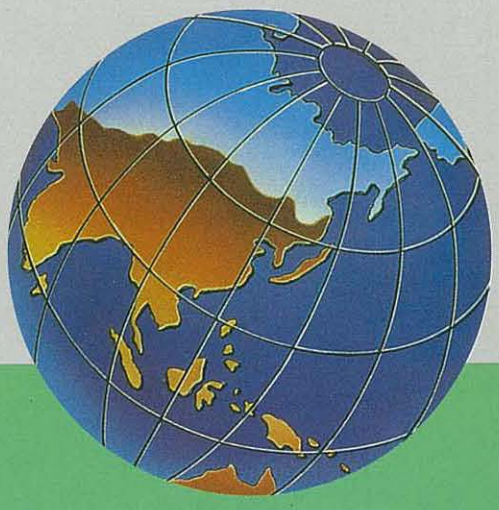
SHIU WING STEEL MILL
TUEN MUN AREA 38

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

EXECUTIVE SUMMARY

AXIS Environmental



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AXIS ENVIRONMENTAL CONSULTANTS LTD

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Contents

1. INTRODUCTION

1.1 Background

Shiu Wing Steel Ltd presently operate Hong Kong's only steel mill in Tseung Kwan O. Government has determined that continued operation of the mill at this location is incompatible with the future planned use of the area. Following discussions with Government, *Shiu Wing Steel Ltd* have agreed to decommission this mill and build a new steel mill of approximate capacity 650,000 t/a of steel products in Tuen Mun Area 38. The nominated Electric Arc Furnace (EAF) capacity is 500,000 t/a, with the balance of 150,000 t/a being provided by imported billets.

AXIS Environmental Consultants Ltd (AXIS) were commissioned by *Shiu Wing Steel Ltd* in November 1992 to undertake the Environmental Impact Assessment (EIA) for the proposed steel mill. The EIA identifies the potential environmental impacts associated with the construction, operation and decommissioning of the proposed steel mill, and proposes mitigation measures for these. It includes detailed environmental information concerning the construction and operation of the proposed plant to be used at the new steel mill. This document summarises the EIA, highlighting the key issues involved.

It should be noted that a final decision has not been made upon the exact size and type of EAF that would be utilised at the proposed steel mill. Consequently, the assessment examines the environmental impact of the overall development assuming typical EAFs of the required capacity. Once a final decision has been made on the exact type of EAF, a supplementary report (or reports) will be issued to more precisely assess the overall environmental impact and, if necessary, amend any previously recommended mitigation measures.

1.2 Project Benefits

The relocation offers a number of benefits:

- The opportunity to incorporate the latest operational and environmental technology into the design and operation of the new plant.
- It would be located in a centralised new industrial area in the west of Hong Kong in accordance with the Environmental Protection Department's (EPD) policy for potentially air polluting industry.
- It would permit the decommissioning of the existing steel mill in Tseung Kwan O, where continued operation of the plant has been determined by Government to be incompatible with the future planned use of the area.

In addition, the expansion in capacity of the plant would result in the following advantages for Hong Kong:

- More employment
- Greater self-sufficiency in reinforced steel bar
- More recycling of waste scrap metal.

1.3 Study and Project Programme

AXIS submitted the draft EIA in June 1993 and a Study Management Group meeting was held on 27 July 1993. Outstanding issues were resolved over the following 10 weeks and additional air quality modelling was undertaken. The environmental issues associated with site formation were agreed with EPD and site formation commenced in September 1993. The draft Final EIA was submitted in October 1993. The steel mill is anticipated to be operational in early 1996.

2. PROJECT DESCRIPTION

2.1 Location

The proposed steel mill would be located in the Special Industries Area of Tuen Mun Area 38 (Figure 1). It would operate 24 hours/day and some 300 days per year. The area of the proposed site is approximately 9 hectares, more than half of which will require reclamation. The site would have direct marine access, and also road access from Lung Mun Road.

2.2 Plant Layout

The proposed steel mill site is larger than the existing steel mill at Tseung Kwan O. The design and planning of the new works would be set out to provide an integrated and efficient material flow and production line. The latest technology would be utilised to ensure maximum productivity, and minimum detrimental impacts on the environment. A preliminary layout of the site is illustrated in Figure 2.

2.3 Process Description

The proposed steel mill would produce high tensile steel reinforcing bars for use in the construction industry. The manufacturing process would be similar to that of the existing steel mill in Tseung Kwan O, and is illustrated in general terms in a Production Flow Chart (Figure 3).

The primary raw material used in the steel making process would be scrap metal. This would be delivered to the site via both sea and road. Sea vessels would berth at the pier, and mobile cranes used to transfer the scrap metal to the scrap storage area.

The scrap would be cut, crushed, screened before being loaded into a scrap bucket, transferred to the furnace bay, and discharged into an EAF for meltdown at a temperature above 1550°C. Carbon and lime would be added

to the furnace, and oxygen introduced via a lance. Slag is formed as a waste product on the surface and is removed prior to tapping.

