

Global Power and Energy Company Limited

Pyrolysis Plant at Yuen Long Industrial Estate

May 2007

Environmental Resources Management

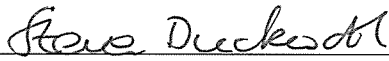
21/F Lincoln House
979 King's Road
Taikoo Place
Island East, Hong Kong
Telephone: (852) 2271 3000
Facsimile: (852) 2723 5660
E-mail: post.hk@erm.com
<http://www.erm.com>

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May 2007

Reference 0060917

For and on behalf of ERM-Hong Kong, Limited
Approved by: <u>Steve Duckworth</u>
Signed: <u></u>
Position: <u>Deputy Managing Director</u>
Date: <u>15th May 2007</u>

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1 BASIC INFORMATION

1.1 PROJECT TITLE

Pyrolysis Plant at Yuen Long Industrial Estate (the Project)

1.2 NAME OF PROJECT PROPONENT

Global Power and Energy Company Limited (Global Power)

1.3 NAME AND TELEPHONE NUMBER OF CONTACT PERSON(S)

Name: Samuel Sze

Title: Project / Construction Manager

Company: Global Power and Energy Company Limited

Phone No: 2522 2811

1.4 PURPOSE AND NATURE OF PROJECT

Global Power proposes to construct and operate a production plant in Yuen Long Industrial Estate (YLIE) to convert used rubber tyres into fuel through a pyrolysis process on a commercial scale. The main purpose of the Project is to recover reusable resources, such as fuel oil products, steel and carbon black, from used rubber tyres, which are currently mainly retreaded for reuse or disposed of at landfills. With the recovery of resources from used tyres, the Project is expected to contribute positively to the Government of the Hong Kong Special Administrative Region (HKSARG)'s efforts in waste reduction.

1.5 LOCATION AND SCALE OF PROJECT

The Project will be located at 1 Wang Lee Street, YLIE (the Site) (*Figure 1.1*). YLIE was developed in the early 1980s on land that had been reclaimed from fish ponds. It is currently managed by Hong Kong Science and Technology Parks Corporation (HKSTPC). YLIE is currently designated as "Other Specified Uses (Industrial Estate)" in the Yuen Long Outline Zoning Plan (OZP) No. S/YL/16.

The Project is expected to process approximately 36,000 tonnes of used rubber tyres for the production of approximately 12,000 tonnes of fuel oil products per annum.

The total area of the Site is approximately 24,400 m² and is currently vacant. The records of HKSTPC indicate that Nippon Hume Concrete (HK) Ltd was the only previous occupant of the Site, which manufactured pre-cast concrete

piles on the premises between October 1985 and July 2000. Subsequent to the closure of the concrete pile manufacturing facilities, all the aboveground structures were demolished and removed, except the concrete hardstanding and the boundary wall.

1.6 NUMBER AND TYPES OF DESIGNATED PROJECTS TO BE COVERED BY THE PROJECT PROFILE

The Project will include a number of elements that qualify as Designated Projects under *Schedule 2 of Environmental Impact Assessment Ordinance*. The Designated Projects to be covered by this Project Profile are listed in *Table 1.1*.

Table 1.1 Designated Projects to be covered by this Project Profile

Elements of the Project	Qualification as Designated Project
Refining of pyrolytic oil into fuel oil products	An oil refinery [EIAO Schedule 2, Part I, K.7]
Storage of rubber tyres (720t), production fuels (35t), intermediate product (240t), gas from pyrolysis (300m ³) and final fuel oil products (240t)	A dangerous goods godown with a storage capacity exceeding 500 tonnes [EIAO Schedule 2, Part I, K.13]

