Appendix A1

APPENDIX A1

TSING CHAU TSAI (TCT) MEGA BORROW AREA

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1. PROPOSALS

1.1 Introduction

The Tsing Chau Tsai (TCT), Peninsula has been identified as a potential borrow area for PADS projects in general and specificially to provide rock and fill material for the Lantau Port and Western Harbour Developments. Various areas within the TCT peninsula have been allocated for borrowing. There are two broad categories of borrowing. The first comprises the temporary borrow areas on the south of TCT, five sites have been or will be utilised for different Projects.

The second category of borrowing is the potential Mega Borrow Area to the north of the smaller sites already identified for borrowing purposes, and generally referred to as the Quarry Area Extension. The Mega Borrow Area has not yet been committed and its form and method of working has yet to be agreed. It is anticipated that the operational life of the quarry could be up to 30 years, undertaken in several phases.

It is proposed that the quarrying would be undertaken in the four distinct phases of container port development which are shown Section 1 of the Report - in Figure 1.1. The estimated in-situ and bulk volumes of excavated material are summarised in Table A1.1 below:

TABLE A1.1

ESTIMATED VOLUMES OF EXCAVATED MATERIAL

PHASE	IN-SITU VOLUME Mm^3		BULK VOLUME Mm^3	
	ROCK	SOIL	ROCK	SOIL
I	21.0	6.3	27.3	8.2
II	13.4	4.3	17.4	5.6
III	4.5	2.4	18.8	3.1
IV	8.8	2.7	11.4	3.5

Prior to the commencement of Phase I some excavation/construction work will be required to form the transportation links required for operation of the quarry areas. This includes the proposed port service road between the Penny's Bay Power Station and the hillslopes of TCT.

Schematic Phasing

There are a number of advantages of phasing the excavation work at the quarry including the following:

- the area of exposed working face can be kept to a minimum;
- pollutant sources are confined to relatively small areas making effective mitigation more feasible;

- the phased programme allows for early restoration and landscaping of working areas;
- phasing allows for the consecutive working of the quarry by two or more contractors; and
- the operating system is sufficiently flexible to enable a satisfactory landform to be achieved regardless of the demand for fill material.

Landform modifications will be required to form the Port Service Road and the various road and rail links along the north coast and through the valley at the north end of Penny's Bay. Works will be required around the existing borrow area to form transportation links along the south coast. These factors are anticipated to control the early phases of any quarrying works.

At present demand for fill material from Port related activities is seen as the primary trigger for beginning the quarrying at TCT. The possible methods of excavation which have been identified include conventional open quarrying and the "glory hole" excavation although this may not provide the required quantities of fill in the desired time.

1.2 Conventional Quarrying

Open quarrying would involve the progressive removal of material from the working face and the formation of a working platform. There are a number of options for the alignment of the cutting face of the quarry. The options are largely influenced by the volume of fill material required, and have varying implications in terms of visual and ecological impact.

1.3 Glory Hole Excavation

The Glory hole method would involve initial excavation of rock material using conventional large scale quarry methods such as drill and blast. The quarry is then worked by sinking a deep shaft which connects to a horizontal tunnel and conveyor belt. The blasted rock is then transported through the tunnel and conveyed to the barge collection point. This method of quarrying forms a crater which cannot be developed on completion of the excavation. However, adoption of this technique means that views of the working face are limited and noise and dust impacts can be kept to a minimum.

2. KEY ENVIRONMENTAL ISSUES

2.1 Background

Quarrying activities will inevitably have some environmental impact, however, the degree of impact can be minimised through comprehensive consultation and by careful and effective planning. The potential environmental impacts from the excavation of fill material from the TCT quarry will include:

- dust from blasting, rock crushing and transportation of excavated material
- noise and vibration from blasting, drilling and rock crushing;
- the 'startle effect', associated with blasting operations;
- waste disposal; and
- visual impacts from exposed working areas.

The degree of impact will depend on the area excavated and the method of quarrying adopted. The Recommended Master Landscape Plan (RMLP) is included in Section 10 of Volume I of this Final Report. The key environmental issues are discussed below.

2.2 Air Quality

Although the site is remote from sensitive receivers, dust generated during excavation works will potentially be a nuisance to the workers on site and on the port itself. It is anticipated that dust generated will be the non-respirable fraction and therefore is unlikely to be a health risk.

However, in-keeping with the Hong Kong Planning Standards and Guidelines it will be necessary for the contractor to employ appropriate dust suppression measures.

An air quality assessment of quarrying activities at TCT has been undertaken in a previous study, (Highways Department 1991). The study concluded that where Sensitive Receivers were within approximately 1 km of the working area mitigation measures would be required to reduce the levels of total suspended particulates, (TSP). The probability of particulate concentrations in excess of the Air Quality Objective, (AQO), is greatest at less than 500 metres. In addition, air quality impacts are expected to arise from diesel exhaust fumes from site plant and machinery.

