

LAMMA ROCK PRODUCTS LIMITED

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**Lamma Quarry;  
Casting Basin & Moderate Quarry Extension,  
Environmental Impact  
Assessment**

*Executive Summary*

*June 1993*



SHUI ON QUARRIES LTD.



LAMMA ROCK PRODUCTS LTD.

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**AXIS Environmental Consultants Ltd.**

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## 1.0 INTRODUCTION

### 1.1 Background

The quarry at Pok Tung Wan is operated by *Lamma Rock Products Ltd.*, a subsidiary of the Shui On Group, under the current Government Licence No. 428 of 1977 which is due to expire at the end of 1993.

It is proposed that the existing Government Licence is extended for a further 2 years. If the application for the licence extension is approved, it is proposed that the quarry limits be extended and that a casting basin facility be constructed. The basin facility would be used for the construction of precast units which are required for the large number of existing, committed and proposed infrastructure projects within Hong Kong.

### 1.2 Study Objectives

The prime objective of the study is to analyse the existing quarrying activities and predict the impacts associated with the proposed developments and to recommend mitigation measures to reduce any impacts to acceptable levels. Major issues considered under the Study Brief include the assessment of impacts on air quality, noise levels, marine water quality, impacts on the nearby fish culture zone (FCZ), marine blasting and visual impacts.

### 1.3 Study Process

The study has been carried out in three main stages with the production of three reports culminating with the Final Report.

*Baseline Monitoring*, during this stage data on air quality, noise and marine water and sediment quality were collected for use in the study. Where the existing data sets were thought to be insufficient extra monitoring programmes were designed and executed. Extra surveys were carried out for noise, marine water quality and marine sediment quality.

*Initial Assessment* stage where the existing and collected data were used to predict the impacts of the proposed development. The process of data collection and subsequent impact prediction using computer models was carried out for noise and air quality impacts. During this stage it was decided that other impacts, water quality and visual, could be effectively controlled and mitigated against through the use of on-site measures so that no unacceptable off-site impacts were expected. For impacts associated with air, noise, water and waste management monitoring schedules and action plans were prepared.

*The Final Stage*, where the findings of the initial assessment stage were refined so that the impacts were accurately predicted and effective mitigation measures recommended for each impact category. Also the monitoring and audit schedules were revised in the light of the impact predictions. This stage culminated in the production of a Draft Final Report which following any comments and suitable responses will become the Study Final Report.

## **2.0 EXISTING FACILITIES AND ACTIVITIES**

### **2.1 Facilities**

There are a number of facilities within the Pok Tung Wan quarry including those related to the quarrying operations being carried out by *Lamma Rock Products Ltd.*

- *rock crushing and screening plant*
- *cement silos (and associated equipment)*
- *facilities for handling aggregate and cement barges*
- *a disused tile factory*
- *and a general storage area.*

### **2.2 Current Activities**

At present the quarry is being operated under the Government Contract No. 428 of 1977, entitled "Right to Quarry Stone at Pok Tung Wan, Lamma Island". The contract allows for the quarrying and processing of the stone and the precasting of concrete.

The present production rate of the quarry is approximately 230,000 tonnes per month.

Blasting at the quarry occurs approximately twice a week and on each occasion a government representative is required to be present. Following a blast the rock produced is of various sizes and is either transported, by a number of large dumptrucks, to the crushing unit to produce an aggregate or if large rock is required, eg. for rock armour, directly to the barge loading point. Following crushing the aggregate product is either taken to the various stockpiles located around the quarry or transported directly to the barge loading point.

## **3.0 PROJECT DESCRIPTION: PROPOSED DEVELOPMENTS**

### **3.1 Casting Basin Construction**

The Pok Tung Wan quarry has been identified as a potential site for the location of a casting basin in a number of Government feasibility studies including the Lantau Airport Railway immersed tube crossing of Victoria Harbour.

The size of the proposed basin would be in the order of 130m long by 120m wide at the quarry floor and have a depth of approximately 14m below the present ground level. At this level the invert of the basin would be approximately -9mPD, and be of size approximately 120m x 100m. This would enable four of the railway units to be cast in the basin at the same time. The existing benched slope at the back of the quarry will need to be pushed back to accommodate the basin.

Excavation of the basin itself will be formed as a drop cut (a normal quarry process) from the platform level at +5mPD to a basin floor level of -9mPD, this will be achieved by producing progressive benches below the existing quarry floor, and mucking out by means of an inclined road from one corner of the dock. Access to the floor of the basin would be provided via a ramp

If fissures are encountered that appear to be potentially unstable, rock bolting/dowelling plus grouting techniques will be employed to ensure stability. (This is thought highly unlikely due to the known nature of the quarry rock quality and lack of faults). Any excessive inflow will be grouted.

As the drop cut reaches design level of approximately -9mPD, a perimeter drainage system will be developed leading to sumps that will also act as initial oil interceptors.

It is therefore expected to take approximately 5 months to excavate the 500,000 tonnes of rock in the drop cut.

### **3.2 Entrance Channel**

To provide access between the casting basin and the sea, it will be necessary to excavate a channel to a depth of -9m below sea level. The width of the channel needs to be a minimum of 15m wide to allow for the passage of the railway tunnel units. Part of the channel may be excavated at the same time as the casting basin, however, the final break through to the sea is to occur after the casting basin is in use and when the construction of the first batch of tunnel units is completed.

To enable this to take place, it will be necessary excavate and dredge the full length of the channel, with drilling and blasting of any encountered rock. A small portion would be left adjacent to the sea, which is to be dredged just prior to floating out of the first batch of units.

### **3.3 Basin Operation**

To support the casting basin activities, it will be necessary to provide support facilities and a suitable works area. The activities that would be undertaken in this area would include:

- site offices;
- workshop and laboratory;
- stores;

- steel bar cutting and bending area;
- sand blasting and coating area;
- form-work storage; and
- form-work fabrication.

The essential facilities and equipment required during the operation of the casting basin are briefly described below:

#### *Batching Plant*

The location of the batching plant for the casting yard will be dependent upon the most economical site. There are two potential alternatives, the first being to upgrade the existing batching plant, and the second to locate a batching plant closer to the casting yard between the current pre-cast yard and the cement works. The former of these alternatives is preferred at this time, and this has been assumed in the assessment.

#### *Steel Bending*

An area will need to be set aside to allow for bending and shaping of the reinforcing steel work. The requirements will be the basic standard requirements for any similar operation in Hong Kong.

#### *Site Offices and Store*

The current estimates are that approximately 200 people will be employed in the actual casting of the units. Offices to house project personnel have been estimated as twelve standard container size offices, plus two similar units to act as warehouse facilities. In addition to these facilities, a canteen will be provided, for use by employees.