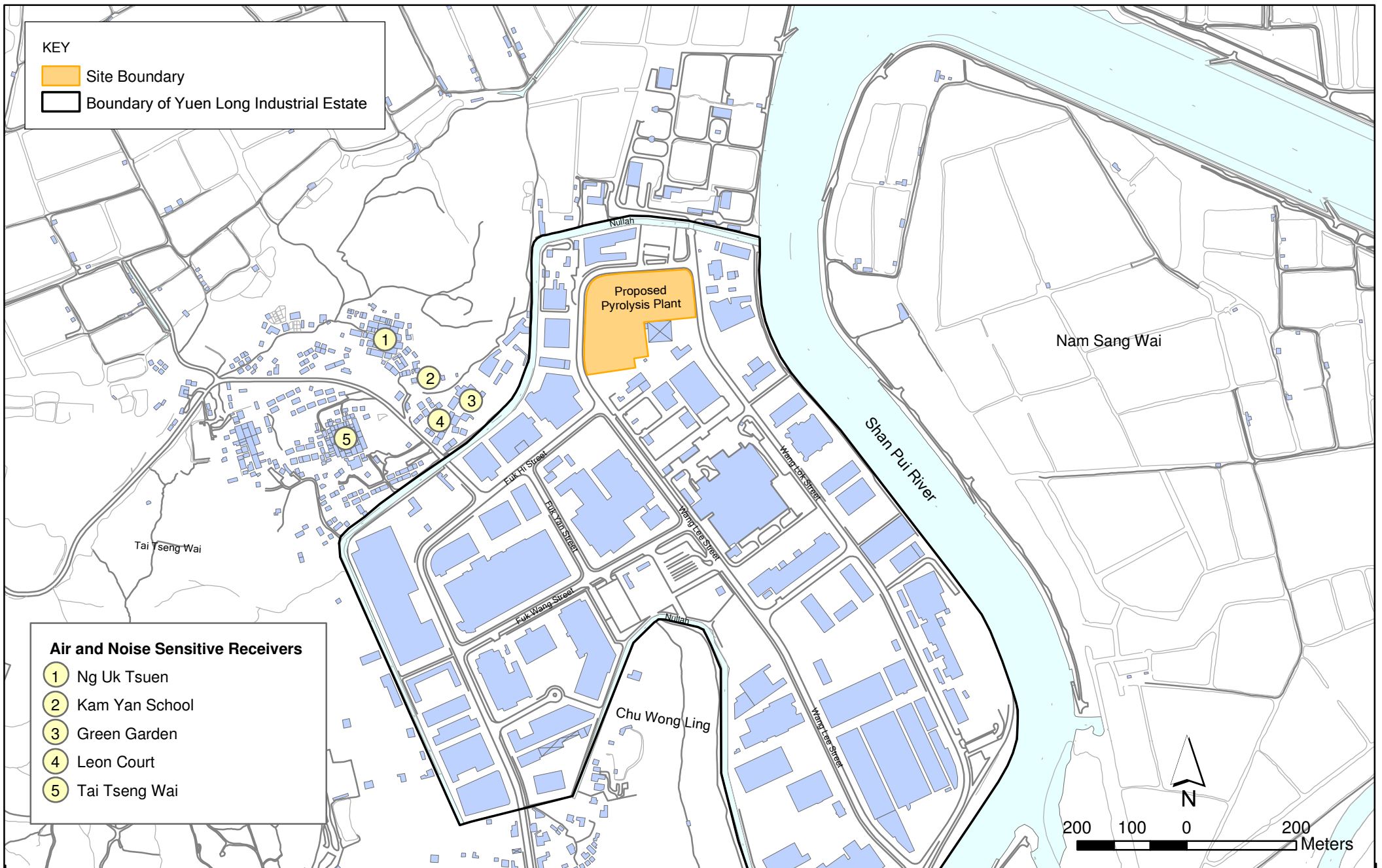


Figure 1.1

Location of the Project

2.1 PROJECT PLANNING AND IMPLEMENTATION

Global Power has appointed David S K Au & Associates Ltd as the consultant responsible for the overall management of the engineering design process of the Project. A design institute in Mainland China has been appointed for the design of the production processes and the associated production equipment. The contractors for the construction of the Project are yet to be determined through the subsequent tendering process.

The design and permitting for the Project have commenced. An indicative programme showing the key milestones for the Project as currently envisaged is provided in *Table 2.1*.

Table 2.1 *Indicative Project Programme*

Key Stage of the Project	Indicative Date
Design and Permitting for the Project	2007
Tendering for the Construction of the Project	3 rd Quarter 2007
Construction of the Project	Mid-2008
Commencement of the Operation of the Project	Mid-2009

The Project will be implemented within the industrial setting of the well-established YLIE and there is no known interaction between the Project and other projects that will potentially give rise to major environmental implications.