When the required temperature and chemical composition of steel is reached, the molten steel would be tapped into a ladle and transferred to a ladle furnace for final adjustment of steel chemistry. In the ladle furnace ferro-alloys, lime and carbon are added. The molten steel is then passed to the continuous casting machine for casting into billets. These steel billets would either be transferred directly to a reheating furnace or to a billet storage area.

The billets would be reheated in a reheat furnace to a rolling temperature of about 1150°C. The heated billets would then be rolled in the rolling mill to the required bar size, and cooled by water sprays and air. The steel bars produced are then sheared to the required length.

The steel bar product would be used as reinforcing bars and hence do not require high surface quality. As such, typical surface finishing operations such as acid pickling/etching, painting, enamelling, solvent cleaning, and galvanising would not be required and therefore no effluents from such operations would be produced.

The oxygen required for the process would be provided by on-site gaseous oxygen production facilities, which produce approximately 95% purity oxygen for EAF lancing by the Pressure Swing Absorption process. Only a small quantity of liquid oxygen will be used on site for the purpose of oxy-cutting, which requires high quality oxygen.

2.4 Construction Activities

The entire construction process will take place over a period of approximately 2½ years which involve:

- site formation and reclamation
- marine pier construction
- building construction and plant installation

The site formation works commenced in September 1993 (with the approval of EPD) and would be completed by mid-1994. The works involve reclamation and approximately 340,000m^3 of marine mud would have to be dredged, 20,000m^3 of this being classified as seriously contaminated. Disposal is required for all dredged marine mud.

2.5 Staffing

Construction would be in three over-lapping phases over approximately 2½ years. The daytime on-site workforce over this period is anticipated to peak at approximately 150.

The main production operations would operate 24 hours per day and 7 days per week. There would be approximately 400 staff working over 3 shifts, comprising some 160 staff on the day shift and 120 staff on each of the other two shifts.

3. SENSITIVE RECEIVERS (SRs)

The proposed steel mill would be located in Tuen Mun Area 38 (Figure 4), an area planned for substantial development in the near future. The Study Area may be presently described as urban fringe, being relatively undeveloped. This is emphasised by the presence of Castle Peak, which separates Area 38 from Tuen Mun New Town. An aerial photograph of the site is provided in Figure 5.

The surrounding environment is to undergo substantial development in the near future, significantly changing the nature of the area.

3.1 Existing Sensitive Receivers

Residential

The nearest residential areas are:

- Village settlements 1.8 km north-northwest of the proposed site
- Vietnamese Refugee Camp, due to close in 1994, (2 km east)
- Tuen Mun high rise residential estates (3 km east)
- Tuen Mun New Town (4 km east).

Industrial

The following industrial facilities currently operate in the area surrounding the proposed steel mill site:

- Short term tenancy Container Storage Area (operating on a portion of the proposed site)
- China Cement Works (adjacent to and NW of the proposed site)
- Castle Peak Power Station (400 metres NW)
- Block making factory (1 km east)
- Concrete batching plant (1 km east)
- Waterfront activities (2 km east).

Miscellaneous

The following are also located in the proximity of the proposed Steel Works site:

- Service reservoirs (directly north of proposed site)
- Pillar Point sewage treatment plant (2km east)
- Landfills (north of proposed site)
- Fishermen's graves (these will be relocated)
- Butterfly Beach (2.7km east)
- Three islands, which are Sites of Special Scientific Interest (SSSIs) because of their importance for migratory birds (4 km west).

The Department of Agriculture and Fisheries advise that some 60 fishing vessels are known to fish regularly in the local sea area. The annual fishery production is estimated at HK$1 million.

Quarrying and landfills have resulted in much of the local area having little ecological importance.

3.2 Planned Sensitive Receivers

There are many new major developments planned for the area local to the proposed steel mill as summarised below:

- Area 38B is planned for reclamation and extensive industrial development which will include a 55 hectare Special Industrial Area.
- A 56 hectare River Trade Terminal (1 km east)
- A 40 hectare Multi-Purpose Terminal (2 km east)
- A low density housing development for 1000 people (2.6km east)
- Tuen Mun West service reservoir (1km east)
- Crematorium, Columbarium and Funeral Services Centre (2 km east)
- Livestock Waste Consolidation Plant
- A Golf Course is proposed (3km east)
- The North Western New Territories Sub-Regional Land Use Plan (a non-statutory document) designates the western part of Area 38A and Area 49 as a Countryside Conservation Area.

4. AIR QUALITY

The principal air emission from the plant will be particulate matter. By far the major potential dust source are the EAF discharges. These would be controlled by a fume extraction system passing to a fabric filter.

Fugitive dust emissions would also be generated from other parts of the process, including the handling and transport of raw materials and waste products. The best practicable means (BPM) of control would be used to minimise these emissions.

Other less significant emissions are sulphur dioxide and oxides of nitrogen from the re-heat furnace, and some carbon monoxide and oxides of nitrogen from the EAF stack. Fuel oil (maximum sulphur content 0.5%) would be used to fire the re-heat furnace.