#### *Wharf*

For loading and unloading of materials, and for transport inwards and outwards personnel associated with the operation of the casting basin, a wharf will be required. A seawall wharf of approximately 50m long adjacent to a casting basin facility, is proposed.

Since the tunnel units required for the LAR harbour crossing are as yet undesignated, typical quantities have been determined from the units used for the existing MTRC Admiralty to Tsim Sha Tsui tunnel which were constructed between 1976-79 using a basin on the recent reclamation at Chai Wan. Preliminary planning for the LAR indicates that 12 units each about 100m long are required, which could be built in 3 batches of four units. Using a casting basin of that proposed, the units would be completed with a frequency of approximately 5 months per batch.

#### *Flotation of Precast Units*

When the units are complete and ready for the basin to be flooded. A trial flotation of the units will occur to commission and test the on-board ballasting

system. Once the trial flotation is completed the units will be towed, using tugboats, out of the basin to the fit out/storage mooring. Approximately one unit per day will be towed out to the mooring.

### **3.4 Quarry Extension**

It is proposed that the existing lease permitting *Lamma Rock Products Ltd.* to operate at the Pok Tung Wan quarry be extended for a period of two years after the present lease expires at the end of 1993. The extension would allow the quarry to continue to produce rock and aggregates for the numerous infrastructure projects in Hong Kong.

## **4.0 AIR QUALITY**

### **4.1 Introduction**

This section assesses the air quality impacts expected to result from the operation of the Lamma quarry and the proposed casting basin. The approach taken in assessing impacts has been to analyse operations taking place on the quarry site and to identify all significant dust producing activities.

The dust emissions from these activities has then been quantified and a dispersion model has been used with meteorological data provided by the Royal Observatory from Cheung Chau to predict the total suspended particulate (TSP) concentrations. The predicted dust concentrations and dust deposition rates have been compared with local Hong Kong and internationally recognised air quality objectives.

In the assessment three cases have been considered:

- existing operations, including the existing quarry, the existing casting operations and the cement handling operations;
- future operations, including operation of the extension to the quarry and the construction of the casting basin; and
- future operation, including operation of the quarry extension and operation of the casting basin.

### **4.2 Existing Air Quality**

Air quality (TSP) measurements have been taken at four monitoring sites in the vicinity of the quarry. The two main sites for which monitoring data are available are located at the Far East Cement silos (site HVC) and near the western quarry boundary (site HVA).

The TSP monitored at the Far East Cement Silos (site HVC) is derived primarily from the quarry and from the nearby cement handling facility.

### 4.3 Modelling Results

Overall the air quality modelling results using the TSP data collected from August 1991 to November 1992, and Royal Observatory data for Cheung Chau for 1991, indicate 24-hour TSP concentrations of  $120\mu\text{g}/\text{m}^3$  at Lo So Shing and  $185\mu\text{g}/\text{m}^3$  at Sok Kwu Wan, which is within the 24-hour AQO of  $260\mu\text{g}/\text{m}^3$ . The annual average results of 48 and  $55\mu\text{g}/\text{m}^3$  at Lo So Shing and So Kwu Wan respectively are within annual average AQO of  $80\mu\text{g}/\text{m}^3$ .

The modelling studies overall were constrained by the lack of environmental monitoring data. The only way that dust levels can be reliably quantified is via an air quality monitoring programme at Sok Kwu Wan. In this respect *Lamma Rock Products* have been endeavouring to establish a high volume sampler at Sok Kwu Wan, and are hopeful to be able to commence monitoring in the near future.

The pattern of TSP pollution in the area as indicated by the modelling study using the long-term monitoring data from site HVC is one of acceptable air quality degraded on occasions for short periods.

## 5.0 NOISE

### 5.1 Methodology

The approach taken for the noise assessment was as follows:

- potential NSRs were identified;
- noise levels were measured at the closest NSR, the restaurants at Sok Kwu Wan and near the school located at Lo So Shing;
- the types of equipment used on the site were identified and the noise levels of the most prominent machines were measured;
- noise from existing operations was measured at the NSRs;
- using the Environmental Noise Model (ENM) model, noise from operations was predicted and the future noise levels estimated; and
- the noise levels associated with the proposed development were compared to existing background noise levels, to the existing quarry noise levels and to the Acceptable Noise Levels (ANL) contained in the *Technical Memorandum for the Assessment of Noise from Places Other than Domestic Premises, Public Places or Construction Sites* and the *Technical Memorandum on Noise from Construction Work other than Percussive Piling*. The noise levels were also compared to the recommended criteria contained in the *Environmental Guidelines in Hong Kong (HKPSG)*.



## **5.2 Environmental Guidelines**

The HKPSG advise that the noise from new development should not exceed a standard that is 5dB less than the relevant ANL. In the current case the ANL for the industrial activities in daytime/evening and night-time are 60dB(A) and 50dB(A) respectively. Therefore the relevant planning level would be 55dB(A) and 45dB(A).

The quarry is not operated at night-time. Should the casting basin be operated at night baseline monitoring would be undertaken to confirm that it complies with the relevant criteria. The assessment indicates that noise levels of 45dBA and 50dBA at the nearest NSR would be achievable from the construction and industrial activities respectively in the casting basin.

The measured and predicted noise from the industrial activities associated with the quarry at the closest NSR is approximately 54dBA (57dBA at a building facade). The noise level therefore exceeds the recommended Environmental Guideline by approximately 2dBA.

## **5.3 Conclusions**

From the discussion it is concluded that the existing operations comply with the criteria appropriate for industrial and construction activities. Further the extension of the quarry will not introduce any new noise sources and will not alter the current level of noise. The proposed casting basin will require some new sources of noise but these will also not increase the current level of noise from the quarry site.

The standard for new construction equipment to be operated on site, such as new cranes and possibly a generating set, will be 45dBA cumulative at the nearest NSR (north of the village of Sok Kwu Wan).

Some of the current operations do exceed the recommended Environmental Guidelines for new development by 2dB. However, this is not considered significant as the noise will be a continuation of the existing noise and will not have a significant impact upon those residents in any NSR. The study leading to this report has also identified that the principal noise sources are the crushers, and these will be addressed during regular maintenance programs in a continuing effort to reduce noise. In addition industrial operations, such as crushing, should not be conducted during night-time.

A Construction Noise Permit would be required for construction activities associated with the casting basin at night.