The existing environment of the Site and its surroundings were reviewed and sensitive receivers were identified in accordance with the guidelines of the *Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM)*.

The Site is located in the northern part of YLIE, bounded by Wang Lee Street in the north and west and Wang Lok Street in the east. Two industrial establishments, Fung Shing Steel Co Ltd (Fung Shing) and Hong Kong Petrochemical Co Ltd (HK Petrochem), are located immediately south of the Site. Fung Shing processes steel sheets into products for construction and manufacturing purposes, including steel tubes, steel pipes and corrugated steel sheets. HK Petrochem is a facility for the production of polystyrene resin.

The Site does not have any direct frontage to existing or planned sensitive uses. The nearest identified noise and air sensitive receivers are Kam Yan School and three-storey village-type residential premises including Green Garden and Leon Court located approximately 200m to the southeast of the Site (*Figure 1.1*) but these are mostly screened by industrial premises along the western boundary of YLIE. The industrial premises between the Site and the environmental sensitive receivers are listed in *Table 3.1* and shown in *Figure 1.1*.

Table 3.1 *Industrial Premises between the Site and Identified Sensitive Receivers*

Name of Industrial Premises	Nature of Business ^(Note)
XYG (HK) Ltd	Production of safety glass
Richardson Pacific (Asia) Ltd	Production of perforated metal products
Eu Yan Sang (HK) Ltd	Research and development of Chinese medicine
Dunwell Industrial (Holdings) Ltd	Used oil recycling
Note:	
Information on the nature of business of industrial establishments in the vicinity of the Site is extracted from the tenants directory published on the HKSTPC website and the websites of the respective companies	

With the location of the Site within the well-established YLIE, which do not encroach on any virgin land or ecological habitats, no ecologically sensitive areas, water bodies or sites of cultural heritage will be affected by the Project.

4.1 GENERAL DESCRIPTION OF THE PROJECT

4.1.1 Construction Phase

The Site is currently vacant and site formation will not be required. The construction of the Project is expected to involve the demolition of the existing boundary wall, removal of the existing ground slab, construction of foundations, excavation for underground utilities, the construction of superstructure for the office and storage and the installation of production equipment including burners, pyrolysis reactors, distillation columns, chimneys and storage tanks.

4.1.2 Operational Phase

The operation of the Project will involve the typical production process illustrated in *Figure 4.1*. The process can be divided into three main stages as follows:

- shredding of used rubber tyres and recovery of steel;
- pyrolysis of shredded tyre and recovery of intermediate products (oil, gas, carbon black and steel); and
- refining of intermediate oil product to final fuel oil products.

The majority of the steel wires in the rubber tyres will be separated and recovered. The rubber tyres will then be shredded and fed to the pyrolysis reactor.

Pyrolysis is the thermal decomposition of materials in the absence of oxygen. In the case of the pyrolysis of rubber tyres, the rubber degrades under high temperatures and long-chain hydrocarbons in rubber are broken down into compounds with shorter carbon chains in the reactor, yielding oil, gas and carbon black. Unlike incineration, the transformation of materials occurs under oxygen-free conditions. The oil from the reactor is collected and used as the feedstock for the subsequent refining process.

Heat will be supplied to the pyrolysis reactors by gas- and oil-fired burners. Apart from diesel and fuel oil, the pyrolytic gas produced from the Project will also be used as fuels for the gas burners. The intermediate oil products from the pyrolysis process will be passed through the condenser. The condensate containing the intermediate oil product will be collected and stored. Solid by-products, including carbon black and the remaining steel, will be collected and sold to recyclers.

