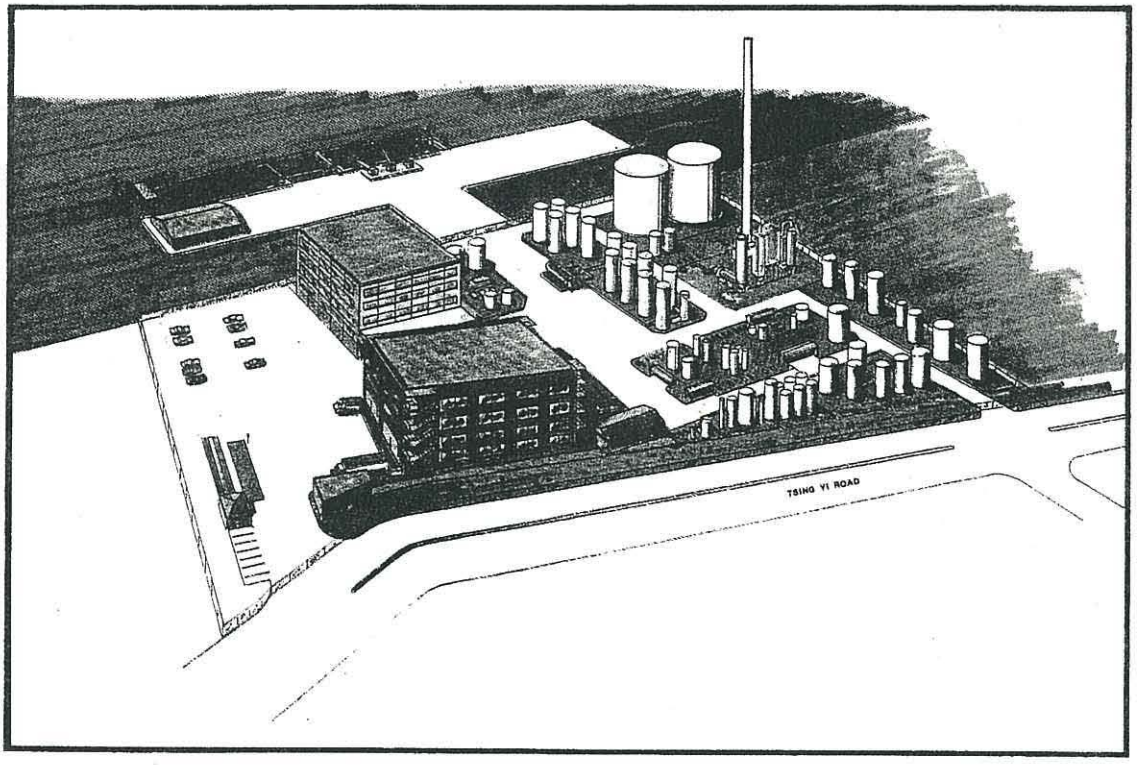
HONG KONG CHEMICAL WASTE TREATMENT FACILITIES

ENVIRONMENTAL IMPACT ASSESSMENT
HAZARD ASSESSMENT

EXECUTIVE SUMMARY



Enviropace Limited

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1.0 BACKGROUND

The Hong Kong Government recently published a Waste Disposal Plan which highlights the magnitude of the problems associated with managing the collection and disposal of nearly 88,000 tonnes of wastes generated in Hong Kong every day. A percentage of these wastes contains toxic or hazardous compounds. These wastes arise as by-products of various industrial manufacturing and maritime activities. Many wastes are produced by small factories operating in multi-storey industrial buildings. Factory owners generally do not have the space, waste management experience or financial incentive to treat their chemical wastes. The common practice is to discharge wastes into sewers and surface water drains, and coastal and harbour waters. This practice poses serious danger to public health as well as damage to sewage treatment plants and the environment.

The Government has reacted to the problem of chemical waste disposal by announcing plans to introduce comprehensive regulatory controls under the Waste Disposal Ordinance on the storage, treatment, transport and disposal of these wastes. To enable the chemical waste disposal strategy to be implemented and to enable industry to comply with the legislative controls of the Waste Disposal Ordinance, the Government clearly needs to establish appropriate chemical waste treatment/disposal facilities.

