number of vessels using the anchorage is reported to be low.

2.2 Current Operations of the TWDGA

Dangerous goods (DG) vessels using the current TWDGA would be the potential users of the new TLCDGA, which comprise vessels licensed to carry Category 2 DG (Liquified Gas) and Category 5 DG (Substances giving off inflammable vapours). The only restriction on the usage of the DGA is that vessels which are carrying Category 1 DG (Explosives) are not permitted to enter and use the DGA. From a study of the allocation of moorings at the TWDGA undertaken in 1998 and 1993,¹ most of the vessels using the TWDGA moorings and anchorage are fuel delivery vessels (Category 5 DG, Class 3 fuel oils), typically carrying 400 tonnes of fuel. The largest vessel can have a fuel capacity of 1200 tonnes. The fuels carried by these vessels are diesel, kerosene and bunker fuel.

The TWDGA provides 72 moorings for DG vessels. Most of the DG vessels currently registered with a mooring at TWDGA are providing bunkering service between the oil terminals at Tsing Yi and ocean going vessels moored in Hong Kong waters (especially vessels moored in the Western Anchorage), container terminals and industrial areas such as the Tai Po Industrial area to the east of Hong Kong.

From previous site surveys, the number of DG vessels found within the TWDGA ranged from a minimum of 9 by day up to a maximum of 25 by night. During typhoons a larger number of fuel barges return to their moorings and/or the anchorage.

¹ The study undertaken in 1998 is the recent site visit undertaken by CES Ltd. in July 1998. The 1993 study is the previous site survey undertaken from 19 June to 2 July 1993, and reported in *Risk Assessment at TWDGA Phase 1, Volume 2 Appendices, ERM Hong Kong 1994*.

An annual survey is conducted by Marine Department (MD) to ensure that the vessels using the DGA meet the safety requirements of the MD. Under the Merchant Shipping (Miscellaneous Craft) Regulation of the Shipping and Port Control Ordinance, the "Declaration of Fitness for Vessel to Carry Petroleum" which specifies the type of DG cargo that the vessel is licensed to carry is renewed following satisfactory outcome of this survey. Furthermore, spillages or discharges of petroleum products from vessels moored within the DGA would not be permitted under the Merchant Shipping (Prevention of Oil Pollution) Regulation and would be controlled by MD. MD patrol vessels regularly patrol the DGA to ensure that the DG vessels are anchored at their registered moorings.

2.3 The Site Search Study

In June 1994, the Marine Department commissioned a "Stage I Coarse Screening Exercise of the Alternative Site Search Study for the TWDGA". The screening exercise identified possible sites for the relocation of TWDGA which would likely be acceptable in terms of risk, environmental, commercial and marine criteria. Eight potential sites were identified. Following a preliminary screening exercise and subsequent discussions with the Steering Group members of the Study, it was agreed that three sites were to be pursued further. These were :

- South of Ma Wan
- North of Hei Ling Chau
- South of Siu Lam

A Stage 2 Study was then carried out for each of the three sites identified. The objectives of the Stage 2 Study were to conduct :

- Detailed quantified risk assessments (QRAs)
- Initial environmental impact assessments (IEIAs)
- Broad consideration of other pertinent factors at the three selected sites

The Stage 2 study concluded that the Ma Wan site was the most preferable. The following reports were published as a result of the Stage 2 Study:

- *Tsuen Wan Dangerous Goods Anchorage: Alternative Site Search Study - Stage 2 Study. Executive Summary (January 1996);*
- *Tsuen Wan Dangerous Goods Anchorage: Alternative Site Search Study - Stage 2 Study. Volume 1: Summary and Ranking Report (January 1996);*
- *Tsuen Wan Dangerous Goods Anchorage: Alternative Site Search Study - Stage 2 Study. Volume 2: Risk Assessment (August 1995); and*
- *Tsuen Wan Dangerous Goods Anchorage: Alternative Site Search Study - Stage 2 Study. Volume 3: Initial Environmental Impact Assessment (January 1996).*

2.4 Site Selection Criteria

The search for an alternative site for the TWDGA was conducted through two stages; a coarse screening exercise on 8 potential sites and a site ranking of 3 short-listed sites (Ma Wan, Siu Lam and Hei Ling Chau). The ranking criteria were as follows :

- Availability and planning intention
- Engineering feasibility
- Construction programme and cost implication

- Acceptability to operators. Main concerns were :
 - Distance from Tsing Yi Oil Terminals and proximity to Victoria Harbour
 - Availability of transportation for vessel crew
 - Availability of associated facilities
- Risk levels – in terms of the DGA itself and marine navigation
- Environmental impacts

Taking account of the listed criteria, the Ma Wan site was considered the most preferable except in respect of construction programme and cost, and potential marine ecological impacts if blasting is necessary during construction.

2.5 Configuration of the TLCDGA

The proposed DGA at Tang Lung Chau has a gross area of 67.5 ha, which is bounded by the centre lines of the surrounding breakwater. The effective area of the DGA is calculated to be 44.8 ha, as measured in line with the MD's criteria. The moorings and internal fairways occupy a net area of 37.3 ha (excluding the perimeter fairway). The proposed DGA is able to provide a total of 72 moorings.