The intermediate pyrolytic oil will be used as feedstock for the refining process, through which the oil will be separated into a number of fractions by

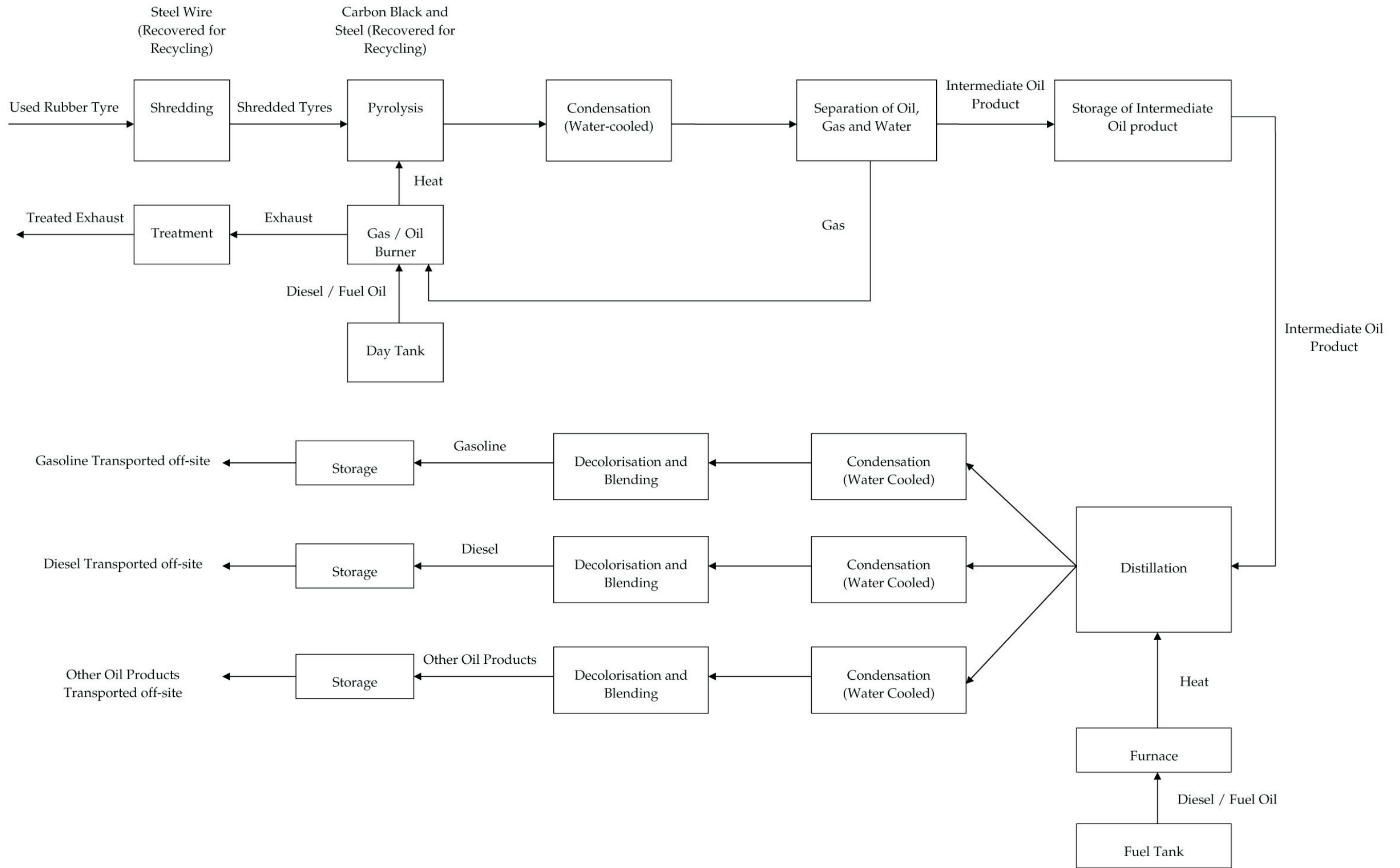


Figure 4.1

Schematic Process Flow for the Proposed Pyrolysis Plant

distillation. The furnace supplying heat to the distillation column will be diesel- or fuel oil-fired.

The various fractions from the distillation process will be collected in condensers and further processed, such as deodorised, decolorised and blended, before directed to appropriate storage tanks.

It is expected that the Project will be operated 24 hours a day for 300 days a year. The daily operation of the Project will be divided into four shifts with a total of about eight supervising staff and workers for each shift. It is currently envisaged that the fuel oil products from the Project will be sold in the HKSAR.