In November, 1990 the Government contracted for the design, construction and operation of Government-owned Chemical Waste Treatment Facilities (CWTF), to be located on Tsing Yi Island, Hong Kong. The contractor is Enviropace Ltd, a subsidiary of Waste Management International Inc. (70%), China International Trust and Investment Corporation Hong Kong (Holdings) Ltd. (20%), and Kin Ching Besser Ltd (10%).

This Environmental Impact Assessment and Hazard Assessment (EIA/HA) has been prepared as part of the design phase of the CWTF in Hong Kong. The purpose of this EIA/HA is to update the earlier, planning phase Environmental Review and Initial Risk Assessment reports on the CWTF (ERL 1987), in order to address specific aspects of Enviropace's conceptual design that may differ from the design assumptions in the previous reports. This EIA/HA will be followed by an Emergency Response Plan, to be prepared when the detail engineering is completed.

The previous environmental and hazard reports concluded that the proposed Tsing Yi Island site was suitable for the project and that the CWTF was likely to result in minimal adverse impact on the local environment, whilst the provision of the CWTF would result in considerable environmental benefits to Hong Kong as a whole.

2.0 CHEMICAL WASTE PROGRAMME IN HONG KONG

The Waste Disposal Plan (EPD, 1989) classifies about 0.3% (or 280 tonnes per day) of the wastes from the 20,000 industrial and commercial establishments in Hong Kong as chemical wastes with toxic and hazardous characteristics. Whilst this is a small volume relative to the total wastes in Hong Kong, the chemicals are such that this group of wastes requires special consideration.

The chemical wastes arise as by-products of various industrial processes employed by many of Hong Kong's export-oriented manufacturers. This is particularly the case for the electronic and metal product industries and metal finishing activities. Non-manufacturing industries also produce chemical wastes, mainly as residues from the storage of materials and from damaged or unwanted products. Another major source of chemical waste arises from the shipping industry. Under the International Convention for the Prevention of Pollution from Ships (or the MARPOL Convention), ships are required to install equipment to contain chemical wastes including oily substances that would otherwise be discharged directly to the sea. These wastes must be off-loaded and disposed of in an environmentally acceptable manner.

Present waste disposal practices as described above pose serious environmental, engineering and public health risks and led the Government to examine a range of chemical waste disposal options. The Government concluded that the preferred strategy would involve a combination of recovery and re-use; chemical detoxification; physical, chemical and biological treatment; thermal destruction; stabilization of the residues of these processes; and disposal of these innocuous residues in a landfill.

These processes comprise the Chemical Waste Treatment Facilities that the Government contracted Enviropace to implement. The CWTF will offer major environmental and socio-economic benefits to the local community and the surrounding environment.

3.0 SITE DESCRIPTION

The CWTF site is located on the south-east side of Tsing Yi Island, at the southern most part of Rambler Channel and northwest of Hong Kong Island and Victoria Harbour. The site was chosen as the best location for the CWTF following a detailed site selection study. The site was chosen for the following reasons:

- it was near the heart of marine transport activities;
- it had reasonably good access to the major industrial zones;
- it had good access to land and maritime transportation;
- the site had already been formed and would be available immediately; and
- the site was located sufficiently far away from residential areas.

The site is bounded to the southwest by vacant land which is reserved for future infrastructure projects. The vacant land separates the site from the China Resources Oil Depot. To the north is the Outboard Marine Asia Limited facility and Rambler Channel, and to the northwest along Tsing Yi Road are Tien Chu Ve-Tsin Chemicals and Dow Chemicals (HK) Ltd. The old Cattle Quarantine Station Jetty is part of the site and is expected to be renovated to receive bulk wastes from barges and other vessels.

The northeastern sector of Tsing Yi Island is largely residential with almost all the residents living in high-rise tower blocks. These two residential estates are more than 1 km from the CWTF site, viz: Mayfair Gardens and Cheung Ching Estate. The total residential population of Tsing Yi Island is about 190,000. Many of the residents commute to Hong Kong for work.