## **6.0 WATER QUALITY**

### **6.1 Background**

The key areas of potential water quality impact identified in the assessment relate to dredging to provide adequate clearance at the dock gate, treatment and discharge of water following the flooding of the basin, and sewage

treatment for construction workers on-site. Blasting may also potentially affect marine ecology and water quality, and this issue is discussed further in Section 7.

To protect the water quality, of the Fish Culture Zone (FCZ), the Company has agreed to a water monitoring schedule and an action plan. Compliance with this monitoring schedule and action plan will be included as part of the Company's lease conditions.

The Company started a monthly monitoring programme at five (5) locations in the bay, in January of this year. This monitoring programme will continue during the construction and operation of the casting basin. In addition, the Company will monitor the water quality at seven (7) locations whenever water is being pumped in or out of the basin and when dredging the entrance channel.

The action plan requires the Company to inform EPD and AFD if a 20% decline in the background water quality occurs, identify any immediate cause and take appropriate action. If the EPD's Water Quality Objectives (WQO) are approached then immediate remedial action has to be taken or work must stop.

Environmental monitoring will be undertaken to ensure that no deterioration in marine water quality occurs in the vicinity of the FCZs. The key parameters to be tested will be the aesthetic appearance of the water (particularly noting the presence of oils and grease), the concentration of dissolved oxygen and the level of suspended solids.

In addition, effluents arising from the settlement tank and from the sewage treatment plant would be monitored to check compliance with the *Technical Memorandum on Standards of Effluents Discharged into Drainage Systems, Inland Waters and Coastal Waters*, under the Water Pollution Control Ordinance. Depending on the type of mould oils utilised, effluents discharged may be tested for phenolic and other substances, however it is proposed that the mould oils/release agents used would not contain phenolic substances.

To ensure that the mitigation measures discussed in this Section to control/minimise water quality impacts are adopted effectively, it is proposed that specific environmental clauses would be incorporated into the contract documents for operating the casting basin.

## **6.1 Dredging**

Dredging of the existing marine sediments is required to a depth of - 9mPD if no rock is encountered. It is intended to use a floating silt curtain designed to contain suspended solids. As part of the operation control measures, suspended solids would be monitored outside the screen; dredging would be halted if levels approach 90% of the upper control limits. Owing to the small area to be dredged, mechanical grab dredgers would be used.

The dredger would be fitted with a closed seabed grab, and the dredged material loaded onto a split barge with a water tight seal. No barge overflowing would be permitted, and dredging would be curtailed when barges move in and out of the silt curtain enclosure.

## **7.0 MARINE BLASTING**

At present it is not known if marine blasting will be necessary, because information on the depth to bedrock in the area of the proposed channel is not known.

Should marine blasting be required the design of the blasting sequence, charge size etc. will be carried out by an independent technical specialist, and submitted to the Mines and Quarries Division of Civil Engineering Department for their approval, and the Marine Department and other departments if necessary.

The assessment has indicated that, should marine blasting be required, the FCZ would not be affected. The predicted peak pressures at the nearest FCZ (some 500m away) have indicated levels well below known fish injury thresholds.

Should the site investigation indicate the need for marine blasting, a marine ecology survey would be undertaken immediately prior to and after blasting. The survey would note and record the presence and abundance of marine species in the vicinity of the area to be blasted. The survey programme would be discussed and agreed with AFD prior to any blasting, and the results of the survey would be submitted to AFD and EPD.

A survey of the marine sediments in the area of the proposed channel has indicated that the sediments are categorised as clean Class A sediments. It is therefore considered that the dredging, transport and disposal of the sediments do not require any special precautions or requirements other than those normally applied for the dredging of clean material.

## **8.0 WASTE**

The extension of the existing quarry in particular and the construction of the casting basin are not anticipated to generate any significant waste management related impacts provided good site practice is adhered to. For the proposed casting basin operations, waste would be collected and surface water is passed through settlement and pretreatment tanks prior to discharge.

The marine mud which will need dredging for formation of the entrance channel has been assessed for contamination, and are classified as clean (class A), sediments. The dredging and disposal will be carried out according to agreed procedures.

The operation of the casting basin has significant potential to create impacts during the basin flooding and pre-cast unit flotation and removal processes.

General good site practice and ongoing careful collection of waste materials and wastewater will be required as well as a special clean up exercise during each flooding/flotation event in order to minimise waste related impacts.

The installation of a sewage treatment facility will keep sewage related discharges to within acceptable limits.

A general site clean up and removal of existing scrap and waste materials will be undertaken prior to every flooding of the basin.

## **9.0 LANDSCAPE AND VISUAL IMPACT ASSESSMENT**

### **9.1 Methodology**

The Landscape and visual assessment followed the following methodology:

- assess the visual and landscape impact of the proposed casting basin during both the construction and operational periods;
- assess the visual and landscape impact of the proposed extension to the quarry; and
- provide guidelines for the mitigation of any impact.

It should also be noted that the Geotechnical Engineering Office of the Civil Engineering Department will be carrying out a study to investigate the long term quarrying and Landscaping requirements for the Sok Kwu Wan Quarry.

### **9.2 Summary of Key Issues**

The assessment has identified the following impacts:

- no significant increase in the visual impact from the construction or operation of the casting basin on key receptors in Picnic Bay;
- no significant increase in the visual impact from the proposed quarry extension on key receptors in Picnic Bay, or on more distant viewpoints on Hong Kong Island;
- moderate visual impact, due to modification of the ridgeline, on sensitive receptors at Lo Tik Wan;
- landscape impacts of the proposed casting basin and quarry extension are seen as moderate only, in view of the severe impact already created by the existing quarry;
- delay in implementing the rehabilitation programme, however the continued operation of the quarry presents the opportunity to derive a more natural final landform.

## 10.0 RECOMMENDED LEASE CONDITIONS

A list of recommendations for inclusion as environmental clauses in the quarry lease and casting basin contract conditions are provided below:

### Air Pollution Control

- the operator shall take all necessary steps to ensure that fugitive dust from the premises do not exceed the *Air Quality Objectives* when measured at or beyond the boundary of the premises *Quarry*
- the operator shall undertake a site inspection audit to determine an action list prioritizing the measures for control of fugitive dust *Quarry*
- the operator shall comply with relevant legislation regarding "specified processes" including compliance with associated "Best Practicable Means (BPM) requirements" *Casting Basin & Quarry*
- comply with the EM & A schedules *Casting Basin & Quarry*