An indicative layout of the Site showing the outline arrangement of the various production process areas is presented in *Figure 4.2*.

4.2 IDENTIFICATION OF KEY ENVIRONMENTAL ISSUE

The construction and operation of the Project may give rise to potential environmental impacts. These potential impacts are identified in *Table 4.1* and addressed in the sections following *Table 4.1*.

Table 4.1 *Potential Environmental Impacts Arising from the Project*

Potential Impact	Construction	Operation
• Gaseous Emission	✓	✓
• Dust	✓	–
• Odour	–	–
• Noise	✓	✓
• Night-Time Operations	–	✓
• Traffic (Land)	–	–
• Liquid Effluents, Discharge or Contaminated Runoff	✓	✓
• Generation of Waste or By-products	✓	✓
• Manufacturing, Storage, Use, Handling, Transport, or Disposal of Dangerous Goods	–	✓
• Hazard to Life	–	✓
• Disposal of Spoil Material	✓	–
• Unsightly Visual Appearance	–	–
• Cultural & Heritage	–	–
• Terrestrial Ecology	–	–
• Marine Ecology	–	–
• Cumulative Impacts	–	–

Legend:
 '✓' = Possible '–' = Not Expected

4.3 CONSTRUCTION PHASE

4.3.1 Air Quality

The existing air quality in the Site area is dominated by emissions from industrial establishments within the industrial estate. The nearest air