A number of proposed developments have been suggested for Tsing Yi Island. The most significant include a Technical Institute and the Container Terminal 9 (CT9)/Southeast Tsing Yi (SETY) project, which would involve relocation of several major industries, reclamation of 140 ha of sea and the development of a major Container Terminal.

4.0 DESCRIPTION OF THE PROJECT

The CWTF will be an integrated facility capable of handling virtually any type of chemical waste. Processes to be installed at the plant include:

- high temperature incineration of organic wastes, coupled with energy recovery;
- separation of oils from water and biological treatment of organically contaminated wastewaters;
- physical-chemical treatment of inorganic aqueous wastes, including oxidation/reduction reactions, neutralisation of acids and alkalis and precipitation of toxic metals;
- special and final treatment of various wastewaters by evaporation and catalytic oxidation, coupled with water recovery (PO*WW*ER);
- recovery of metal and possibly etchant materials from the waste by-products of electronics industries; and
- stabilisation of sludges and CWTF process residues containing toxic constituents that might otherwise leach in a landfill environment. The residues include wastewater treatment sludge filter cake and incinerator bottom and fly ash.

The Government requires that the CWTF be able to treat a wide range of wastes, although not all can be known at this time. Because of the possibility of receiving wastes in addition to those included in the Contract categories, the CWTF has been designed for flexibility and adaptability in both storage and treatment. Therefore, three of the CWTF processes have greater versatility than their conventional alternatives: rotary kiln incineration, stabilisation, and the PO*WW*ER aqueous treatment process. The rotary kiln can accept most organics, including solids and containers that are not anticipated. PO*WW*ER can treat a very broad range of chemical characteristics simultaneously and still remove contaminants to very low levels. Stabilisation can immobilise toxic metal substances in waste sludges and residues of the other processes by mixing the residues with appropriate reagents, so that all solid materials leaving the CWTF are innocuous. The flexibility in each of these systems will allow the CWTF to handle the range of waste streams required by the Government.

The following chart presents a summary of the quantities of wastes that the CWTF has been designed to receive.

Approximate Quantities of Chemical Wastes to be Treated at the CWTF

Wastes and Treatment Process	Approximate Quantities (tpa)
Organic Wastes for Incineration	14,650
Inorganic Wastes for Physical/Chemical Treatment	69,500
Aqueous Organic Wastes for Biological and Special Treatment	13,650
Total	97,800

The facility will produce cleaned gases that will be discharged through the incinerator stack, treated water effluent that will be discharged to the foul sewer and stabilised solid materials that will be disposed of in landfills.

A comprehensive environmental management and monitoring programme will be implemented at the CWTF to ensure that the potential environmental impacts are minimised. All wastes received at the CWTF will be logged and, where appropriate, sampled to allow tracking through the plant and to ensure delivery to the correct storage and processing unit. Air emissions from the incinerator, liquid effluents to the foul sewer, and groundwater at the site will all be monitored throughout the operating life of the Facilities. All sampling and analyses will be carried out according to U.S. EPA methods. Information from the monitoring programme will be available to the Government and assessed to ensure that the environmental management procedures are maintained. A preventive maintenance programme and an emergency response plan will be implemented throughout the CWTF.

Enviropace will implement a system of containerisation, collection and laboratory testing for the wastes throughout Hong Kong that will be treated at the CWTF. Containers will be provided on the premises where wastes are generated, and periodically collected and replaced by Enviropace.

Enviropace will also provide equipment and trained personnel for emergency response to chemical accidents throughout Hong Kong.