The EPD BPM guideline limit for the EAF discharge is 30mg/m^3 for Total Suspended Particulates (TSP), 2 mg/m^3 for lead and 1mg/m^3 for cadmium. These limits would be met. EPD have also set an acceptable increment in the ambient 24-hour TSP concentrations for the site of 40μg/m^3. The Hong Kong Air Quality Objective is 260 μg/m^3.

The site emissions were modelled using the AUSPLUME model, and estimates of pollutant levels obtained at ground-level and at a height of 30m. The modelling indicated that the EPD acceptable increment of 40μg/m^3 for 24-hour TSP is met approximately within the boundaries of sites immediately adjacent to the steel mill. All gaseous emissions, and also lead, are well within the Hong Kong Air Quality Objectives.

The modelling also showed that the EAF and reheat furnaces are low

contributors to the particulate emissions from the site. For a worst case emission rate from the EAF furnace of 30 mg/m^3, the concentration at the outer boundary of adjacent sites is about 1.5μg/m^3, compared with the EPD increment criterion of 40 μg/m^3. Thus control of fugitive emissions will be important to maintain acceptable TSP levels.

5. MARINE WATER QUALITY

The operation of the proposed steel mill would result in some aqueous discharges to the surrounding environment, as follows:

- Dredging, reclamation & dumping
- Cooling Water
- Sewage
- Surface Water
- Waste Oil.

These discharges would be required to satisfy the permissible effluent standards as detailed in the Technical Memorandum issued under the Water Pollution Control Ordinance; the purpose of these standards is to meet Hong Kong Water Quality Objectives.

Dredging and mud disposal has the potential to impact upon marine water quality owing to the typical increase in suspended solids, the decrease in light penetration and release of any heavy metals from contaminated muds. A significant volume of the marine mud local to the proposed site has been identified as seriously contaminated with copper. Special procedures were recommended for the dredging and disposal of the contaminated mud to minimise potential impacts.

Sea water would be used as cooling water in the steel mill to cool down recirculating process water. Extensive calculations were carried out to quantify the dilution of the cooling water discharge in the sea (and the corresponding temperature increase) which varies with discharge pipe diameter and discharge level. These parameters were agreed with EPD such that Hong Kong Water Quality Objectives are satisfied. It should be noted that the volume of the cooling water discharge from the proposed steel mill will be less than 1% of the industrial cooling water discharges local to the proposed site.

There is presently no sewage infrastructure serving the area, although this will be available in an estimated six years, when any sewage discharges will be connected. In the meantime, to avoid any potential impact and to satisfy discharge standards, sewage would be either treated on-site before local discharge, or pumped/tankered to Pillar Point Sewage Treatment Works.

Surface water has potential to pollute because of the pollutants it can collect as it drains from the site. Surface water from open areas where there is potential for contamination (such as the scrap storage area) would be drained to an interceptor for removal of oil and solids, prior to discharge to sea. The interceptor would have a by-pass to prevent flushing during periods of heavy rainfall.

Waste oil from the process would be licensed as a Chemical Waste and taken off-site by licensed contractor. Consequently, no significant impacts would result upon the marine environment.

6. NOISE

In the noise assessment, existing and proposed noise sensitive receivers were identified, and an extensive assessment of noise levels during both construction and operation was undertaken.

The assessment identified the types of equipment to be used, and noise levels for this equipment were used in the ENM computer model to predict noise levels at sensitive receivers. Where standard noise emission levels were unavailable, field measurements at the existing Tseung Kwan O steel mill were used to determine noise levels, in particular for the most prominent machines to be used in the steel making process.

The predicted noise levels were compared to background noise levels and to acceptable noise levels specified in Technical Memoranda issued under the Noise Control Ordinance. Noise levels were also compared to the recommended criteria contained in the Hong Kong Planning Standards and Guidelines.

The assessment showed that, because there are no noise sensitive receivers in close proximity to the proposed steel mill site, noise is not a significant issue in this project. For both construction and operational noise, predicted noise levels would readily comply with noise criteria. The nearest noise sensitive receiver is a village some 1.8 km from the proposed site, and this is screened by from the proposed site by mountainous terrain.

7. SOLID WASTE MANAGEMENT

7.1 Solid Wastes

The major solid wastes that would result from the operation of the steel mill are slag, filter dust and scale.

Slag would result mainly from the EAF and the ladle. During production it would rise to the surface as an impurity and be removed. Approximately 100 tonnes of slag per day would be generated. Slag is a hard grey granular material and comprises mainly of calcium oxide (approximately 50%), iron oxides and silica. These are all essentially benign substances from an environmental perspective. Slag can also contain elevated levels of oxides of heavy metals, all of which are potentially polluting. However, the metals are normally fused within the slag and therefore tend to be immobile.

Filter dust would result from the collection of EAF exhaust gas dust particles by the baghouse filter. The filter dust would be stored in hoppers and be pelletised on discharge. An estimated 45 tonnes of dust per day would be generated. The filter dust comprises mainly iron oxide (approximately 50%), silica, lime and heavy metals (primarily zinc, manganese and lead).

Scale is a waste product produced during casting and rolling operations. Scale comprises greater than 90% ferric oxides and needs to be removed to prevent it being rolled into the steel and marring the product quality. The scale would flake off the steel when cooling occurs during spraying by cooling water. Approximately 35 tonnes per day of scale would be produced.