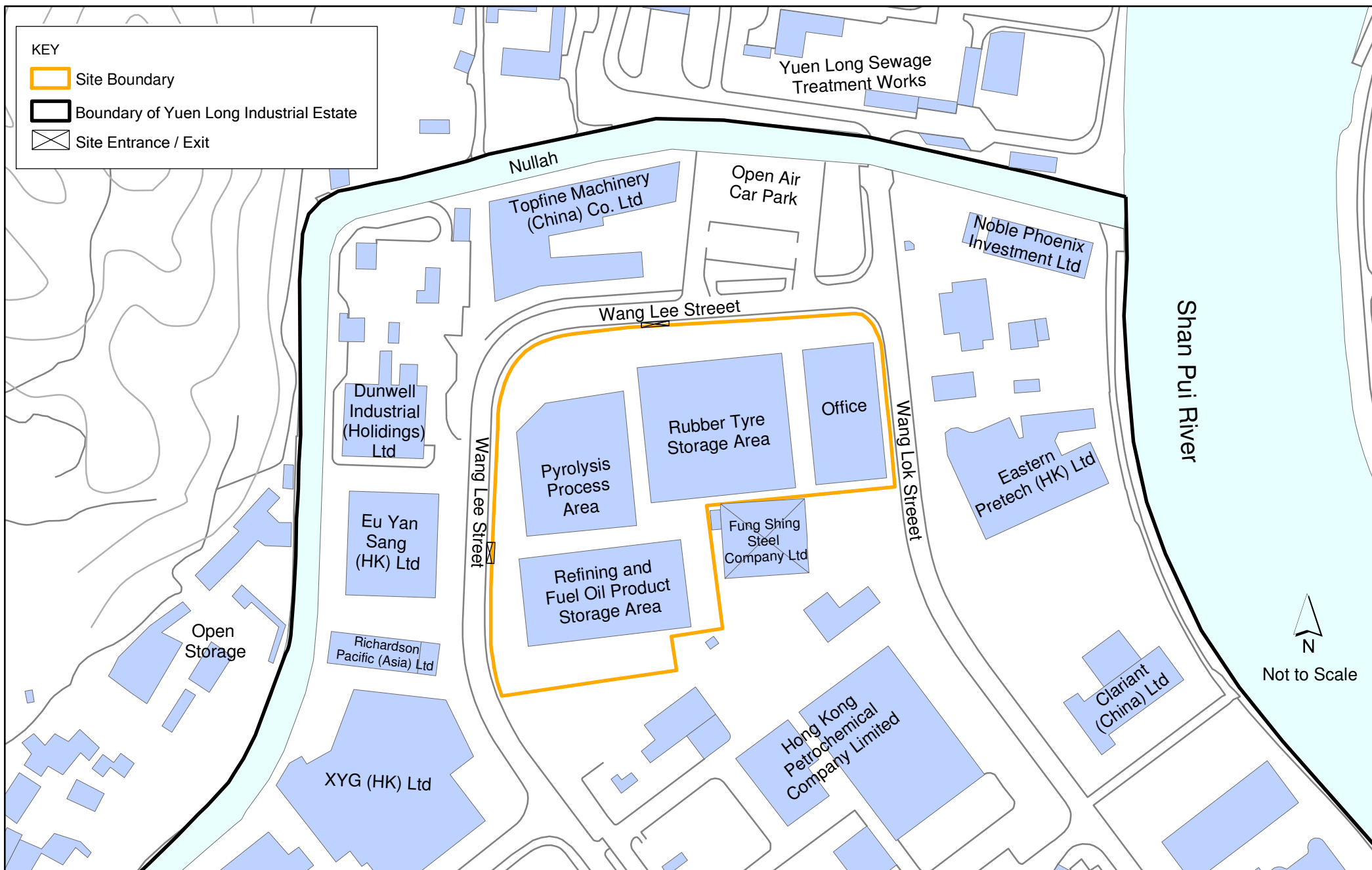


Figure 4.2

Indicative Layout of Pyrolysis Plant

sensitive receivers (ASRs) are identified as Green Garden, Leon Court and Kam Yan School located at a distance of approximately 200 m from the Site boundary.

Dust may arise from general construction and demolition works. The scale of the works will be small and the extent will be confined to the Site area. The Site is located at a reasonable distance from the identified ASRs, with other industrial premises of YLIE interposing between the two. With the implementation of dust suppression measures stipulated under the *Air Pollution Control (Construction Dust) Regulation* and adoption of good site practice, no construction dust impacts are expected.

Air quality impact may also arise from the operation of diesel-powered construction equipment. Considering the small scale and limited extent of the construction works, the total number of diesel-powered construction plant items will be small, and therefore no adverse air quality impact from the gaseous emissions of construction equipment is expected.

4.3.2 *Noise*

The demolition and construction works for the Project will involve the use of Powered Mechanical Equipment (PME) such as generators, excavators, concrete breakers, concrete lorry mixers, and mobile cranes. With the closest noise sensitive receivers (NSRs) including Green Garden, Leon Court and Kam Yan School located at a distance of about 200m but screened by interposing YLIE industrial premises, adverse construction noise impacts are not envisaged.

4.3.3 *Water Quality*

The construction of the Project will not require any site formation and only excavation works of a small scale will be undertaken for the construction of foundations and underground utilities. With the implementation of good site practice and appropriate mitigation measures in accordance with the *Practice Note for Professional Persons on Construction Site Drainage (ProPECC PN1/94)*, no water quality impacts from the construction works of the Project are expected.

4.3.4 *Waste Management*

The construction and demolition activities associated with the Project will result in the following broad categories of waste:

- construction and demolition (C&D) materials, mainly from the demolition of existing boundary wall and removal of existing concrete ground slab;
- chemical waste, such as batteries and lubricating oils from the maintenance of construction vehicles and equipment; and
- general refuse, including food waste from the on-site work force and the packaging from the construction materials

It is expected that C&D materials generated from the construction works will be properly segregated and scrap metals will be recovered for recycling. The amount of C&D waste requiring disposal at landfills and the associated potential impacts will be minimal.

The construction activities of the Project are not expected to generate significant quantities of chemical waste, and therefore no impact is expected in this respect. With proper housekeeping measures and refuse collection arrangements in place, no impact is expected to result from refuse generated during the construction phase of the Project.

4.4 *OPERATIONAL PHASE*

4.4.1 *Air Quality*

Potential air quality impacts may arise from the combustion of fuels to supply the heat energy necessary for the pyrolysis and refining processes. Air pollutants emitted in the exhausts of the burners and furnaces will include nitrogen oxides, sulphur dioxide, carbon dioxide and particulates.