2.3 Noise

With regard to noise impacts, the main areas of concern are elevated noise levels, vibration and the 'startle effect' associated with blasting operations, possible rock crushing and drilling. Transportation of the fill material will involve noisy plant such as bulldozers, excavators/loaders, and large dump trucks.

The village of Fa Peng has been identified as a potential noise sensitive receiver, (NSR), for quarrying at the TCT mega borrow area. Additionally, since the area of quarrying activity will vary over time, NSRs at Penny's Bay may also be affected by the works.

2.4 Water Quality

Both the borrow activities and the placement of the fill in the reclamation may give rise to significant water quality impacts. Assuming that the fill material is uncontaminated, the impacts will generally relate to the release and dispersion of suspended particulates to marine waters, with consequent plumes extending from the borrow area, driven largely by run-off. Recent site visits have noted that the ongoing excavation near to the north eastern edge of Penny's Bay is currently causing such effects.

2.5 Terrestrial Ecology

The temporary small borrow areas mainly affect areas of hilly grassland and do not impact on any habitats or species of known importance.

In attempting to influence the form and method of working of the Mega Borrow Area, the LAPH Studies have taken into consideration the landscape, ecological and environmental mitigation thresholds. The environmental considerations are strongly conditioned by the topographical structure of the TCT peninsula and, as analyzed in more detail in the Environmental Baseline Report, it has been possible to identify physical thresholds which contain a conventionally worked quarry largely within a footprint, such that external environmental affects on SRs are significantly mitigated. Thus, rather than effectively cutting the peninsula in half leaving only the northern section intact, it is recommended that areas of prime vegetation on the west coast and inland valleys should be retained and the borrow area be reshaped to accommodate this.

Whilst such reshaping has been suggested to avoid major areas of ecological sensitivity, should it go ahead, it will inevitably have some impacts, primarily upon two small freshwater streams and natural woodland/tall scrub behind the Cheoy Lee Shipyard (in Penny's Bay). The main impact would be complete removal of these habitats in order to access the overburden and underlying rock. Another indirect affect is likely to be alteration of the water catchments which could affect the flow of streams and therefore the associated vegetation. These impacts are considered to be relatively minor and of local significance only.

With regard to animal species, the Chinese Pangolin has been found in small numbers in North Lantau and probably still exists within the Study Area. In habitat terms, this mammal favours areas where it can shelter, food (termites, ants and wasps) is abundant and where it can burrow easily. Other parts of the Study Area away from the TCT peninsula which are less rocky are possibly more favoured by the Pangolin. The prospect of borrowing further parts of this peninsula is therefore not considered critical to the survival or distribution of the Chinese Pangolin on North Lantau. The impacts on the overall distribution and survival of this species in Hong Kong are judged to be minimal. However,it is recommended that a survey is conducted to investigate whether the Chinese Pangolin is present within the TCT peninsula. This survey would be most appropriately carried out when further decisions have been made on the future development of this area.

The terrestrial ecology of the TCT peninsula could, and most probably will, also be affected by the Sham Tseng Link, (STL), road to the North Lantau Expressway, (NLE), the Green Island Link, (GIL), and the Freight Rail Link to Sham Tseng. The exact routes and nature of these links are subject to further study and consequently still uncertain at this stage, however it is unlikely that the wooded valleys and freshwater streams could be completely avoided. It is considered that the ecological issues should influence decisions on route location and that measures should be included in the design to ensure minimal impacts on sensitive habitats and to facilitate mitigation where required.

The Pa Tau Kwu peninsula will be traversed by a temporary road which serves the Marine Services Support Area (MSSA) in Phase I of the LAPH development. It is considered that the road should be designed to ensure that the existing woodland highlighted in WP No. 12A will be retained.

The saddle between Penny's Bay and Ta Shui Wan contains the road links between the Container Port and the North Shore development, and the link between the NLE and the Container Port. These links will be required by 1997 and the valley will contain additional roads serving future phases of the Container Port.

The major topographical constraints in this valley has meant that it will be impossible to retain any of the existing vegetation in the main corridor. As a mitigation measure for the loss of this small area of tall scrub/woodland, an extensive programme of tree/shrub planting has been suggested; details of this are set out in Working Paper No. 24 *Rural Hinterland Strategy*. The loss of a few hectares of tall scrub/woodland in this area is unavoidable but is not considered to be of particular significance, except in a very local context where appropriate mitigation measures have been suggested.