7.2 Disposal Optoins

There are various disposal options for dealing with the solid wastes, as follows:

- Dispose to landfill
- Use as reclamation fill
- Use as a road material base
- Waste stabilisation
- Recovery/recycling.

All these options were considered for each of the principal solid wastes to be produced by the steel mill.

7.3 Leachate Tests

Tests were deemed necessary to quantify the pollution potential of the solid wastes. Slag, filter dust and scale samples were collected from the existing steel mill, and leachate tests were conducted to help determine what treatment and/or disposal options are environmentally acceptable. The suitability of the disposal options can be determined by the extent by which heavy metals leach from the solid waste.

The leachate test results indicated that:

- Reclamation fill of all three solid wastes is not a disposal option, unless pretreatment is undertaken;
- All three solid wastes could not be considered for re-use as road material base, unless pretreatment is undertaken;
- Landfill disposal of scale and slag would have no significant environmental impact.
- Filter dust leaches significant quantities of zinc, lead and sulphates, and as such is not considered suitable for disposal to a non-containment landfill site. However, filter dust could be landfilled at SENT landfill, where dilution, attenuation, containment and treatment of the leachate is anticipated to result in no significant environmental impact. SENT landfill will accept industrial waste for co-disposal with municipal waste.

7.4 Conclusions

It was recommended that filter dust from the proposed steel mill be pelletised and disposed of at SENT landfill. Monitoring of the leachate would be undertaken at SENT landfill by the operator. If levels of contamination are found to be excessive, the filter dust would require stabilisation prior to landfilling to ensure minimal environmental contamination.

It was also recommended that the technical, environmental and economic performance of the relatively new commercial plasma furnace process of heavy metal recovery be monitored to assess if it is a viable option for recovery of zinc and lead from the filter dust. In addition, the possibly of exporting the dust to China for re-use would be examined further.

It was recommended that either WENT or NENT landfills be used for disposal of slag and scale, as these are relatively inert wastes. In addition, the possibility of exporting the scale to China for re-use would be examined further.

8. LANDSCAPE AND VISUAL IMPACT ASSESSMENT

Both the construction and operation of the proposed steel mill has potential to result in some landscape and visual impact; however, the EIA identified that impacts would be negligible owing to the absence of any significant sensitive receivers local to the proposed site, which is primarily industrial. Only the following moderate visual impacts were identified:

- Moderate visual impact on walkers in the Countryside Conservation Area;
- A marginal increase in visual impact on sensitive receptors outside the immediate area due to transport of materials to and from site.

It was recommended that strong contrasts in colour of buildings and plant be avoided, and that muted colours that relate to, but not replicate, the natural environment be used. It was also recommended that landscaping on the road boundary be used to extend the landscape framework and reduce the visual mass of the development.

A photomontage of the proposed steel mill is illustrated in Figure 6.

9. TRAFFIC ASSESSMENT

9.1 Road Traffic

The road traffic assessment indicated that the overall impact of road traffic due to the construction and operation of the steel mill is considered to be small because:

- The road traffic related to the steel mill during construction and operational phases would only be a minor part of the total vehicle

flow in Area 38 development, perhaps 5%;

- The increase in the traffic volume due to the steel mill is minor compared to the existing traffic from the container storage area (STT) which presently occupies the site;
- The widening and improvement of the Lung Mun Road will allow for more traffic;
- Much of the transport to the steel mill will be by sea;
- Reserves for a possible dual 3-lane carriageway and LRT to serve the future development in Tuen Mun West will further improve access to the area.

9.2 Marine Traffic

The marine traffic local to the proposed steel mill site is presently mainly dominated by vessels to China Cement Works and Castle Peak Power Station; delays to these vessels, as a result of the proposed steel mill, will be short and infrequent, amounting to no more than an estimated average of six occasions per year.

The ship movements associated with the proposed steel mill are less than 1% of the total ship movements forecast for the developed Area 38 in 2006.

A radar survey shows that larger vessels pass well clear of Area 38, allowing adequate manoeuvring room for vessels arriving and departing. Smaller vessels which at present pass very close to the proposed site may need to amend their courses.

10. ENVIRONMENTAL MONITORING AND AUDIT SCHEDULES

Environmental monitoring schedules and audit procedures are essential in order to:

- Ensure that any environmental impacts resulting from the construction and operation of the steel mill are minimised or kept to acceptable levels;
- 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;
- Provide a means of checking compliance with environmental objectives, recording anomalies and documenting corrective action.