The shape of the TLCDGA has been modified since its conception in the IEIA. Main features including the following have been investigated:

- the DGA is enclosed by breakwaters to prevent strong waves from entering the DGA; and
- at least two entrances to the DGA for emergency evacuation purposes.

The finalized layout plan of the TLCDGA is shown in **Figure 2.2**. The DGA is protected from waves by two breakwaters around the four sides of the anchorage. The breakwaters are not physically connected to Tang Lung Chau because this will reduce potential ecological impacts on the strip of natural coastline of Tang Lung Chau facing the DGA. There are two entrances to the DGA. They are provided by the space between the ends of the breakwaters at the north-east and south-east of the anchorage.

2.6 Construction Activities of the TLCDGA

The construction of the TLCDGA will involve a total length of 3,372 m of breakwaters. For the dredged foundations, the craft is likely to include grab and trailing suction hopper dredgers for dredging and sandfilling, and towed barges for rockfill and armour placement.

Breakwater construction will require the removal of soft marine mud from a seabed trench for the breakwater foundation and replacement with sandfill. Based on the most up-to-date information, underwater blasting of rock on the seabed would not be required. (A vibrocore survey undertaken in July 1998 found high rock levels in the north-east corner of the proposed DGA, near the northern entrance, and in the north-west corner).

To meet the MD's minimum requirement of 3 m of soft material cover at the mooring anchorages for the safe mooring of vessels, a possible measure is the dumping of soft material to overlay the seabed where in-situ hard material is found in place. Following the completion of the breakwaters construction, it is proposed that filling materials be dumped at the necessary areas within the DGA to make up the required 3 m thickness of soft material at the mooring locations for gravity anchor bedding.

The proposed phasing of works is shown in **Figure 2.3**. The south-west breakwater is to be constructed first which can help to protect the remaining construction work. This breakwater can minimize any down-time due to wave exposure from the south and effectively prevent cross traffic at a relatively early stage.

A possible alternative to dredging which has been considered for the breakwater construction is the use of the Deep Cement Mixing (DCM) technique² as a method of foundation improvement. With the DCM technique, however, a field trial would be required to prove the suitability of the technique in conditions similar to those that would be encountered during construction. Concern has been raised over the length of time of the trial and the need to gazette the trial under the Foreshore and Sea-bed (Reclamations) Ordinance. Thus it is considered that the DCM foundation option is unlikely to be feasible with the proposed construction programme and is therefore not considered further. The details of the comparison of the dredged and DCM foundation types can be referred to in the "*Technical Report on Reprovisioning and Marine Impact of Dangerous Goods Anchorage at Tang Lung Chau.*" The technical report recommended that the dredged foundation method be pursued in detailed design.

2.7 Project Programme

The latest estimate on the programme is for commencement of the works in late 2000. The overall construction schedule is of approximately 33 months duration and includes a contingency for time extensions. The completion of the works would be approximately mid 2003. A tentative construction programme is shown in **Figure 2.4**. The programme will be reviewed at the detailed design stage.

2.8 Benefits of the Project

The selected site for the TLCDGA is located in open waters to the south of Ma Wan Island and away from populated areas and major developments. The total number of sensitive receivers in the vicinity of the proposed TLCDGA is therefore less than that for the current TWDGA located in Tsuen Wan Bay. Existing sensitive receivers in the vicinity of the TWDGA, as identified in the EIA study for the Tsuen Wan Bay Further Reclamation³, include residential and industrial buildings near the waterfront and along Castle Peak Road and Tsuen Wan Road. There are industrial blocks to the west of the interchange between Castle Peak Road, Tsuen Wan Road and Tuen Mun Road.

As described earlier in Section 2.4, the Ma Wan site was considered the most preferable of the 3 short-listed sites except in respect of construction programme and cost, and potential marine ecological impacts if blasting is necessary during construction. (It should be noted that underwater blasting of rock on the seabed is no longer considered to be required during the construction phase). On considering potential benefits to the marine environment, the breakwaters can function as habitat enhancing devices. The breakwaters can provide a suitable hard substrate similar to artificial reefs for the colonisation and establishment of intertidal and subtidal faunal assemblages.

The location of the DGA has changed since the Site Search Study. The DGA is now located further away from Ma Wan (closest distance to the breakwater is approximately 270m). This increase in

² DCM involves the injection and mixing of a cement slurry with the low strength material, i.e. marine mud, to be treated. A chemical reaction between the cement and the *in situ* material increases considerably the strength of the clay and reduces the water content thus locally consolidating the material.

³ Tsuen Wan Bay Further Reclamation, Area 35. Engineering, Planning and Environmental Investigation, Volume 6 : EIA Final Assessment Report, MCAL May 1998.

separation distance from the population on Ma Wan, as compared to the Site Search Study layout, would result in lower risk levels.