### Noise

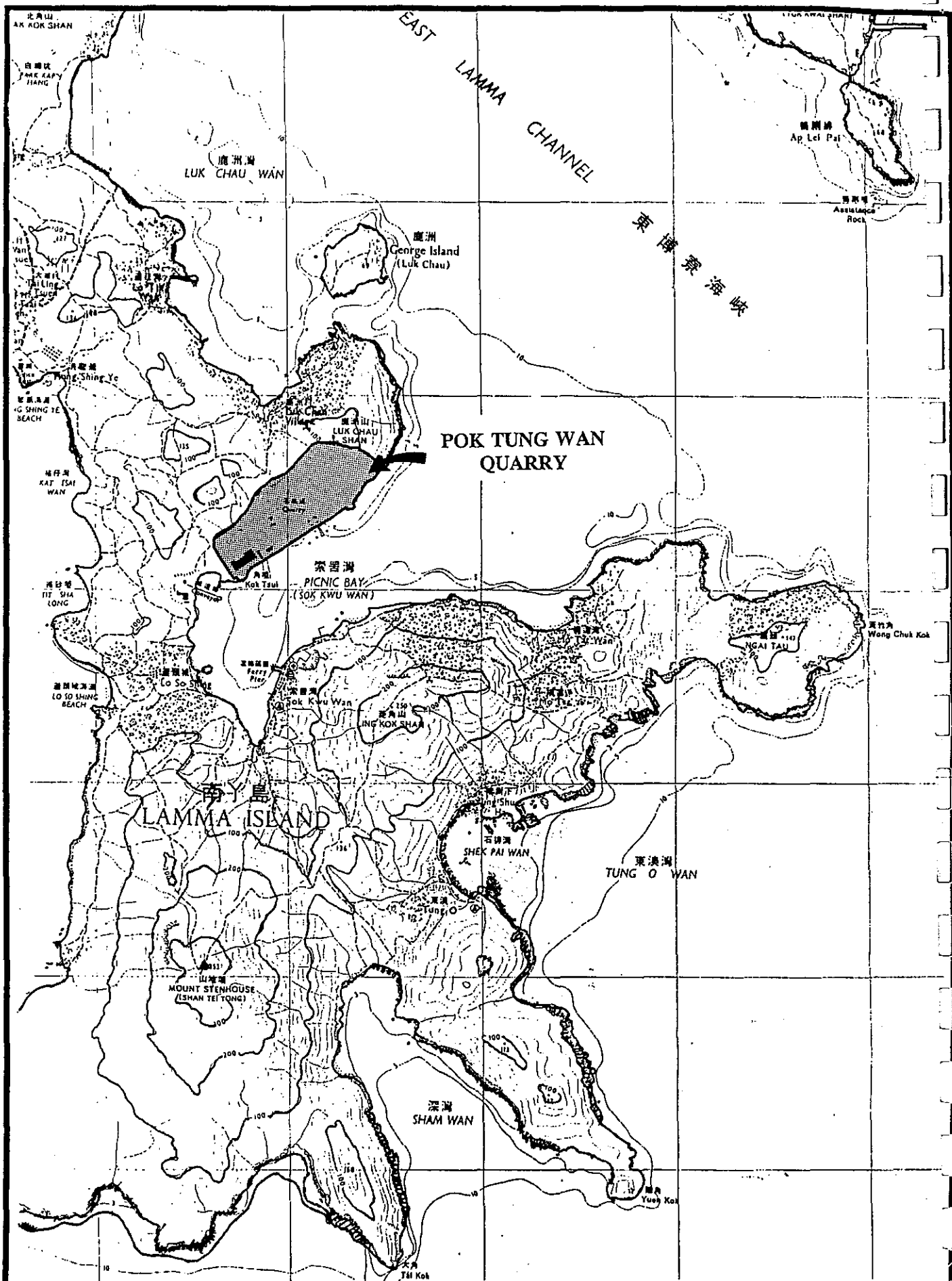
- ensure that prior to any night-time work being undertaken monitoring is carried out to confirm the acceptability of the noise produced by the casting basin operations *Casting Basin*
- where ever possible to utilise electrically powered plant e.g. cranes *Casting Basin*
- construction and industrial additional overall equipment noise levels to be <45dBA and <50dBA respectively at the nearest NSR *Casting Basin*
- comply with the EM & A schedules *Casting Basin & Quarry*
- ensure a Construction Noise Permit be obtained prior to undertaking any work within restricted hours *Casting Basin*

### Waste

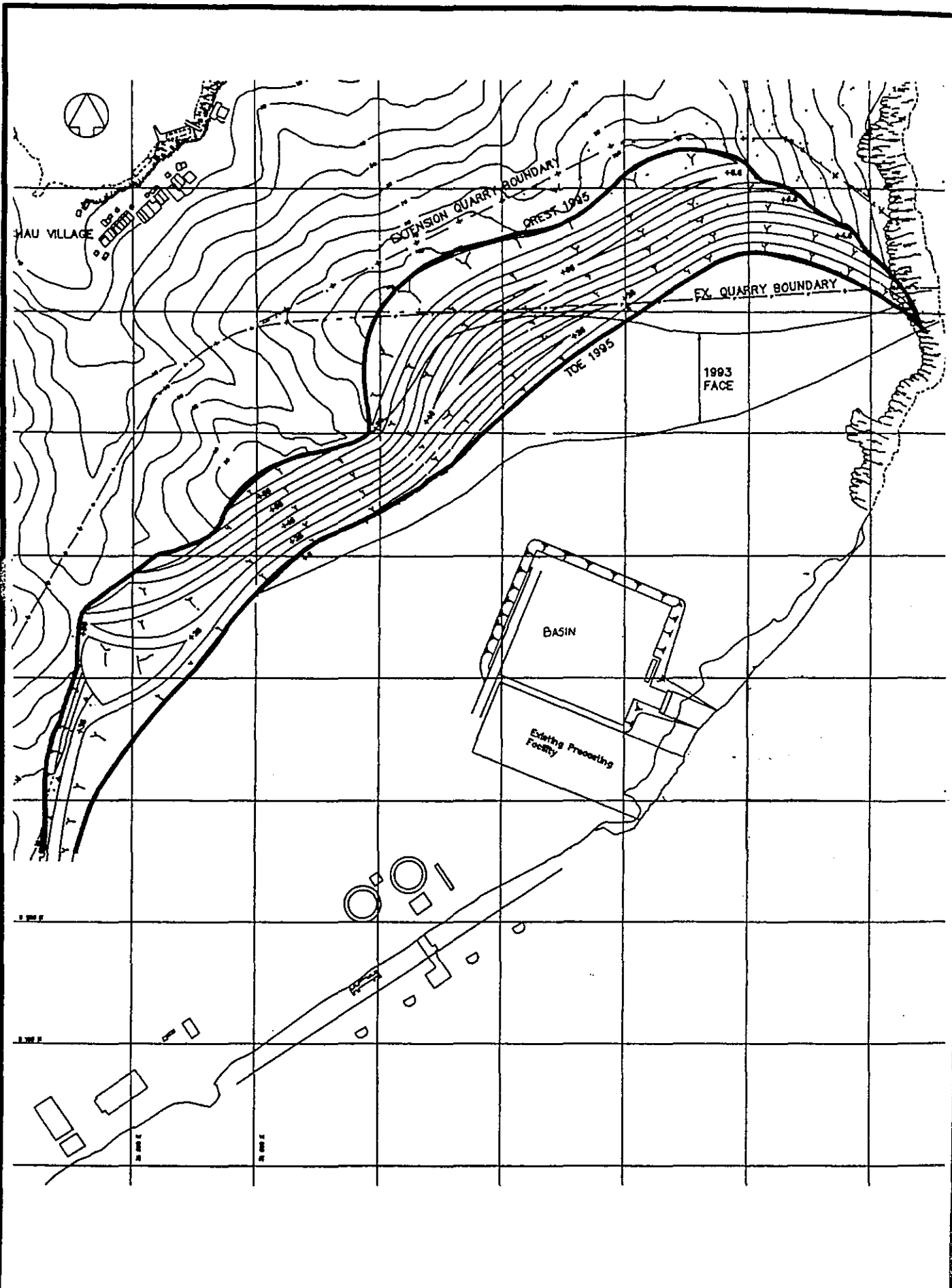
- ensure that prior to the basin being flooded a full and thorough manual clean-up of the casting basin is carried out and subsequently checked by a senior member of staff *Casting Basin*
- ensure that prior to the basin being flooded and after the manual clean-up the casting basin is washed down. The waste water generated by the basin washdown must be transferred to the surface treatment tank before discharge *Casting Basin*
- ensure that after the casting basin is flooded and prior to the seagates being fully opened any floating materials are removed and are disposed of in an appropriate manner *Casting Basin*
- ensure that the monitoring programme as specified in the EM & A schedules is followed and complied with *Quarry & Casting Basin*