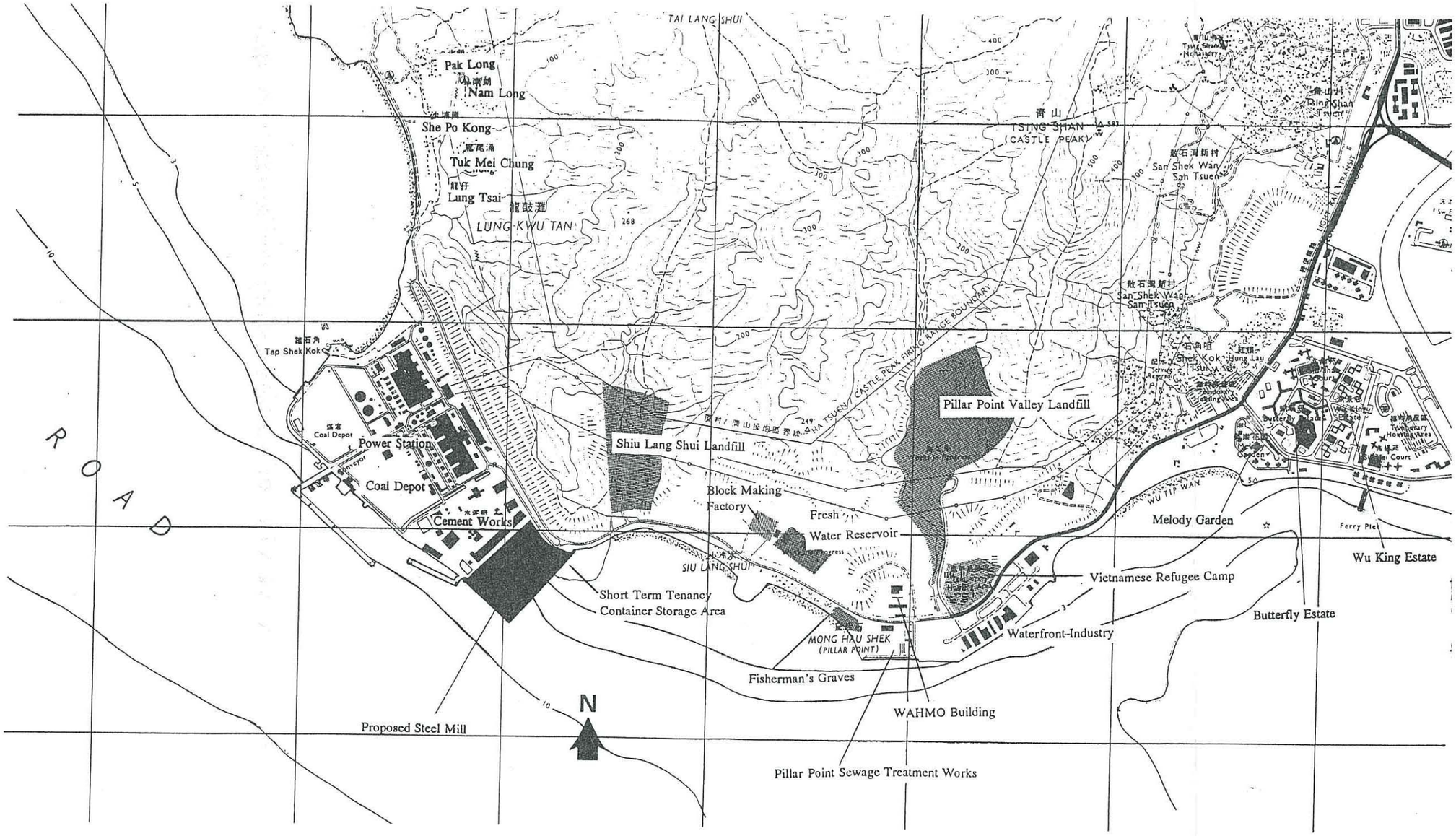
Environmental monitoring schedules were developed for the project in consultation with EPD. These detail the monitoring requirements in relation to air, noise, water quality and waste management. The schedules also detail action plans which set out the action to be taken if certain pollution levels are

reached.

An audit system was also recommended, for both the construction and operational phases. The construction phase audit requirements include checking monitoring procedures and results, recording exceedances of pollution levels, assessing control and mitigation actions, and recording complaints.

The operational phase audit requirements include reviewing requirements for monitoring and environmental managements practices, ensuring mitigation measures are being applied, and reviewing effectiveness of and recommending improvements in environmental controls.

It was also recommended that the monitoring and audit work be carried out be suitably qualified and experienced personnel.