2.9 Description of Scenarios with or without the Project

An indication of likely future environmental conditions in the absence of the proposed DGA has been presented for the key environmental issues addressed in this DEIA study.

As described in Section 2.1, a comprehensive residential development has been approved in the northeastern CDA and the adjacent 'Village Type Development' zone will be developed. In addition, a theme park (Ma Wan Park) has been "approved with conditions" at the western CDA, to the north of Lantau Link. With the significant increase in population on Ma Wan from these future developments, there will be a substantial increase in wastewater discharges and associated pollutant loadings. In terms of future marine water quality, the potential for a reduction in marine water quality in the Ma Wan area has been identified (Section 3.3.2). Similarly, with the increase in wastewater discharges from the future residential development on the northeastern part of Ma Wan, there is the potential for a reduction in beach water quality at the two beaches on eastern Ma Wan. A sewage treatment works is therefore proposed to be constructed at Pak Wan on northern Ma Wan to serve the committed developments and will provide treatment to secondary level. Associated with the increase in wastewater effluent discharge in the Ma Wan area, is the potential for deterioration in marine sediment quality in the coastal areas off Ma Wan (Section 7.4).

There are no known proposed major odour generating activities or petroleum-based odour sources in the vicinity of the proposed DGA site. The future (without the proposed DGA) background odour level in the vicinity of the site is anticipated to be minimal (Section 5.4). In the future, the ambient noise levels (without the proposed DGA) would increase due to the comprehensive residential development in the northeastern CDA, the development of the adjacent 'Village Type Development' zone and the proposed theme park to the north of Lantau Link (Section 6.2). It is anticipated that the general air quality would deteriorate in the future due to these committed developments on Ma Wan and the associated increase in road and marine traffic in the area.

Proposed major developments in the surrounding area include the Lantau Port Development (Stage 1) for Container Terminals (CT) No. 10 & 11 (including Penny's Bay Reclamation) and the South-East Tsing Yi Port Development for CT9. Following the relocation of the TWDGA to the proposed site, the Tsuen Wan Bay Further Reclamation will proceed.

2.10 Summary of the Key Issues Report

The prime objective of the Key Issues Report (KIR) was to identify the environmental key issues that require assessment in the DEIA and their corresponding assessment methodologies. The details of each discipline addressed in the KIR are summarized as follows :

2.10.1 Water Quality

Water quality issues are related to the effects of construction and operation including dredging and bacteria (from sewage discharges from vessels) on nearby sensitive receivers, especially the Ma Wan fish culture zone and beaches on Ma Wan. These will be assessed using modelling techniques. The effects of the breakwater configuration on tidal flow will also be assessed using modelling techniques.

2.10.2 Fuel Spillage

The movement of spilled fuel will be predicted using computer modelling. Results will be used to identify sensitive receivers which are likely to be at risk in the event of a major fuel spill near the northern and southern entrances of the DGA.

2.10.3 Air Quality

Odour from the vapour of petroleum products stored on vessels using the DGA will be the only key air quality issue. This will be assessed through odour monitoring and computer dispersion modelling.

2.10.4 Noise

Noise is not a key issue during construction and operation. Detailed noise assessment is therefore not required.

2.10.5 Construction Waste and Mud Contamination

The quantity of construction waste including contaminated mud will be quantified. Mitigation measures will be developed for their removal and disposal to protect water quality and marine biota.

2.10.6 Hazard Assessment

Hazard assessment will be based on reviewing and confirming the findings in the Site Search Study.

2.10.7 Ecology

Ecology is a key issue due to the presence of the Ma Wan fish culture zone, nursery and spawning grounds, the Chinese White Dolphin and fishing activities in the vicinity of the TLCDGA. Effects of water quality deterioration due to dredging and fuel spill on these sensitive receivers will be assessed through literature review and site visits. A survey will be carried out to characterize the intertidal habitats on nearby Tang Lung Chau so as to assess potential ecological impacts.