**Water**

- ensure that the use of phenolic compounds is, if possible, prohibited *Casting Basin*
- ensure that the location of the sewage treatment plant (STP) discharge point is agreed with AFD and EPD *Casting Basin*
- ensure that the discharge licence requirements for the STP and the surface treatment tank are complied with *Casting Basin*
- ensure that any refuelling of the plant equipment is, where possible, carried out outside the basin *Casting Basin*
- ensure that any water pumped out of the basin passes through the surface treatment tank prior to discharge *Casting Basin*
- ensure that any maintenance of the plant equipment is carried out outside the basin *Casting Basin*
- ensure that the preparation of the formwork is carried out outside the basin, including the cleaning and application of mould oils/release agents *Casting Basin*
- ensure that the concrete curing process employed is, where possible, carried out through the use of curing membranes *Casting Basin*
- ensure that the casting basin seagates are only opened on an ebb tide *Casting Basin*
- ensure that prior to the casting basin being flooded and the seagates opened AFD, EPD and Marine Department are informed *Casting Basin*
- ensure that the monitoring programme as specified in the EM & A schedules is followed and complied with *Casting Basin & Quarry*

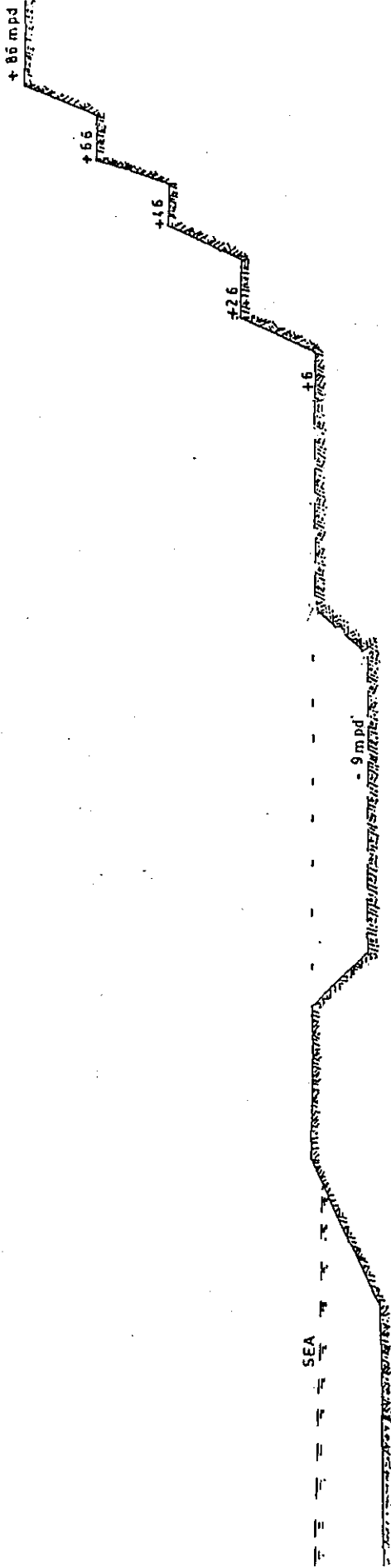


Job Title	LAMMA QUARRY EIA	
Drg Title	LOCATION OF POK TUNG WAN QUARRY	
Scale NTS	Figure No. 1.1	
Date Jan '93		



Job Title :		LAMMA QUARRY EIA	
Drg Title :		PLAN OF PROPOSED CASTING BASIN SHOWING LANDFORM AT THE END OF 1995	
Scale :	N.T.S	Drg No.	
Date :			Fig No. 2.1





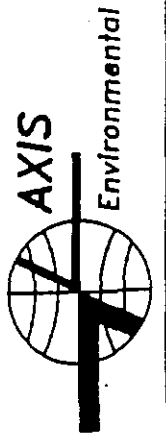
SECTION THROUGH THE PROPOSED  
CASTING BASIN

Scale : n.i.s.

Drwg. No.

Fig. No. 2.2.

