Section 13

13 RISK APPRAISAL - LAMMA BREAKWATER

13.1 INTRODUCTION

As part of the LAPH Studies, the Consultants are required to examine the risk implications of the use of the reclaimed area behind (i.e. to the north) the Lamma Breakwater. This Section examines the possible restrictions from a risk perspective of the use of the reclamation area for Potentially Hazardous Installations (PHIs).

Many of the engineering, environmental and navigational aspects of the proposed Lamma Breakwater have already been examined and the main conclusions are presented in the Preferred Concept Plan Report. The Preferred Breakwater layout is shown in Figure 2.1. The associated reclamation area could be as great as 400 ha. From the outset, it is clear that no PHIs (including an oil refinery) would be automatically excluded on the grounds of insufficient land area being available. However, the decision to locate a particular PHI on the reclamation area would, of course, depend on many other factors including economic feasibility, the load bearing characteristics of the area, the ability to transport people and materials to and from the site, etc..

13.2 NEARBY POPULATION CENTRES

One of the key aspects of risk assessments, particularly in Hong Kong, is the proximity of areas of high density residential population. By inspection, it is immediately apparent that the site is well suited for PHIs, particularly since the marine approaches would be from the south (thus ensuring that laden bulk tankers did not pass close to centres of population in Hong Kong). The nearest areas of population can be summarised as follows:

- Cheung Chau lies to the WNW/NW with a densely populated central isthmus. The current (1991) population of around 21,500 is about 5km from the centre of the proposed reclamation;

- Hei Ling Chau lies to the NNW and is managed by the Correctional Services Department. The island has a total population of nearly 2,000 comprising inmates of a drug rehabilitation centre and of a "young offenders" prison, CSD staff, and about 600 Vietnamese boat people. The population is distributed around the island in camps and is within 7-9.5km of the centre of the proposed reclamation; and

- Lamma Island lies to the E/NE with a sparse population of nearly 3,000 concentrated on Yung Shue Wan in the north-west of the island. Most of the population resides about 6km from the centre of the proposed reclamation. In addition, the Lamma Power Station lies about 4.5km to the NE.

There are no other (existing or proposed) areas of residential population nor industrial development within 8km of the centre of the proposed reclamation. With regard to the areas identified above, it is currently envisaged that some increases in population will occur due to "natural" (small-scale) development.

13.3 RISK CONSIDERATIONS

In dealing with the range of possible incidents at PHI sites, the following general observations can be made:

- for incidents involving fires, process explosions, releases of flammable/toxic gases from process units and catastrophic failures of tanks containing flammable/toxic liquids the hazard range to which the consequences could cause fatalities rarely extends beyond several hundred metres;

- for incidents involving the catastrophic failure of storage tanks containing flammable gases (liquefied under pressure/refrigeration) the hazard range rarely extends beyond 2km; and

- for incidents involving the catastrophic failure of storage tanks containing liquefied toxic gases (such as ammonia or chlorine) and of vessel cargo tank(s) containing volatile toxic/flammable liquids or liquefied gases the hazard range may extend for several kilometres.

It is clear that the residential population in the vicinity of the proposed reclamation will only be at

risk from the most severe incidents involving massive (1,000t or more) releases of particularly hazardous materials. In addition, two further points should be borne in mind:

- incidents involving vessels (carrying hazardous materials in bulk) at or near the jetties are often major contributors to the overall risk levels associated with PHIs. Since the berths will be located in the sheltered waters to the north of the reclamation area, the associated risks should be lower than for more exposed berths; and

- the prevailing wind is from the north-east which will tend to disperse gases and vapours away from the nearest residential areas.

With regard to the advice from the Co-ordinating Committee on the Land-use Planning and Control Relating to Hazardous Installations, (CCPHI), and the associated Risk Guidelines, it is likely that the possibility of more than 1,000 fatalities on the reclamation area will be more of a limiting factor than the presence of remote population centres. This, in turn, leads to the view that:

> *'...from a risk perspective (and the CCPHI Interim Societal Risk Guideline in particular), it would be preferable for a few (low worker density) PHIs requiring large land areas to be located on the proposed reclamation rather than numerous relatively small PHIs to ensure that 1,000 (off-site) fatalities could not result from any one incident on a particular site.'*

13.4 NATURE OF POTENTIALLY HAZARDOUS INSTALLATIONS

Against this general background, possible PHIs for location on the proposed Lamma Breakwater reclamation area are considered in Table 13.1. In each case, the possibility of a risk to the nearby residents is indicated together with a summary of the key hazards which would need to be addressed at the detailed planning stage. The possibility of residents being at risk is based on consideration of the possible consequences of the severest accidents occurring under the most unfavourable meteorological conditions. However, there is little doubt that for all the PHIs listed in Table 13.1, the associated risks to nearby residents would fall well within the CCPHI Risk Guidelines.

TABLE 13.1

POSSIBLE PHIs FOR LAMMA BREAKWATER

NATURE OF PHI	LAND USAGE	RISK TO RESIDENTS	KEY CONCERNS
LPG Terminal	Low	None	Currently, LPG is imported into Hong Kong in small (1200t) coastal tankers. Should this be relaxed permitting the importation in large (30,000t) refrigerated tankers, consideration should be given to the possible effects of a massive release from cargo tanks which could result in a "remote" risk to nearby residents.
Oil Terminal	Medium	None	None
Oil Refinery	High	None	If the refinery was to use hydrofluoric acid (HFI) in an alkylation unit consideration should be given to ensuring a minimal amount of storage.
Bulk Chemical Terminal	Medium	Extremely Remote	The bulk import of particular chemicals (notably those of volatile toxic liquids) could lead to a massive release at the jetties.
Chemical Works	Medium/ High	Remote	The bulk storage of liquefied toxic gases in tanks of 1,000t or more. The bulk import/export (by sea) of toxic gases and/or volatile toxic liquids.
LNG Terminal	Low/ Medium	Remote	The marine transport involves dedicated LNG carriers with a capacity of about 50,000t carried in several tanks. There is therefore the possibility of a massive release at or near the jetties.
Power Station (non-nuclear)	Medium/ High	None	None

13.5 CONCLUSIONS

In general the Lamma Breakwater reclamation provides an ideal opportunity for the siting of the PHIs mainly because of its remote, yet convenient, location and ease of access from the sea. However from a risk point of view there are a number of installations which would be favoured. These include installations which generally require large land areas but have low worker populations e.g. oil refineries and power stations.