5.0 ENVIRONMENTAL IMPACT ASSESSMENT AND HAZARD ASSESSMENT

The CWTF at Tsing Yi Island has already been the subject of environmental and hazard assessments (ERL 1987). The major conclusions of the assessments were as follows:

- the location of the CWTF is appropriate under the planning strategy for Tsing Yi Island;
- the CWTF will provide a much needed facility for the safe treatment and disposal of the increasing quantities of chemical waste being generated in Hong Kong;
- the CWTF will reduce present risks to public health and safety, and prevent future deterioration in water quality from wastes by reducing present improper disposal practices;
- there are no significant effects on amenity for Tsing Yi residents; and
- approximately 70-100 jobs will be generated by the CWTF once it is operational. (In fact the eventual number of jobs to be generated by the CWTF is now estimated at 375.)

The main purpose of the EIA/HA is to address those aspects of the Enviropace conceptual design that may differ from the general plan for the CWTF that was assessed before. The focus of the EIA/HA has been on a series of key issues which were the subject of a Key Issues Report prepared when the Enviropace design was accepted by the Government. The Key Issues Report identified air incinerator emissions, road traffic and visual impacts as the main environmental issues requiring further detailed consideration, together with risks and hazards. Other issues such as solid and liquid waste disposal, noise and socio-economics are also addressed in the present environmental assessment, but because of the reduced potential for environmental impact, the approach has been to reconfirm, where appropriate, the results presented by ERL (1987). The Key Issues Report is included in the EIA as Appendix A. The earlier environmental and hazardous assessments are available from the Government.

The following is a summary of the potential environmental impacts and hazards associated with the CWTF which have been determined in the EIA and HA.

5.1 ENVIRONMENTAL IMPACTS AND MONITIORING

AIR

Air emissions from the CWTF incinerator were identified as the most important of the Key Issues to be studied in detail in the EIA/HA. Computer modelling of the dispersion of pollutants was carried out to determine the concentrations of pollutants at the locations of all possible receptors at all elevations in the surrounding environment of the CWTF site.

The model assumed that the incinerator would continuously emit pollutants at the maximum rate allowed by the Contract. In practice, however, emissions will be much lower than this most of the time. Also the model predicts the highest pollutant levels that would occur under worst case meteorologic conditions. In reality, however, wind directions and atmospheric stability conditions are always changing. Therefore, pollutants at any particular location will, on most occasions, not be as concentrated as those assumed in the assessment.

Assuming these worst case operating and meteorological conditions, incinerator emissions predicted will be well within the Hong Kong air quality objectives and maximum individual cancer risk standards. This is shown very clearly for four pollutant species in Table A below. Also, a review of the limited air quality data that are available indicates that the cumulative impact of the CWTF on the existing ambient air quality is likely to be negligible.

Monitoring will include an assessment of both incinerator stack emissions and ambient air quality. Key parameters at the incinerator stack will be monitored continuously to ensure proper combustion and they are outlined in Table B below. Ambient air quality will be measured every six months at three locations. Further details about this program are presented in Table 12 of the EIA report.

TABLE A

COMPARISON OF PREDICTED CONCENTRATIONS FOR CRITERIA POLLUTANTS AT MAYFAIR GARDENS AND DOW CHEMICAL

			Maximum Predicted Concentrations (µg/m³)			
			Mayfair Gardens		*Dow Chemical*	
Criteria Pollutant	*Averaging Time*	*AQO*	*Ground level*	*100m*	*Ground level*	*100m*
Sulphur Dioxide	1 hour	800	40	75	40	400
	24 hour	350	8	15	30	50
	Annual	80	0.6	1.5	1.5	4
Nitrogen Dioxide	1 hour	300	27	50	27	270
	24 hour	150	5	10	20	33
	Annual	80	0.4	1.0	1.0	2.7
Carbon Monoxide	1 hour	30,000	8	15	8	80
Particulates	24 hour	260	0.8	1.5	3	5
	Annual	80	0.1	0.2	0.2	0.4