The pyrolysis and refining processes will occur in the largely enclosed environment of the reactor and distillation column and major discharge of gaseous emissions from these processes are not expected. However, fugitive emissions of volatile organic compounds (VOCs) may still arise from certain components of the plant such as storage tanks, pumps and valves.

To protect the gas holders from over-pressure, a gas flare and a gas vent will be provided. As these control devices will only be operated under emergency situations, no adverse air quality impact is expected to arise from their operation.

4.4.2 *Noise*

The existing ambient noise environment of the Site is dominated by noise generated from industrial activities from the adjacent premises of YLIE.

The pyrolysis plant will be operated 24 hours a day. Key potential noise sources during the operational phase of the Project will include the tyre shredders, valves and pumps. As discussed in *Section 3*, these noise sources will be at a distance of about 200m from the nearest NSRs but mostly screened by interposing industrial premises. No adverse impact from fixed noise sources of the Project is therefore expected.

The operation of the Project will only require a very small number of transportation vehicles. The traffic induced by the Project on the existing roads will be minimal. As a result, no traffic noise impact associated with the operation of the Project is anticipated.

4.4.3

Water Quality

Water quality impact may arise as a result of the discharge of industrial effluents to the drainage/sewerage systems and/or water bodies nearby. The operation of the Project is not expected to generate a substantial volume of effluents as the industrial process involved will either generate very little liquid effluent or re-circulate the process water in a closed system.

A very small quantity of slightly acidic water, which constitutes only 0.2% of the total volume of the final oil products, is expected to be generated in the pyrolysis process. The water will be released to the atmosphere as vapour, leaving the acidic salts behind with other solid residues in the reactor, and no discharge of liquid effluents will be required. Cooling water for the condensers will be re-circulated and no discharge of cooling water will be made under normal circumstances.

Only a small quantity of domestic sewage is expected to be generated during the operation of the Project as there will be no canteen facilities or kitchens provided on Site and the number of staff will be very small.

Proper connections to the nearest public sewer will be provided. Appropriate treatment will be provided to process effluent streams, if any, prior to discharge in accordance with the *Technical Memorandum on Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (WPCO-TM)* issued under *Section 21 of the Water Pollution Control Ordinance (WPCO)*.

4.4.4

Waste Management

The pyrolysis process will generate both by-products and wastes. With reference to the production capacity indicated in *Section 1.5 of this Project Profile*, it is estimated that approximately 14,400 tonnes of carbon black and 3,600 tonnes of scrap steel will be generated.

Chemical waste such as spent lubricant oil, paint and oil filters from equipment maintenance will be properly collected and disposed of in accordance with *Waste Disposal (Chemical Waste) (General) Regulation*. Considering the relatively small number of equipment items on site, the quantity of chemical waste to be generated is expected to be small.

Catalysts will be used in the refining process. Appropriate arrangements will be made with the suppliers to collect the spent catalysts for rejuvenation and therefore no disposal is expected to be required.

General refuse such as food packaging and food waste will be collected in enclosed bins and collected by waste collector on a daily basis. Given the small number of staff (ie about eight per shift) and the absence of canteen facilities or kitchen on site, the amount of general refuse generated during the operational phase is expected to be negligible.

4.4.5 *Landscape and Visual*

The Site is located within the well-established YLIE, which is largely occupied by industrial facilities. The implementation of the Project, which is an industrial establishment, will have no effect on the existing landscape character within and around YLIE.

The terrain of YLIE and its surrounding area is generally flat. Dependent upon the dimensions of the plant equipment in the final design of the Project, certain structures of the Project (such as the chimney stacks, pyrolysis reactor and the distillation column) may be visible to residents on the top floors of Green Garden and Leon Court.

4.4.6 *Hazard to Life*

A total of about 720t used rubber tyres and about 515t oils (including production fuel, intermediates and final fuel oil products) will be stored on site during the operational phase of the Project. There will also be a maximum of 300m³ of pyrolytic gas to be stored in three gas holders. As the total capacity for the storage of dangerous goods exceeds 500t, the Project will be qualified as a dangerous goods godown under *Environmental Impact Assessment Ordinance (EIAO)*. Potential hazards from the storage of dangerous goods and pyrolytic gas will need to be considered.