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Shiu Wing Steel Mill

Figure 1 : Location of Proposed Steel Mill

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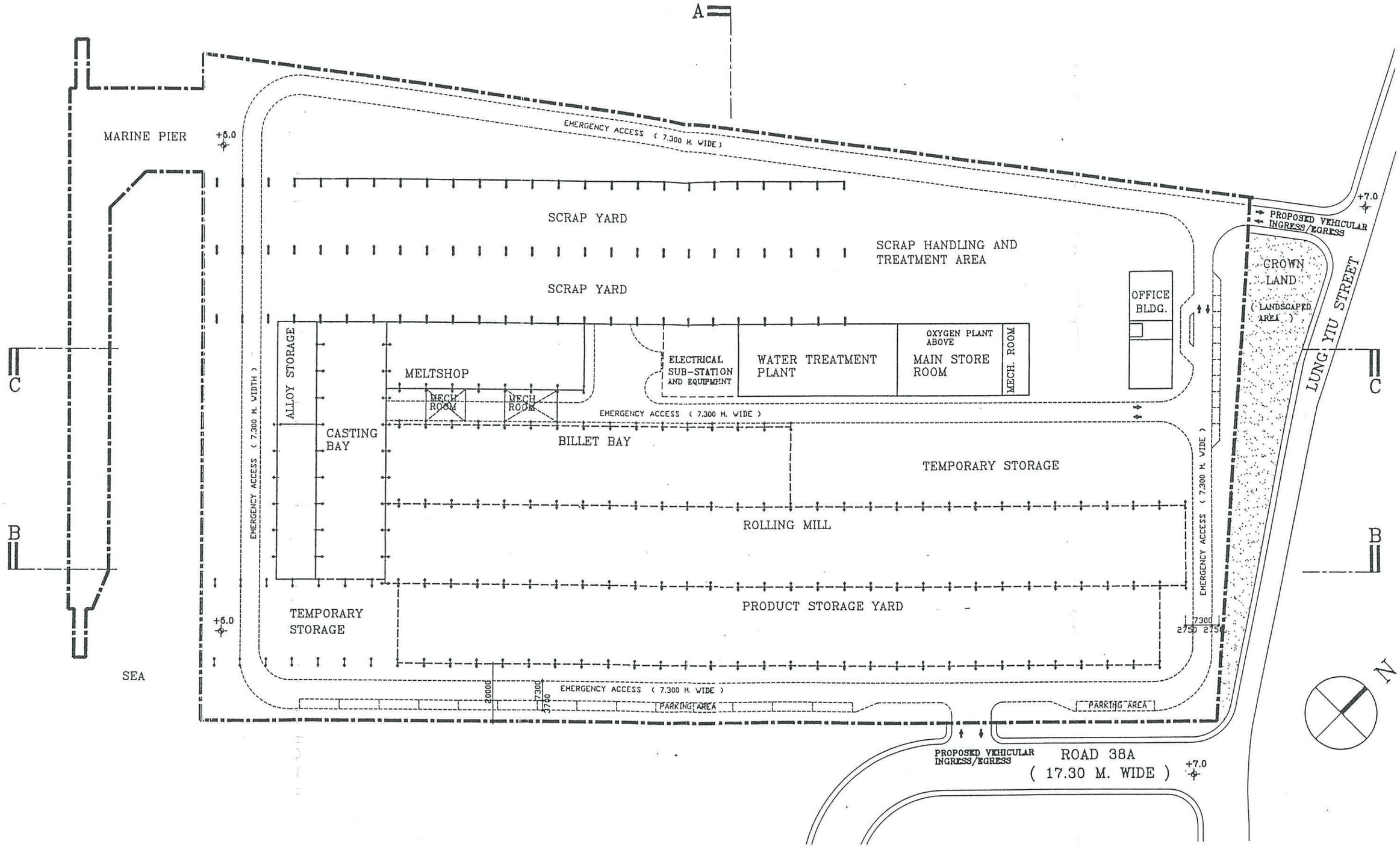