2.11 Scope and Overall Approach to the DEIA Study

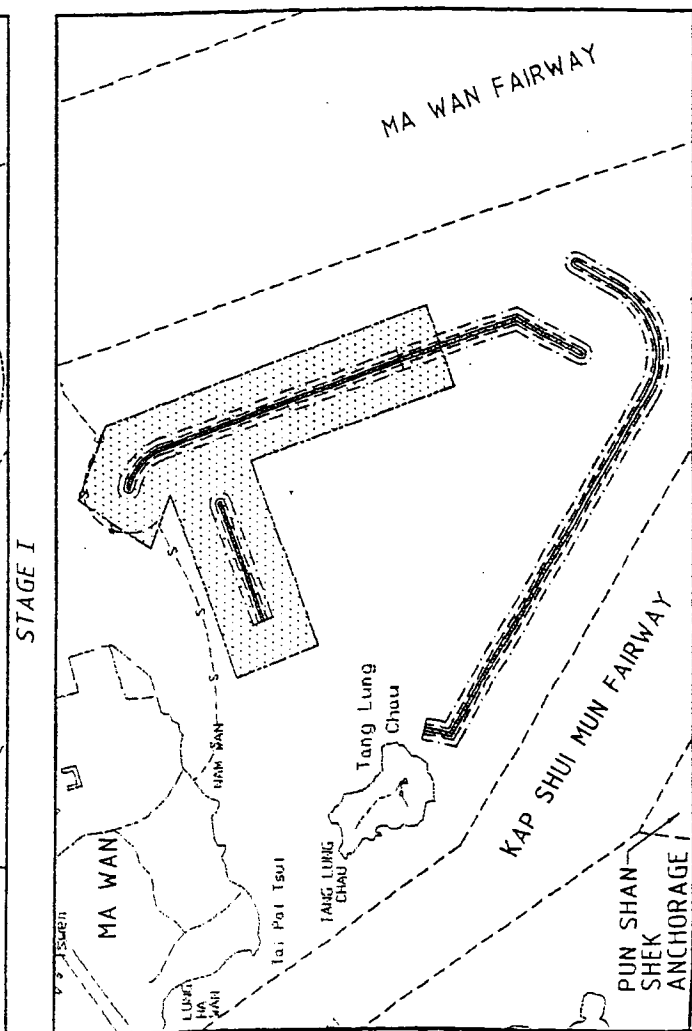
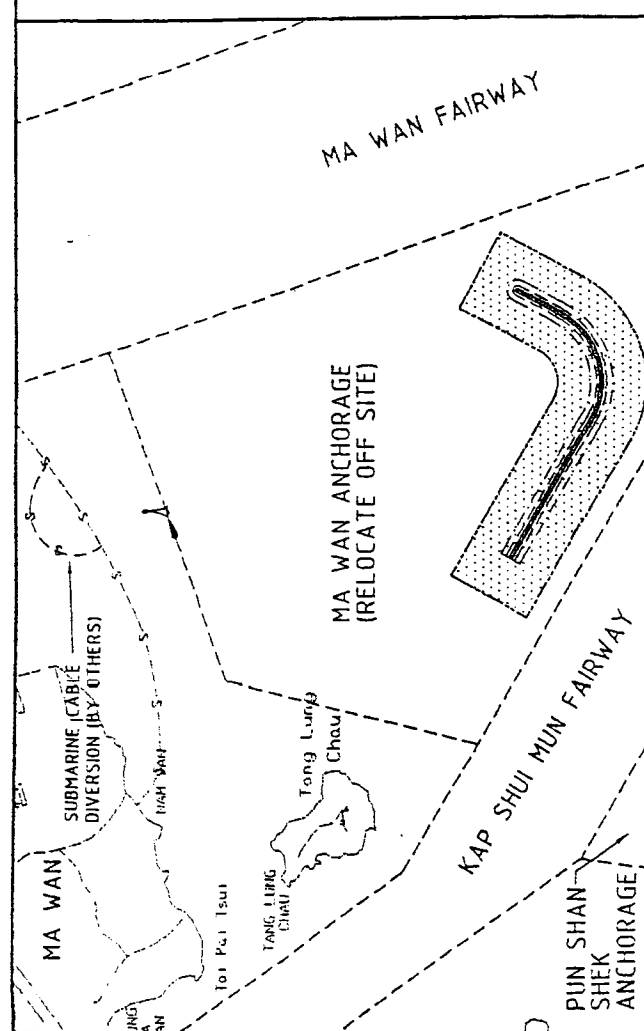
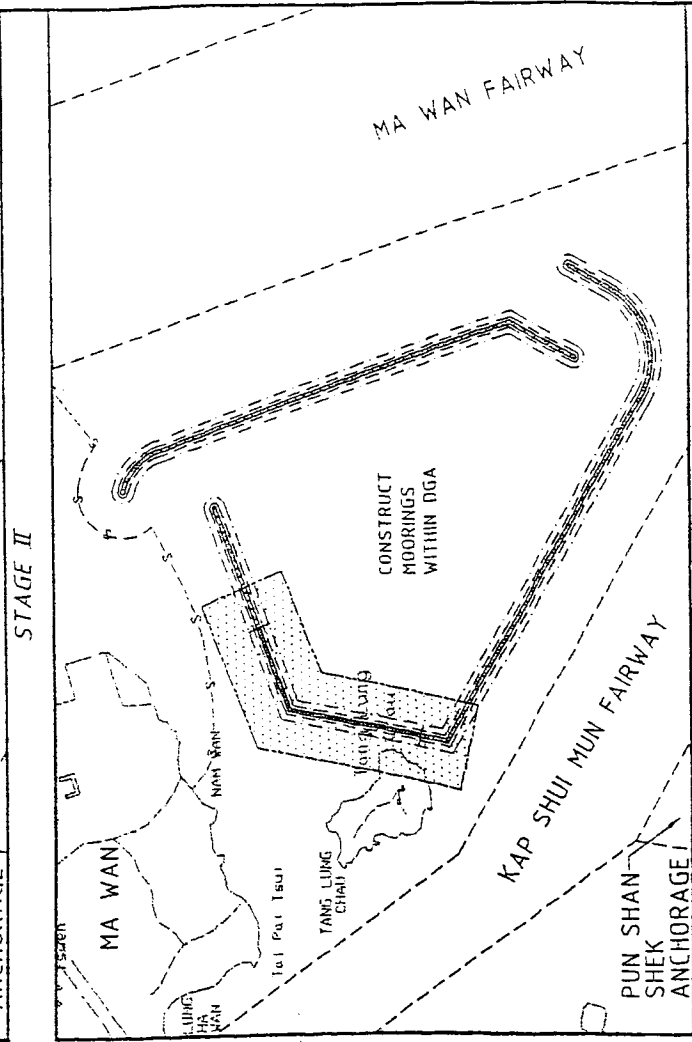
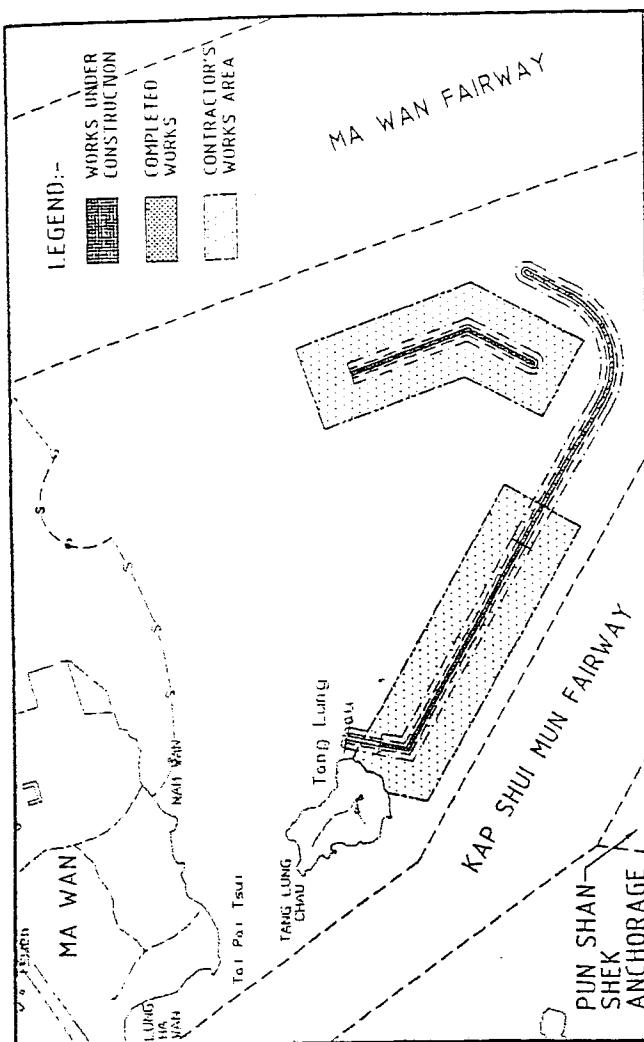
The scope of work for the DEIA is detailed in the finalized Study Brief attached in Appendix A. In accordance with the Study Brief, issues related to the following areas are to be addressed:

- water quality impact;
- hazard assessment (review the risk findings of Site Search Study);
- environmental impact related to fuel/chemical spillage arising from the operation of the TLCDGA;
- dredging impact;
- ecological impact including fisheries impact;
- noise impact;
- air quality impact; and
- waste impact.

The scope also includes recommendation of mitigation measures, identification of residual impacts and proposing environmental monitoring and auditing (EM&A) requirements for the project. The hazard assessment undertaken of the proposed DGA considers the potential off-site risk from the

operation of the TLCDGA, in accordance with the requirements of the *Technical Memorandum (TM) on Environmental Impact Assessment Process*. It should be highlighted that site selection is outside the scope of work for the DEIA.

The assessment methodology adopted in the DEIA is in accordance with the *TM on EIA Process*. Where quantitative predictions have been provided, the modelling methodology, input parameters and method of calculation have been discussed, reviewed and agreed with the relevant Government Departments. It should be noted that worst-case scenarios or conservative assumptions have been considered where appropriate.



LEGEND:-




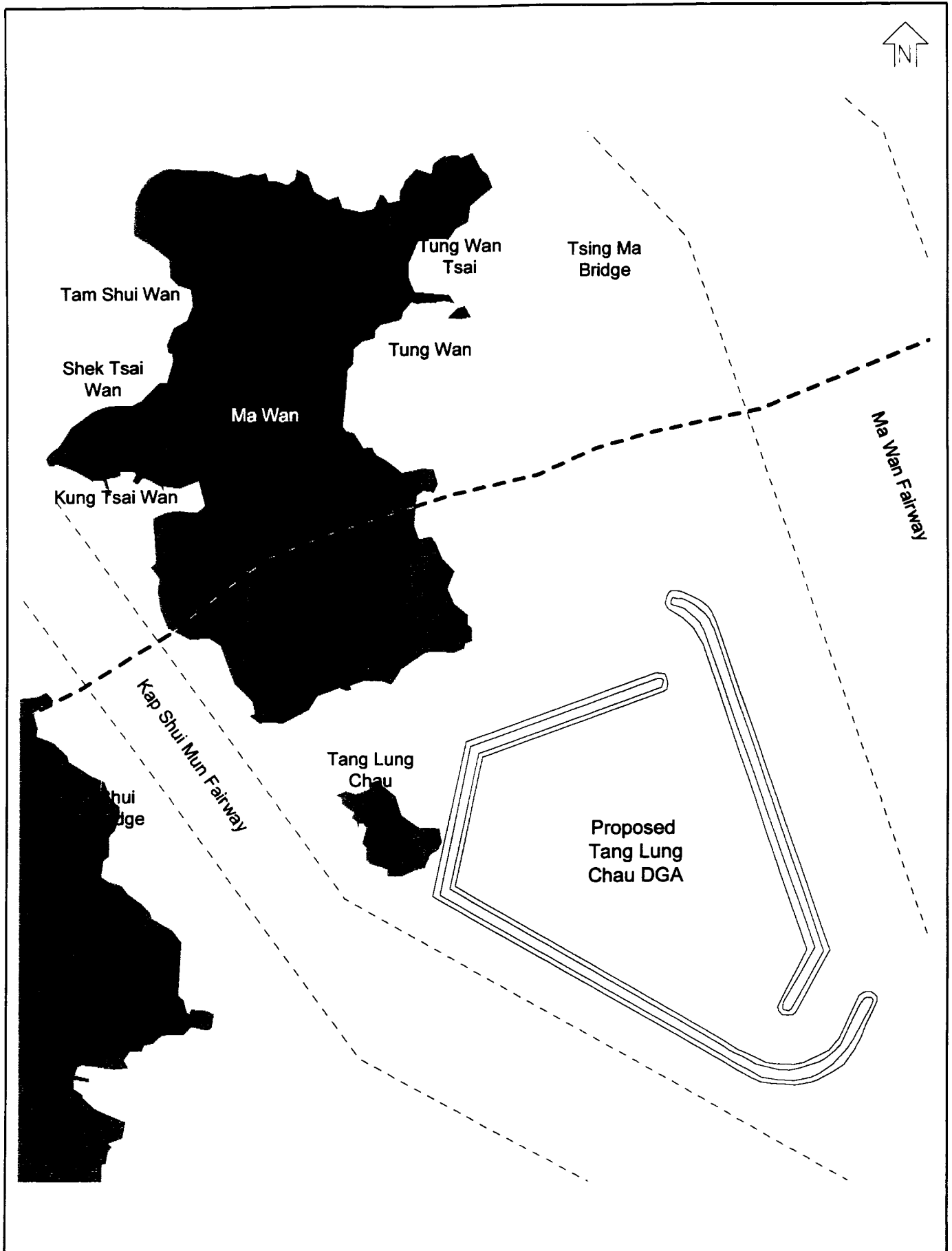
-  WORKS UNDER CONSTRUCTION
-  COMPLETED WORKS
-  CONTRACTOR'S WORKS AREA

FIGURE 2-3
SCALE: 1:12500

TSUEN WAN BAY FURTHER RECLAMATION, AREA 35
TANG LUNG CHAU DGA - DEVELOPMENT PHASING

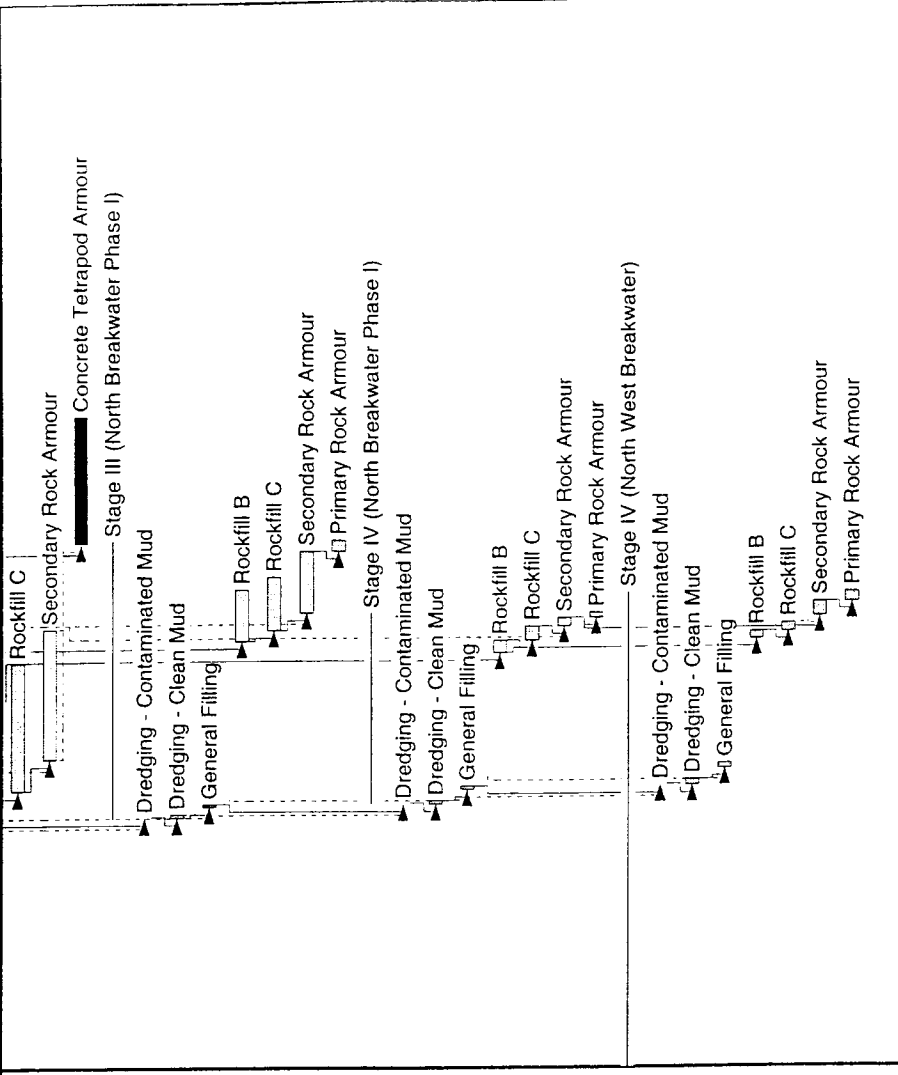


LAYOUT OF TANG LUNG CHAU
DANGEROUS GOODS ANCHORAGE (TLCDGA)