5.1 CONSTRUCTION PHASE

5.1.1 Air Quality

The potential dust impacts associated with the construction of the Project will be mitigated by the implementation of construction site management practices for dust control. This includes erection of site hoardings, watering of exposed soil surfaces, covering of stockpile of dusty material with impervious sheeting.

5.1.2 Noise

The following construction noise management measures are proposed for the construction and demolition works:

- only well-maintained equipment should be operated on-site and equipment should be serviced regularly during the works;
- machines and equipment that are in intermittent use should be shut down between work periods or should be throttled down to a minimum;
- silencers or mufflers on construction equipment should be utilized and should be properly maintained during the works; and
- where necessary, mobile noise barriers should be positioned with a few metres of noisy plant items.

5.1.3 Water Quality

Appropriate measures will be implemented in accordance with the guidelines stipulated in EPD's *Practice Note for Professional Persons on Construction Site Drainage (ProPECC PN 1/94)* during the construction and demolition works to properly control site run-off and drainage and to minimise potential water quality impacts.

5.1.4 Waste Management

To minimise the amount of construction waste, careful design, planning and good site management practice will be adopted by the contractors of the Project and waste on-site will be properly segregated to increase the potential for reuse and recycling.

Chemical waste generated during the construction of the Project will be properly stored in accordance with EPD's *Code of Practice on the Packaging, Labelling and Storage of Chemical Waste* before collection for disposal by a licensed Chemical Waste Collector. General refuse generated on-site will be

stored in enclosed bins and collected by licensed waste collector on a regular basis.

5.2 *OPERATIONAL PHASE*

5.2.1 *Air Quality*

A detailed air quality assessment will be conducted during the further design of the plant process and components of the Project to determine the degree and extent of impacts from its gaseous emissions during the operational phase. Appropriate emissions control systems will be recommended and incorporated in the Project design to ensure that potential air quality impacts on the ASRs are minimised.

5.2.2 *Noise*

Given that the distance of the NSRs from the Site and the screening provided by other YLIE industrial premises, adverse noise impact to the NSR is not anticipated. A detailed fixed plant noise assessment will be conducted as part of the detailed design of the Project to identify and confirm the requirements for mitigation measures, if any.

5.2.3 *Water Quality*

Appropriate treatment of the production process effluents will be provided to ensure that the effluent discharge to the public sewerage system will meet the relevant standards in the *WPCO-TM*.

5.2.4 *Waste Management*

Chemical waste will be properly stored in accordance with EPD's *Code of Practice on the Packaging, Labelling and Storage of Chemical Waste* before collection for disposal by a licensed Chemical Waste Collector. General refuse will be stored in enclosed bins and arrangements will be made for its regular collection by licensed waste collector.

Arrangements will be made with uptakers or recyclers for by-products, including carbon black and steel, generated from the Project to ensure recovered resources are reused as far as practicable.

Similarly, spent catalysts from the refining process will be collected by suppliers for rejuvenation through appropriate procurement arrangements.

5.2.5 *Landscape and Visual*

The Project will conform to the existing landscape character of YLIE and the potential visual impact associated with the Project is considered minor. No mitigation measure is considered necessary in this respect.

5.2.6

Hazard to Life

Arrangements and facilities for the storage and handling of dangerous goods during the operation of the Project will be in strict compliance with relevant legislation and guidelines. An assessment of the potential hazards associated with the storage and handling of dangerous goods within the Project will be conducted to ensure that risk level associated with the Project stays within the *Hong Kong Government Risk Guidelines*. Mitigation measures, if required, will be implemented with reference to the recommendations of the hazard assessment.

Used rubber tyres in Hong Kong are currently managed mainly by retreading for reuse or disposal at landfills. A small quantity is shredded and processed into a material for road and slope construction.

The Project will introduce an innovative approach to the recovery of reusable resources, including steel, carbon black and hydrocarbons, from used rubber tyres in a commercially viable manner. Through this approach, the Project will create new opportunities for the management of waste tyres in Hong Kong. The operation of the Project should therefore provide environmental benefits to Hong Kong in the long run by assisting in the reduction of waste and conservation of valuable landfill space.

There are no previously approved EIA reports relevant to this Project.