TABLE B

INCINERATOR STACK MONITORING PROGRAM

Sample	*Parameter*	*Frequency*
Stack Gas Components	Particulates	Once/week
	Chlorine and compounds (as Cl_2)	Once/week
	Fluorine and compounds (as HF)	Once/week[1]
	Hydrogen sulphide	Once/week
	Carbon monoxide	Continuous[2]
	Acidity (as Sulphuric acid)	Twice/week on start-up Once/week on normal operation
	Sulphur dioxide	Twice/day on start-up Once/day on normal operation
	Oxides of nitrogen (as NO_2)	Same as SO_2
	Hydrogen chloride	Same as SO_2
	Hydrogen fluoride	Once/month
	Hydrogen bromide	Once/month
	Total phosphorus (as P)	Once/month
	Toxic Metals I (including mercury, cadmium, antimony and their compounds)	Once/week
	Toxic Metals II (including lead, copper, arsenic, nickel, chromium and their compounds	Once/week
	Total hydrocarbons	Continuous
	Dioxins/Furans PCDD and PCDF	Once/month
	Smoke/Steam	Continuous

Notes: (1) Once/day if burning F compounds specifically.

(2) Linked to CO_2 measurement to calculate combustion efficiency.

Source: Contract Document (1990), Table SD12(a), and Pending Addenda.

The CWTF incinerator will be operated with an automatic emergency interlock and shutdown system. This system will ensure an orderly transition to safe conditions during a process upset or mechanical equipment malfunction. In the event of a serious incinerator upset, all waste feed will automatically stop. Even in a complete power loss to the CWTF, the incinerator functions will only decay very slowly while auxiliary power is restored to the system.

Dust generated during construction will potentially cause a short-term, localised, nuisance, but the overall environmental impact will be negligible. The potential for dust during operation is very low. The plant has been designed so that raw materials and incinerator ash are handled in an enclosed environment. Specific procedures have been devised to ensure that the impact from handling these materials will be negligible. No ongoing monitoring program is envisaged.

Five sources of fugitive emissions were identified but none was considered likely to lead to any significant impact. Product storage and handling facilities have been designed so that fugitive emissions will be vented to either a gas scrubber, a carbon absorption system, the incinerator, or an auxiliary boiler. The design features of the CWTF and the very low potential for impact means that no specific management or monitoring programme is planned.

WATER

Effluent from the CWTF treatment process will meet very strict limits on pollutant concentrations. This water will be discharged to the foul sewer, in accordance with the Contract. The multiple processes for treating liquids at CWTF, both conventional and special, produce a high degree of confidence that the broad range of wastes can be safely managed.

A comprehensive management and monitoring programme will be implemented and is outlined in Table C below. Continuous automatic monitoring of pH, temperature and flow rate will be provided in order to give immediate warning of any significant change in the composition of the effluent. A range of physical and chemical parameters will be monitored each shift.

TABLE C

MONITORING PROGRAMME FOR TREATED EFFLUENT

Parameter	*Frequency*
pH	Continuous
Flow rate	Continuous
Temperature	Continuous
Suspended solids	Each Shift(1)
Cyanide (CN^-)	Each Shift(1)
Metals (Ag, As, Ba, Cd, Cr, Cu, Hg, Pb, Ni, Zn, B, Mn, Fe, Sn)	Each Shift(1)
Total Nitrogen (Kjeldahl)	Each Shift(1)
Sulphide ($S^=$)	Each Shift(1)
Sulphate (SO_4)	Each Shift(1)
Total Residual Chlorine	Each Shift(1)
Phenol	Each Shift(1)
Grease and Oil	Each Shift(1)
Phosphate	Each Shift(1)
Detergents	Each Shift(1)
COD (Cr)	Each Shift(1)
Polychlorinated biphenyls	Weekly

Notes: (1) The final effluent is sampled automatically each hour and a composite sample is prepared from these hourly samples.

Source: Contract Document (1990), Table SD12(b) and Pending Addenda.

Other potential sources of water pollutants are: accidental spillages, water run-off from the plant site or contaminated groundwater. The CWTF design and operations include safe-guards for all of these.

The current design provides for safety checks and valves which greatly reduce the likelihood of accidental spills, for example from a pipe connection at the MARPOL wastes jetty. If a spill were to occur, volumes would be small and the area affected would be minimised with the deployment of booms and skimmers.