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THE SITE

BUILDING ROOF AREA

LANDSCAPED AREA

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TEL. 511 8383, FAX 507 4915

0 50m

SEPT.,1993 TM372-MP2b

Shiu Wing Steel Mill

Figure 2 : Proposed Steel Mill Layout

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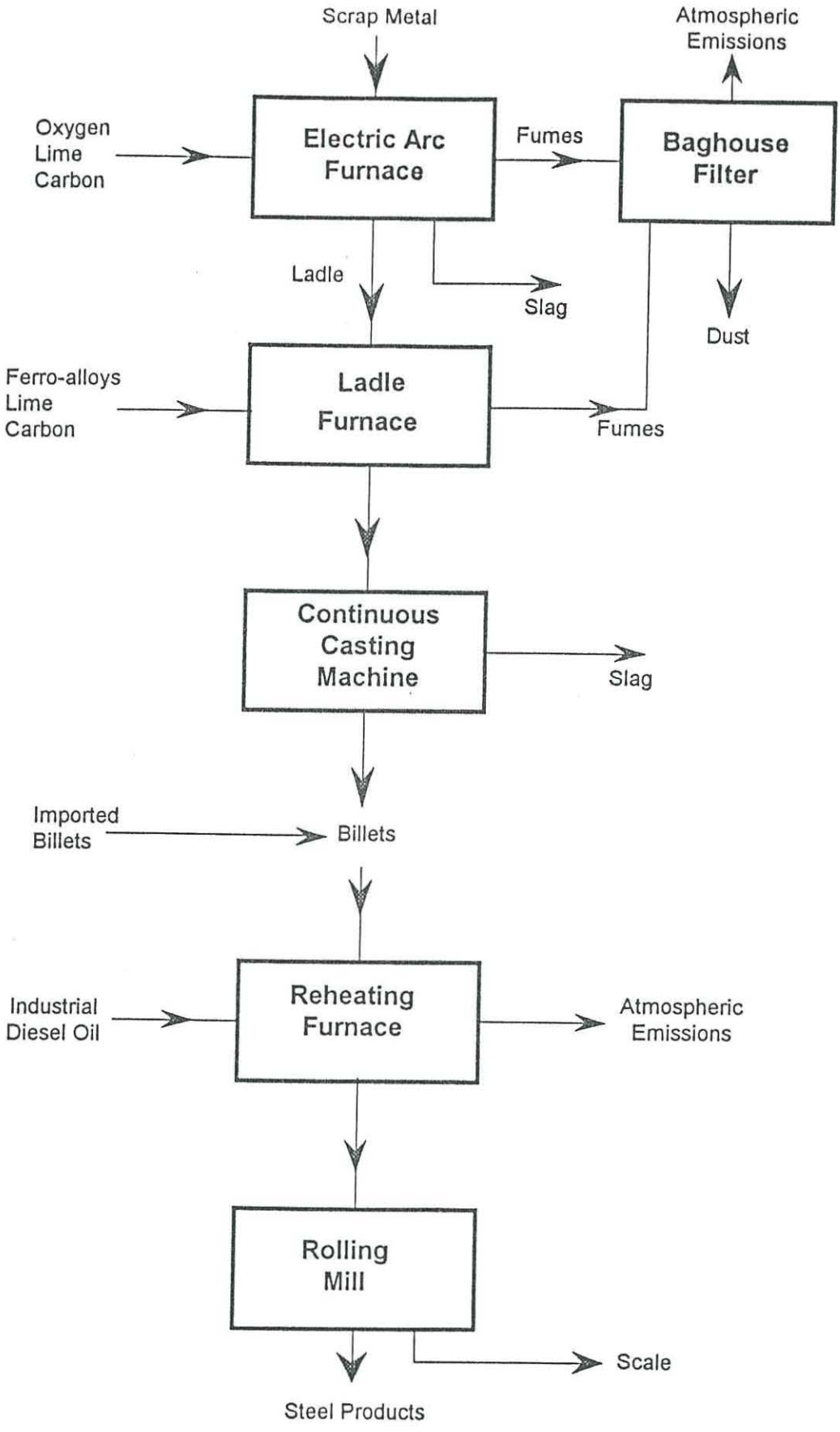

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Shiu Wing Steel Mill

Figure 3 Production Flow Chart

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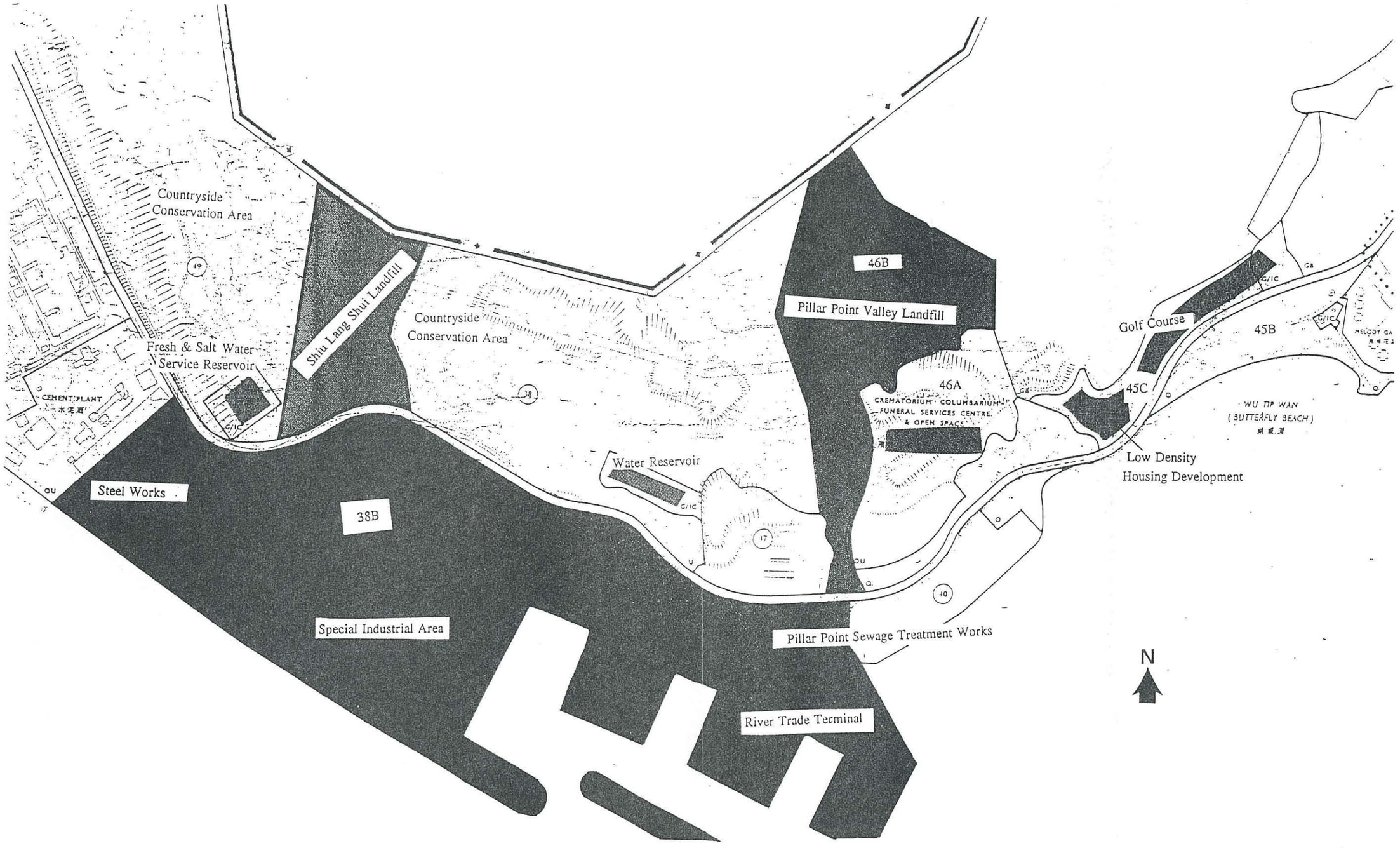