Date :



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## 1.0 簡介

### 1.1 背景

位於博洞灣的石礦場是由瑞安集團的附屬公司之南丫島石料產品有限公司，根據香港政府現時發出的牌照(編號428/1977)所經營的。而該牌照將會在1993年底到期。

現擬將該牌照延長兩年，假如延長牌照年期的申請獲批，石礦場的界限將會向外擴展，並在該地興建混凝土構件盆地，用以鑄造進行或擬進行之基建項目所需的預製件。

### 1.2 研究目的

研究的主要目的是對現時石礦開採活動進行分析，預測擬擴展工程帶來的影響以及提供建議與措施以減低不良的影響達到可接受的水平。研究撮要主要考慮事項包括對空氣質素，噪音水平及海洋水質帶來的影響，對鄰近養魚區的影響以及海上爆破及視覺影響作出評審分析。

### 1.3 研究過程

研究已分三個階段進行，各期的報告將匯合編成一份最後報告書。

初步監察期：在初步監察期內已收集有關空氣質素、噪音及海洋水質與沉澱物質素的數據，該等數據將會應用於研究方面。由於現有數據並不足夠，因此設計了監察程序並且加以使用。同時，對於噪音、海洋水質及海洋沉澱物質素亦已進行額外的調查。

初步評核期：在此階段，現有及所蒐集的數據均用來預測擬擴展項目所帶來的影響。數據的蒐集以及其後採用電腦製作的模擬是用以預測對噪音及空氣質素的影響。在此階段發現

可透過在場採用措施有效控制及減少對水質及視覺的不良影響，使對場地的影響達到可接受程度；同時亦已製備監察程序表及行動計劃，以針對空氣、噪音、水質及廢物管理有關的影響。

最後階段：在初期蒐集到的數據已加以分析，使各種影響均能準確預測，並可按不同影響提供各種有效減低不良影響的措施。此外，在完成預測之後，監察及評審附表亦已作出相應的修改。在這階段將會綜合各期的報告以編製最後報告初稿，在收集有關意見之後便會製成最後研究報告。

## 2.0 現有設施及業務活動情況

### 2.1 設施

博洞灣的設施包括南丫島石料產品有限公司開採石礦的設施：

- 碎石及篩石廠
- 放置水泥槽槽（及組件）
- 處理碎石設施及水泥躉船
- 已棄用的電磚廠
- 以及作一般儲存用的範圍

### 2.2 業務的活動情況

目前，石礦場是根據政府合約（編號428/1977）的規定進行經營的，該合約賦予“在南丫島博洞灣開採石礦的權利”，同時允許開採及加工礦石及製造混凝土預製件。

目前每月產量約為230,000噸。

石礦場約每星期進行兩次爆石，每次均須有政府派員在場。爆石後，石料型狀大小各異。石料將會以大型傾卸車運送至碎石部，以生產碎石產品；如需要體積較大的，則石料會直

接送往躉船裝載地點。經過碎石工序後，石料產品將會運往石場附近儲存倉庫保存，或直接運往躉船裝載地點。

### 3.0 工程項目的有關資料：擬擴展的項目

#### 3.1 混凝土構件盆地的興建

根據若干政府進行的可行性報告顯示，博洞灣的石礦場是興建混凝土構件盆地機會最高的地點。上述的研究報告包括有關在大嶼山機場鐵路興建地底管道連接維多利亞港的可行性研究。

擬興建的盆地將位於石礦場上，長、闊將分別為130米及120米，深度約為地面以下14米。在這一水平的盆地內側約-9米PD，面積約120米×100米。相信可同時放置4條鐵路組件。石礦場後面現有的斜坡可能需要後移，以便盆地有足夠空間。

在平台水平+5米PD至盆地地面水平-9米PD間將會進行挖掘工程（即為石礦正常開採程序）。為達至這一要求，將會在現場地下生產推進式的台階，並在站台的一角築起一條斜路以便將掘出的泥抽取。同時亦會提供斜台以便進出盆地。

假如出現裂痕造成不穩定的情況，則會採用栓石法以及灌漿技術，以保持穩定。（不過，這可能性並不大，因為石場的石質佳且並無瑕疵）。太深入的裂痕將會以灌漿方式填補。

當挖掘至設計水平時（約-9米PD），將會有周界灌溉系統並連貫油井，作為最初步收集油的地方。

因此，預料需要用5個月時間挖掘約500,000噸的石塊。

### 3.2 入口通道

為了提供混凝土構件盆地與海的通道，必須挖掘一條通道至水平線下-9米PD，闊度至少為15米，以容許鐵路組件的通過。通道的部份挖掘工程可以與該盆地的挖掘工程同步進行，但最後與海連接的部份應在盆地已開始使用，並在隧道組件已建造完成後才可動工。

為配合上述安排，必須挖掘通道(整條的長度)，並採用鑽石及爆石方式進行。此外，應頂留一小部份為與海相連部份，該部份應在第一批躉船組件使用時方進行挖掘。

### 3.3 盆地的操作

為了配合盆地的運作，必須提供支援設施及適當的工作範圍，在該範圍內將包括：

- 場地辦工室
- 工場及實驗室
- 貯物室
- 鋼條接焊切割場地
- 沙石爆破及塗層場地
- 製品貯存
- 製成品加工

盆地運作時所需的主要設備及設施概述如下：

#### 水泥攪拌機

水泥攪拌機位置以最合乎經濟原則的地點為佳，現在兩項選擇：第一選擇是對現有水泥攪拌機加以改良，另一選擇則是將水泥攪拌機接近混凝土構件場並在現設的頂製件廠及水泥工作間之間。在目前而言，前者為較佳選擇，而在評核時亦以此假設為根據。

### 鋼材彎曲

將需要留一範圍作為處理預應力彎曲及定型鋼材的場地。場地的規格以本港其他同類型場地的基本標準為依據。

### 場地辦公室及貯物室

據目前估計，當組件進行鑄造時，實際需要聘請約200人，辦公室所需面積約相等於12個標準貨櫃的面積，同時尚需2個面積相約的場地，用以作貯存庫；此外亦需設立一個飯堂供職工使用。

### 倉庫

為方便裝卸物料及運載工作人員出入，必須設立一個倉庫，現建議設立一個約50米長，建於盆地設施旁的海堤式倉庫。

由於大嶼山機場鐵路渡海隧道組件的設計尚未定出，但所須之數量將與目前連接金鐘及尖沙咀地鐵站的隧道（建於1976-79年間）接近，並採用最近在柴灣堆填的盆地。初步估計，大嶼山機場鐵路需12個組件，各長約100米，可分為3批4組件，如按建議的盆地，組件每批約需5個月完成。

### 預製件的浮動

當預製件已完成，並可讓盆地積水時，將會試行把預製件浮動，並測試壓倉材料系統。當浮動試驗完成後，組件會由拖船由盆地拖起，搬到貯藏趸船上。估計每日會約有一組預製件搬到趸船上。

## 3.4 石礦場之擴展

茲建議將現時容許南丫島石料產品有限公司經營博洞灣石礦場期限延展2年，（在目前租約於1993年底屆滿起計），若獲延長使用期，石礦場可繼續生產石料及碎石以供本港數項大型基建項目之用。