FIGURE 2.2

SCALE 1 : 16000

2004
2003
2002
2001
2000
S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M

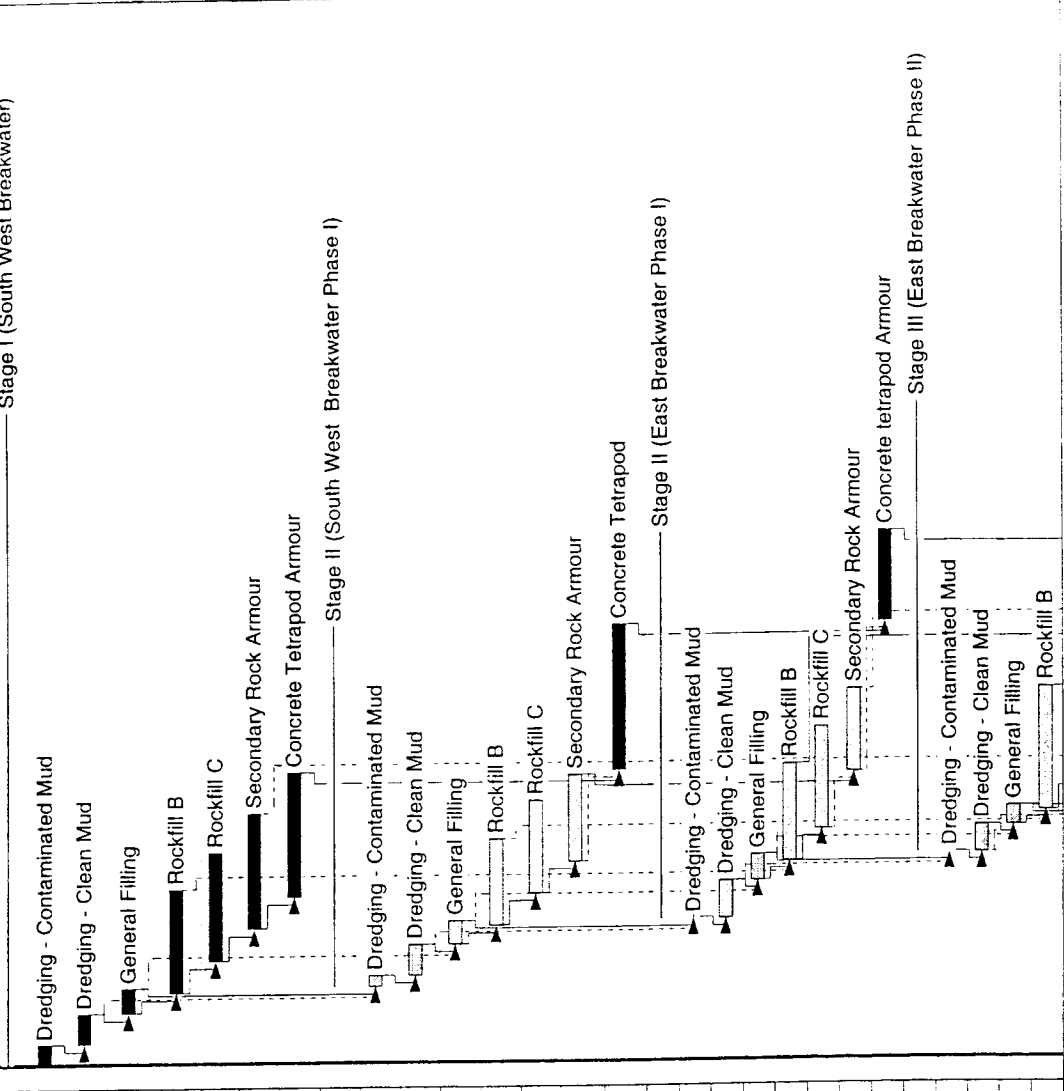


Act ID	Description	Orig Dur	Early Start	Early Finish
1350	Rockfill C	155	01SEP01	02FEB02
1360	Secondary Rock Armour	158	09OCT01	15MAR02
1370	Concrete Tetrapod Armour	153	27JUN02	26NOV02
1400	Stage III (North Breakwater Phase I)	334	30JUL01	28JUN02
1410	Dredging - Contaminated Mud	0	30JUL01	29JUL01
1420	Dredging - Clean Mud	4	30JUL01	02AUG01
1430	General Filling	3	12AUG01	14AUG01
1440	Rockfill B	62	28FEB02	30APR02
1450	Rockfill C	64	13MAR02	15MAY02
1460	Secondary Rock Armour	74	03APR02	15JUN02
1470	Primary Rock Armour	13	16JUN02	28JUN02
1500	Stage IV (North Breakwater Phase I)	230	15AUG01	01APR02
1520	Dredging - Contaminated Mud	0	15AUG01	14AUG01
1530	Dredging - Clean Mud	4	15AUG01	18AUG01
1540	General Filling	4	01SEP01	04SEP01
1550	Rockfill B	15	13FEB02	27FEB02
1560	Rockfill C	17	28FEB02	16MAR02
1570	Secondary Rock Armour	10	17MAR02	26MAR02
1580	Primary Rock Armour	6	27MAR02	01APR02
1610	Stage IV (North West Breakwater)	571	01OCT00	24APR02
1620	Dredging - Contaminated Mud	0	05SEP01	04SEP01
1630	Dredging - Clean Mud	7	05SEP01	11SEP01
1640	General Filling	6	25SEP01	30SEP01
1650	Rockfill B	9	28FEB02	08MAR02
1670	Rockfill C	10	09MAR02	18MAR02
1690	Secondary Rock Armour	17	27MAR02	12APR02
1700	Primary Rock Armour	12	13APR02	24APR02
1710		1	01OCT00	01OCT00

TSUEN WAN BAY FURTHER RECLAMATION, AREA 35
TANG LUNG CHAU DANGEROUS GOODS ANCHORAGE
TENTATIVE CONSTRUCTION PROGRAMME

FIGURE 2 4

SCALE



Act ID	Description	Orig Dur	Early Start	Early Finish
1014	Stage I (South West Breakwater)	787	01OCT00	26NOV02
1015	Dredging - Contaminated Mud	25	01OCT00	25OCT00
1018	Dredging - Clean Mud	37	26OCT00	01DEC00
1020	General Filling	30	02DEC00	31DEC00
1030	Rockfill B	124	26DEC00	28APR01
1040	Rockfill C	130	02FEB01	11JUN01
1050	Secondary Rock Armour	139	12MAR01	28JUL01
1060	Concrete Tetrapod Armour	150	19APR01	15SEP01
1160	Stage II (South West Breakwater Phase I)	433	01JAN01	09MAR02
1090	Dredging - Contaminated Mud	13	01JAN01	13JAN01
1100	Dredging - Clean Mud	37	14JAN01	19FEB01
1110	General Filling	28	20FEB01	19MAR01
1120	Rockfill B	104	14MAR01	25JUN01
1130	Rockfill C	112	21APR01	10AUG01
1140	Secondary Rock Armour	105	29MAY01	10SEP01
1150	Concrete Tetrapod	175	16SEP01	09MAR02
1190	Stage II (East Breakwater Phase I)	464	20MAR01	26JUN02
1200	Dredging - Contaminated Mud	0	20MAR01	19MAR01
1210	Dredging - Clean Mud	45	20MAR01	03MAY01
1220	General Filling	31	04MAY01	03JUN01
1230	Rockfill B	117	27MAY01	20SEP01
1240	Rockfill C	123	04JUL01	03NOV01
1250	Secondary Rock Armour	99	11SEP01	18DEC01
1260	Concrete tetrapod Armour	109	10MAR02	26JUN02
1290	Stage III (East Breakwater Phase II)	541	04JUN01	26NOV02
1310	Dredging - Contaminated Mud	0	04JUN01	03JUN01
1320	Dredging - Clean Mud	33	04JUN01	06JUL01
1330	General Filling	23	07JUL01	29JUL01
1340	Rockfill B	148	25JUL01	19DEC01

TSUEN WAN BAY FURTHER RECLAMATION, AREA 35
TANG LUNG CHAU DANGEROUS GOODS ANCHORAGE
TENTATIVE CONSTRUCTION PROGRAMME

FIGURE 24

SCALE :