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Shiu Wing Steel Mill

Figure 4 : Proposed Developments in the Surrounding Area

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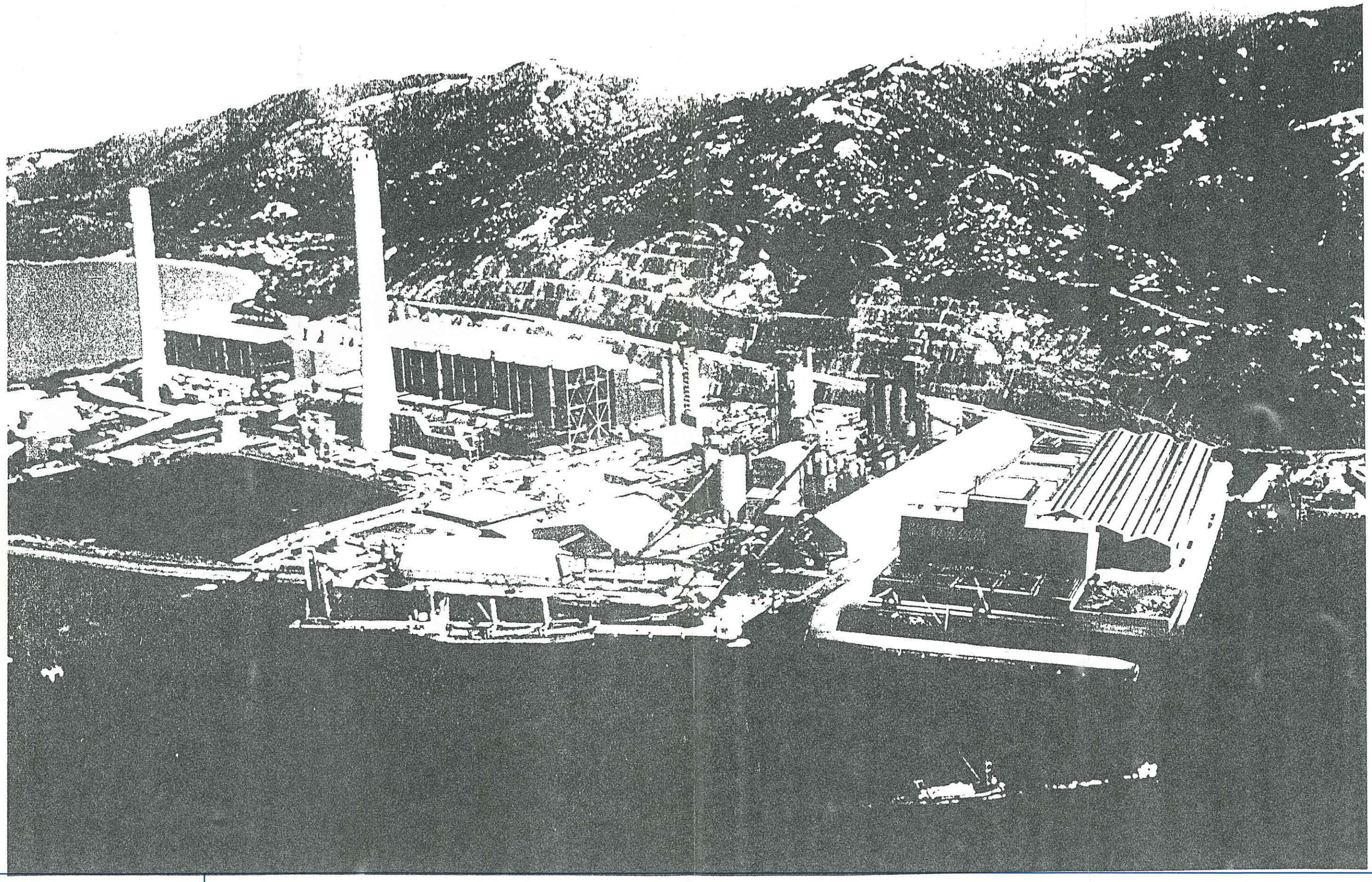

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Shiu Wing Steel Mill

Figure 6 : Photomontage of Proposed Steel Mill

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Figure 5 : Aerial Photograph of Site

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