## 4.0 空氣質素

### 4.1 簡介

本部份旨在評核經營南丫島石礦場及建議興建的混凝土構件盆地所引至之空氣質素影響。評估是根據現已在石礦場地盆運作的分析及定出各項產生塵埃的活動而作出。

由該等活動而產生的塵埃經已量化；同時使用一個散佈模型（連同長洲天文台提供的氣像數據）以預測空氣中的總懸浮微粒（TSP）數量。預測的塵埃集結比率是與本港及國際認可的空氣質素標準作比較。

在評估過程中，下列三點包括在考慮之列：

- 現時運作情況，包括現時石礦場、鑄造構件的運作情況及水泥處理的工作程序；
- 將來的運作情況，包括石礦場擴展後的運作及混凝土構件盆地的建築；及
- 將來的運作情況，包括石礦場擴展部份的運作及混凝土構件盆地的運作。

### 4.2 現時空氣質素

空氣質素的測量工作已在石場附近的4個監察站進行，其中兩個主要監察站，一個位於「遠東水泥」的水泥放置槽監察的TSP主要是從石礦場及石礦場鄰近的水泥處理設施中取得的。

於遠東水泥（HVC）所進行之總懸浮微粒監察結果是包括了石礦場以及附近之水泥廠所產生之塵埃散播。

### 4.3 模擬測試結果

根據在1991年8月至1992年11月蒐集的TSP數據以及長洲天文

台1991年的數據顯示，空氣質素模擬測試結果顯示；蘆鬚城地區每24小時的TSP集結量為每立方120  $\mu\text{g}$ ，在索罟灣則為每立方米185  $\mu\text{g}$ ，該數據是在空氣質素指標(AQI)每小時計每立方米260  $\mu\text{g}$ 的數據之內的。兩地年平均則分別為每立方米48  $\mu\text{g}$ 及每立方米55  $\mu\text{g}$ ，亦是在AQI年平均每立方米80  $\mu\text{g}$ 之內。

整體而言，模擬測試是受到缺乏環境監察數據所限制的，唯一能可靠測塵量水平是需要透過索罟灣的空氣質素監察程序而進行的，而南丫島石料產品有限公司已嘗試在索罟灣蒐集大量樣本，監察可望於不久將來開始進行。

根據模擬研究計劃，對HVC區進行長期監察，而取的數據顯示，TSP污染在該區的空氣質數下降，為時亦不長。

## 5.0 噪音

### 5.1 評估方式

噪音評估的方式如下：

- 尋找適合的噪音敏感區(NSR)；
- 噪音是在最接近的NSR測量，包括位於索罟灣的餐廳及位於蘆鬚城的學校；
- 確定在該等地區所使用的設備種類，而最顯著的機器發出的噪音已測量記錄下來。
- 現時運作經營所產生的噪音已在各NSR記錄下來。
- 使用環境噪音模型，可以預測運作經營的噪音以及將來噪音的水平。
- 擬發展項目的噪音水平是與現時背景噪音水平比較，目前石礦場噪音水平及可接受噪音水平〔載列於評估住宅以外的地方，公共場匠或建築地盆噪音的技術備忘錄以及有關評估建築工程（除打樁）以外所產生的噪音的技術備忘錄〕；此外亦與“香港規劃標準與準則”(HKPSG)作比較。

## 5.2 環境方面的準則

HKPSG建議新發展項目的噪音不應超越有關標準，即應較有關的可接受的噪音聲級(ANL)少5dB，據目前所顯示，工業運作日間／黃昏及晚上的ANL分別為60dB(A)及50dB(A)，因此有關的計劃水平將會是55dB(A)及45dB(A)。

石礦場在晚間是不進行開採的，假如混凝土構件盆地在晚上作業，則應事先進行初步的監管，以確保符合有關規定。評估顯示盆地的興建及工業作業所產生的噪音水平應可分別維持在45dBA。

從石礦場作業所測量及預測的噪音約為54dBA（建築物反射面之噪音值則為57dBA），因此，噪音超越環境指引所建議的標準達2dBA。

## 5.3 總結

從上述討論看，目前在石場進行的工作及建築工程的噪音水平是符合有關標準的。此外，擬發展項目不會帶來任何新的噪音來源，亦不會改變目前的噪音水平，雖然混凝土構件盆地可能會帶來一些新的噪音來源，但不會改變目前的噪音水平的。

新的建築設備例如新的吊機及發動機組件的標準將會為45dBA（累積至最接近NSR（索罟灣以北的鄉村））。

部份新發展工程將會超越環境指引所建議的水平，但並不太嚴重，因為該等噪音只是現有噪音的延續而對附近的居民並不會帶來任何重大不良影響的，研究指出，主要的噪音來源將會來自碎石機，這個問題將會在定期保養計劃中解決，以持久的方法減少噪音，此外，碎石等工業運作不應在晚間進行。

與混凝土構件盆地有關的建築工程，如在晚間進行，應先取得建築噪音批准者。

## 6.0 水質

### 6.1 背景

評估報告中提到，主要的水質影響是與挖泥，清理盆地積水及工地的污水處理有關。此外，爆破的工程亦可能是影響海洋生態及水質的原因之一，不過這問題將會在第七部份作進一步討論。

為保障養魚區的水質，該公司已同意推行一個水質監察計劃及採取一系列行動。而該公司的租約條款中已包括該公司須遵守該等計劃的規條。

今年一月，該公司已在港灣5個地點按日進行監察工作，而監察工作在盤地興建及操作期均會繼續的。此外，公司將會設立7個水質監察站，監察由盆地抽出的水質及在渠道入口挖泥時對水質的影響。

根據行動計劃所定，假如地下水質下降達20%，公司必須知會環保署(EPD)及魚農署(AFD)兩個部門，找出任何突發原因，並採取適當步驟加以改善，假若涉及EPD所制定的水質標準，則必須立即採取補救行動，否則須停止運作。

環境監察行動將會執行，以保證對鄰近養魚區的海水水質不會構成危險。主要監察的指標是水質表面的情況（特別是着重有否油漬）、已分解的氧氣集中情況以及浮游固體的水平。

此外，由沉箱及污水處理站排放的水亦會受到監察，以確保水質污染控制條例中有關“污水排放至灌溉系統、內陸水流及沿岸水流的標準備忘錄”已予以遵守。排放的污水可測量出是否石炭酸或其他物質，但要視乎所用模油的種類。不過所用的模油／防粘劑是不包石炭酸物質的。