These major transport links will give rise to a "barrier effect" which will affect animal movement, in particular the movement of mammals. It is extremely difficult to quantify the effect, however initially some mammals are likely to be killed on the roads as they try to cross from the TCT peninsula to the rest of Lantau. In other countries, the provision of mammal tunnels has been used to mitigate this impact where known routes have been affected. This type of mitigation measure is not considered appropriate in this situation at this stage, partly because of the topography and large distance involved, but also because of the lack of detailed knowledge and understanding of the patterns of movement and numbers of species involved. It is an issue which should be kept under review, but the possible loss of a small number of mammals is unlikely to prove significant in terms of the terrestrial ecology of the area.

The freshwater stream to the north west of this area will be retained along with much of the woodland/tall scrub along the northern coast between Wang Tong and Tai Yam

2.6 Visual

The visual impact of quarrying is often the most significant environmental impact leaving significant scars on the landscape. Restoration works associated with quarrying are a relatively recent development in Hong Kong. This is partly due to the fact that there are only hard rock quarries, which generally lend themselves to restoration only when the quarries are becoming exhausted.

The TCT quarry area has the potential to cause a significant visual impact and it will be necessary to ensure that the development of the area as a source of fill is carefully planned.

Despite the phased approach to the quarry operation which will minimise the visual impact, visually sensitive receivers are likely to include users of the Port Road, workers at the Penny's Bay Power Station and at the Lantau Port, and also users of the Ferry services from Discovery Bay and Peng Chau.

3. MITIGATION MEASURES

3.1 Noise

Due to the remote nature of the site the number of NSRs is limited. However, the potential impacts should be reduced by using such measures as restricting the blasting times to day-time hours and not on public holidays. Those likely to be affected should be forewarned through an information campaign, indicating the location and times of blasting.

Optimum blasting should be adopted. This can be described as placing the designated amount and type of explosives in pre-determined positions in accurately located and drilled blastholes and filling them in a carefully designed sequence, so as to safely and economically break and displace a calculated quantity of rock. Optimum blasting also serves to minimize the amount of suspended particulates released.

Noise mitigation measures should also be employed, for example:

- silencing of noisy equipment and use of enclosures where appropriate;
- regular maintenance of plant and equipment;
- use of temporary noise screens; and
- strategic siting of noisy equipment.

3.2 Water quality

The borrow area should be designed so as to minimise the volumes of surface run-off entering the marine environment directly. This could involve the installation of an interception ditch or drainage collection channel. Thus adequate drainage should be provided for site working areas and sediment and oil traps should be employed to minimise the carriage of suspended solids and contaminants into the marine environment.

3.3 Dust

Use of optimum blasting techniques will assist in minimising dust generation, in addition, dust suppression methods can be adopted including:

- erection of barriers/screens around the site, particularly areas of blasting;
- installation of appropriate filtration equipment on machinery;
- frequent water spraying, including spraying and covering excavated material prior to transportation; and
- provision of wheel wash facilities for site vehicles.

3.4 Visual

In order to limit the visual impact of the quarry it is essential to keep the working face to a minimum. It has therefore been proposed that the quarry is worked sequentially from the north end and that a series of cells are excavated back to the final profile with each being reinstated by hydroseeding and planting before work on the next phase commences.

3.5 Landscaping Aspects

It is important that the slope profiles are formed to a gradient which will permit landscaping and restriction, as well as ensuring slope stability and adequately drainage.

Chunam slopes would be environmentally unacceptable in any areas of the borrow area.

The excavation should be limited to the southside of the peak at Fa Peng Teng to safeguard important wooded valleys and protect views from the New Territories.

The visual and landscaping aspects of the quarrying works and restoration programme are discussed in more detail in the Landscape Plan Section of Volume I of this Final Report.

3.6 Environmental Monitoring and Audit Requirements.

Given the scale of the proposed quarrying, environmental monitoring schedules and audit procedures are essential in order to:

- ensure that any environmental impacts are kept to 'acceptable' levels, i.e. within the Hong Kong Planning Standards and Guidelines:
- establish procedures for checking that mitigation measures have been applied and are effective, and that the appropriate corrective action is undertaken if and when required; and
- provide a means of enforcing compliance with the environmental objectives, recording anomalies and documenting corrective action.

Monitoring programmes in accordance with those outlined in Section 14 should be incorporated into the appropriate contract(s) for the TCT mega borrow area in the form of environmental clauses.

Ecological monitoring

Prior to the commencement of any construction /excavation activities further ecological survey work is recommended to identify opportunities to minimise the impact important habitats of ecological importance. This should include a survey of the distribution of the Chinese Pangolin.

4. CONCLUSIONS

In conclusion the environmental impacts associated with the excavation of fill material from the TCT mega borrow area can be minimised provided that the mitigation measures outlined above are adopted. A monitoring and audit programme will ensure that the standards and guidelines are achieved and enforced.

Further studies have been recommended to identify ecologically important habitats and to determine the distribution of the Chinese Pangolin.