The entire surface of the CWTF is sealed. Storage and process areas are bunded and protected with secondary containment. If necessary, rainwater runoff from these areas will temporarily be contained, so that effluent discharged from the CWTF operations can first be evaluated and then treated as needed before it is released.

The Emergency Response Plan will detail the procedures to be observed in the event of a spill. Further, the CWTF plans to implement a groundwater monitoring programme for early detection of possible contamination caused by CWTF activities. Details of the soil and groundwater monitoring programmes are presented in Table 18 of the EIA. To determine site conditions prior to CWTF operations, five boreholes with wells will be installed and samples of soil and groundwater will be extracted and analysed. If the results indicate significant contamination, it is recommended that EPD initiate a detailed environmental audit. EPD may also consider installing other wells offsite to determine groundwater flows in the area.

It is concluded that the CWTF has planned to take important steps to minimize the impact its facility will have on any groundwater or sea water.

SOLID WASTE DISPOSAL

All wastes and process residues at the CWTF will be detoxified, chemically stabilised and physically immobilized so that the materials are environmentally benign. The stabilised materials will undergo sampling and analysis. Only those materials which pass the analytical test and are proven innocuous will be sent off-site for final disposal in a landfill. This will more than comply with all the regulations governing the CWTF residuals. Details of the chemical species to be analyzed in these materials are presented in Table 19 of the EIA. There is little impact these wastes could have on the environment.

HUMAN OR SOCIAL

TRAFFIC:

The volume of construction traffic is insignificant in terms of general traffic conditions; therefore, it poses only minimal environmental impact as queuing might occur on the main road. Likewise, the impact of waste collection traffic flows are unlikely to be very significant. Installation of signal controls will not be necessary for traffic to ingress and egress the site.

The present scheduling arrangements for collection vehicles necessitate operations during peak rush hour traffic. This will cause delays, reduce the efficiency of collections and possibly present an increased risk in the event of traffic accidents, for purposes of environmental control and emergency response. These impacts are not likely to be significant.

Night time collections might alleviate these conditions; however daytime collections cannot be avoided due to the large number of waste generators in Hong Kong.

NOISE:

Noise associated with construction or operations is unlikely to have any significant impact on residential areas on Tsing Yi. All activities are designed to meet the noise control ordinance.

VISUAL:

The CWTF will be visible from the harbour and from Hong Kong Island, but will not be a prominent visual feature. An appropriate colour scheme will be chosen to mitigate the visual impact of the facilities.

SOCIO-ECONOMICS:

The socio-economic impact of this facility can only be viewed as positive. A cleaner environment, employment generation and the possibility of attracting increased foreign investment in manufacturing, storage and shipping are all important social benefits which the CWTF is expected to provide

5.2 HAZARD ASSESSMENT AND MITIGATION

A Hazard Assessment was prepared prior to detailed design of the facility in order to identify any part of the proposed operations needing to be addressed in the detailed design with regard to the risks posed. The risks quantified are specifically those of fatality to people outside the CWTF site as a result of acute exposure to an accidental release to the atmosphere of hazardous material.

The Hazard Assessment addresses the operations intended to be carried out on the site, with their associated plant and equipment, and transport to the facility of waste materials and reagents for use in the treatment processes. Also included is the risk arising from a major fire in stored packaged waste. The HA considers potential hazards due to safety management and treatment process facilities, in addition to those intrinsic to the materials, storage and processes.

The risks thus calculated were compared with the Interim Risk Guidelines laid down by the Government of Hong Kong. While the proposed CWTF will not have large enough inventories of hazardous substances for it to be classified as a Potentially Hazardous Installation, concerns about the potential offsite risks to the public and the environment are considered sufficiently significant for the EPD to apply the Guidelines.

The Interim Risk Guidelines for Hong Kong are numerical measures of individual risk and societal risk. The criterion applied to the CWTF is that the risk of fatality to an individual outside the boundary of the CWTF shall not exceed a probability of one in 100,000 per year (10^{-5}/yr). Similarly the risk of fatality to a group of individuals outside the boundary of the CWTF shall not exceed the probability of one in 1,000 per individual. (That is, one in a million for a group of 1,000; one in 100,000 for a group of 100; and so on.)