為了確保本條所述有關控制減少對水質影響的措施予以實行，茲建議將有關特殊環境條款列入經營操作盆地的合約大件中。

### 6.1 挖泥工程

假如沒有石塊阻擋，現海上沉澱物的挖掘深度應為-9MPD。現考慮在挖掘過程中使用浮式帳幕以防浮在水面的固體流走。作為控制措施的一部份，浮在水面的固體將會在帳幕以外受到監察。假如水平達到挖制上限90%，挖泥工程便會停止；鑑於挖泥範圍不大，因此挖泥工作將會使用械鉗式挖泥機。挖出之泥機土將放在一個裂口式駁船上防止溢出；在駁船進出圍網範圍時，挖泥工程將會減少。

### 7.0 海上爆破

目前尚未知道是否需要在海上爆破，因為擬建通道的範圍河床石的深度尚未得知。

假如要進行爆破，則會由一名獨立技術專定設計爆破程序，裝載炸藥量等事宜，並會提交土木工程署的礦務部，以取得批准；在有需要時，亦會呈交海事署及其他部門的。

據評估數顯示，如需要進行爆破，養魚區是不受影響的。據預測，爆破對最接近的養魚區（約500米遠）造成最大的壓力是遠低於對魚類造成損傷的已知限度的。

假如在場地調查後認為有需要進行海上爆破時，則會立即在爆破前及爆破後進行海洋生態研究的。該調查將會記錄須進行爆破區防近範圍的海洋生物數量，而且在爆破前是會將調查計劃與AFD進行討論的，而調查結果亦會向AFD及EPD提交的。

據調查顯示，擬建通道範圍的海沉澱物是屬於一級清潔沉澱物，因此，除需採取在一般挖掘清潔沉澱物時所需的措施外，挖泥工程，運輸及傾到沉澱時並不需採取任何特別措施。

## 8.0 廢物

只要場地工作守則均受嚴格遵守，有關石場的擴展工程及盆地的建築工程將不會引致大量的廢物。以盆地而言，廢物及水份在排放之前，廢物是會被收集起來的，而水份則會流入沉箱，及預先處理箱加以處理才排放的。

需要被挖起以建築通道入口的海泥已受污染測試，測試顯示海泥被列為清潔沉澱物（甲級）。挖掘及傾倒工作將按議定程序進行。

盆地在積水及當預製件浮於水面及清除加工過程的運作可能對環境造成不良影響。因此，必須養成良好的工作程序，同時亦須在積水時採取特別清理工作，以減少對環境造成不良影響。

安裝污水處理設施可使污水排放達至可接受程度。

每次盆地積水前必須進行例行清潔工作及搬走所有廢物。

## 9.0 景觀及視覺影響的評估

### 9.1 評估方法

景觀及視覺影響的評估乃按以下方法進行的

- 在擬建築的盆地施工及運作期內評估視覺上及景觀的影響。
- 對擬擴建的石礦場進行視覺及景觀進行評估。
- 為減少不良影響提供指引。

此外，土木工程署的土力工程部將會就有關索罟灣石礦場的長期及四周環境的要求作深入的研究調查。

## 9.2 主要問題撮要：

評估工作發現：

- 盆地的建築及在索罟灣的主要接收站的運作均顯示並無對環境增加視覺上的影響；
- 在索罟灣的主要接收站或更遠的港島接收站顯示擬擴展石礦場並無對環構成嚴重的視覺影響；
- 由於分水嶺的改動，設於蘆荻灣的敏感接數器顯示有中度的視覺影響；
- 鑑於再出有石礦場已對四周環境造成嚴重影響，因此，擬建的盆地及擴展的石礦場對四周環境的影響佳為中性的；
- 延遲環境復元計劃的推行；但石礦場的不斷運作可令地形自然形成。

## 10.0 有關出租條例

下列為建議列入石礦場租約及鑄造地合約中有關環保的條款：

### 空氣污染控制

- |  |                    |
|--|--------------------|
| - 操作者必須採取一切步驟，確保由物業外洩的塵埃在測檢時（不論在物業範圍以內或以外），均不超過「空氣質氣質素標準」。     | 石礦場                |
| - 操作者必須在場地進行檢查，定出一系列應辦理事項（根據重要性列出先後次序），以控制外洩塵埃。                | 石礦場                |
| - 操作者必須遵守與“特殊加工程序”有關的法例包括遵守“Best Practicable Means” (BPM) 的規定。 | 鑄造構件盆地<br>及<br>石礦場 |
| - 遵附表EM及A  | 鑄造構件盆地<br>及石礦場     |

### 噪音

- 必須確保晚間工程進行之前已進行監察，以確保在盆地運作時發出的噪音符合可接受程度。 鑄造構件盆地
- 可能的話應儘量使用電動器材，例如吊機等。 鑄造構件盆地
- 可能及工業附加的設備噪音水平應分為 <45dBA 及 <50dBA (以最接近NSR為佳)。 鑄造構件盆地
- 遵守附表EM及A 鑄造構件盆地
- 如在受限制期間進行工程前，必須確保已取得建築噪音許可証。 鑄造構件盆地

### 廢物

- 確保每次盆地積水前，應以人手全面清理盆地並由一名高級職員負責檢查。 鑄造構件盆地
- 確保每次在盆地積水前及在人手清理後，盆地的水已流走，流走的污水在排出之前，必須先引入污水處理水槽先行處理。 鑄造構件盆地
- 確保每次盆地積水後以及水閘全面開啟前，所有浮面物質均已清險並以適當方式加以處理。 鑄造構件盆地
- 確保附表EM及A所規定的監察程序均已遵守。 鑄造構件盆地及石礦場

### 水

- 在可能性況下，確保禁止使用含石炭酸混合物。 鑄造構件盆地
- 確保污水處理站的排放點的位置乃獲AFD及EPD所同意的。 鑄造構件盆地
- 確保排放牌照中對污水處理站及污水處理槽的所有關規定均已遵守。 鑄造構件盆地



- 確保在可能情況下所有設備注油均在盆地以外進行。 鑄造構件盆地
- 確保所有在盆地吸走的污水在排放前均引入污水處理槽先行處理。 鑄造構件盆地
- 確保任何機器設備的保養工程均在盆地以外進行。 鑄造構件盆地
- 確保一切定型加工工序包括清理及使用模油／防粘劑均在盆地以外進行。 鑄造構件盆地
- 確保在可能情況下透過薄膜保護方式對混凝土進行固化加工。 鑄造構件盆地
- 確保鑄造盆地水閘只在退潮時開啟。 鑄造構件盆地
- 確保在盆地積水及水閘開啟前通知AFD, EPD及海事處。 鑄造構件盆地
- 確保附表EM及A所規定的監察程序均已遵守。 鑄造構件盆地