There are several components of a full quantitative risk assessment.

- Identification of Hazards

  All of the hazardous materials involved are classified and the properties that make them hazardous are evaluated. The many ways in which these materials might be released to the environment are considered. Some of these ways can be the result of a complex chain of events. For the CWTF, potential hazards occurring from transportation, storage, handling and preparing for treatment, as well as from the treatment processes, were all considered.

- Frequency Estimation

  The likelihood that any of the hazardous materials could be released during normal operations or as a result of an accident is determined. Historical data are generally used to estimate the frequency or probability of any particular event. These data are available from the operating experience of many similar activities worldwide. The most representative data are those for events which have occurred in Hong Kong. Due consideration has been given to these local data.

- Consequence Analysis

  The consequences of each of the many hypothetical events are evaluated. Models predict the area affected by a release, taking into the account the location and component of the CWTF operation that is involved, the circumstances of the release, and the probabilities of the various weather conditions in Hong Kong. The effects of various potential hazards are calculated statistically, taking into account the chemistry of the hazardous materials and whether the release might result in a toxic cloud, a flammable cloud, thermal radiation, or an explosion.

- Risk Assessment

  The risks of the many hypothetical events are computed from the results of the foregoing studies. These computations take into account the known health impacts of exposure under the conditions modeled, at the various distances from the CWTF where individuals and populations might be located. The results evaluated are then compared with the Interim Risk Guidelines.

Enviropace was found to have given much attention to on-site safety and risk minimization. That is, the philosophy of designing in safety from the start resulted in very low risks for all CWTF operations. It is noted, however, that more than 98% of the total risk associated with the CWTF derives from the use of chlorine and sulphur dioxide to process certain waste chemicals. These two reagents are toxic gases that are liquified and stored in pressurized containers. Chlorine is commonly used in municipal waste treatment systems worldwide but its use in Hong Kong is being discouraged for the future.

The CWTF site operations using the common level of design and operation, normally consistent with low hazard plants, would not strictly meet the numerical Interim Risk Guidelines for either Individual or Societal Risk. As stated above, this is a calculated result of the use as reagents of moderate amounts of chlorine and smaller amounts of sulphur dioxide. However, with Enviropace applying best engineering methods and using management systems consistent with best current guidelines and modern standards in the industry, the CWTF could reduce both individual and societal risk. Individual risk could possibly be reduced to a point meeting the Interim Risk Guidelines at the plant gate, by a factor of approximately 2. Societal risk, which is a function of the affected population, would only exceed the Interim Risk Guidelines under certain conditions, and then by less than a half order of magnitude.

The introduction of up to 1500 additional people near to the site due to the SETY development will alter the societal risk situation. Individual risk would not be altered; this should still be acceptable since risks beyond the site boundary are less than 10^{-5}/yr. However, the Societal Risk which previously just exceeded the Interim Guideline would now substantially exceed it.

Significant risk reduction could be achievable in the transport of chlorine and sulphur dioxide using one of two marine transfer options. The justification for such modification would be the reduction in societal risk, as individual risk from transport activities is small.

If chlorine and sulphur dioxide were eliminated from the site, then the CWTF would meet the Interim Risk Guidelines with ease, both in terms of individual and societal risk. Removal of these two reagents was investigated as a mitigation measure. There are two processes which use chlorine in the CWTF, one for reacting cyanide wastes and the other for recycling materials used in printed circuit board manufacturing. Other processes can be used that do not employ chlorine.

The substitution of sulphur dioxide in the CWTF process for reducing chromium is also possible. Some minor usage of sulphur dioxide may still be required for the effective treatment of some wastes or for laboratory use, but this would involve a much lower quantity than originally planned.

The risk contours computed for the CWTF, with and without the use of Cl_2 and SO_2, are shown in Figures A and B, respectively.

FIGURE A: CONTOURS OF INDIVIDUAL RISK FOR ALL ACTIVITIES ON CWTF SITE

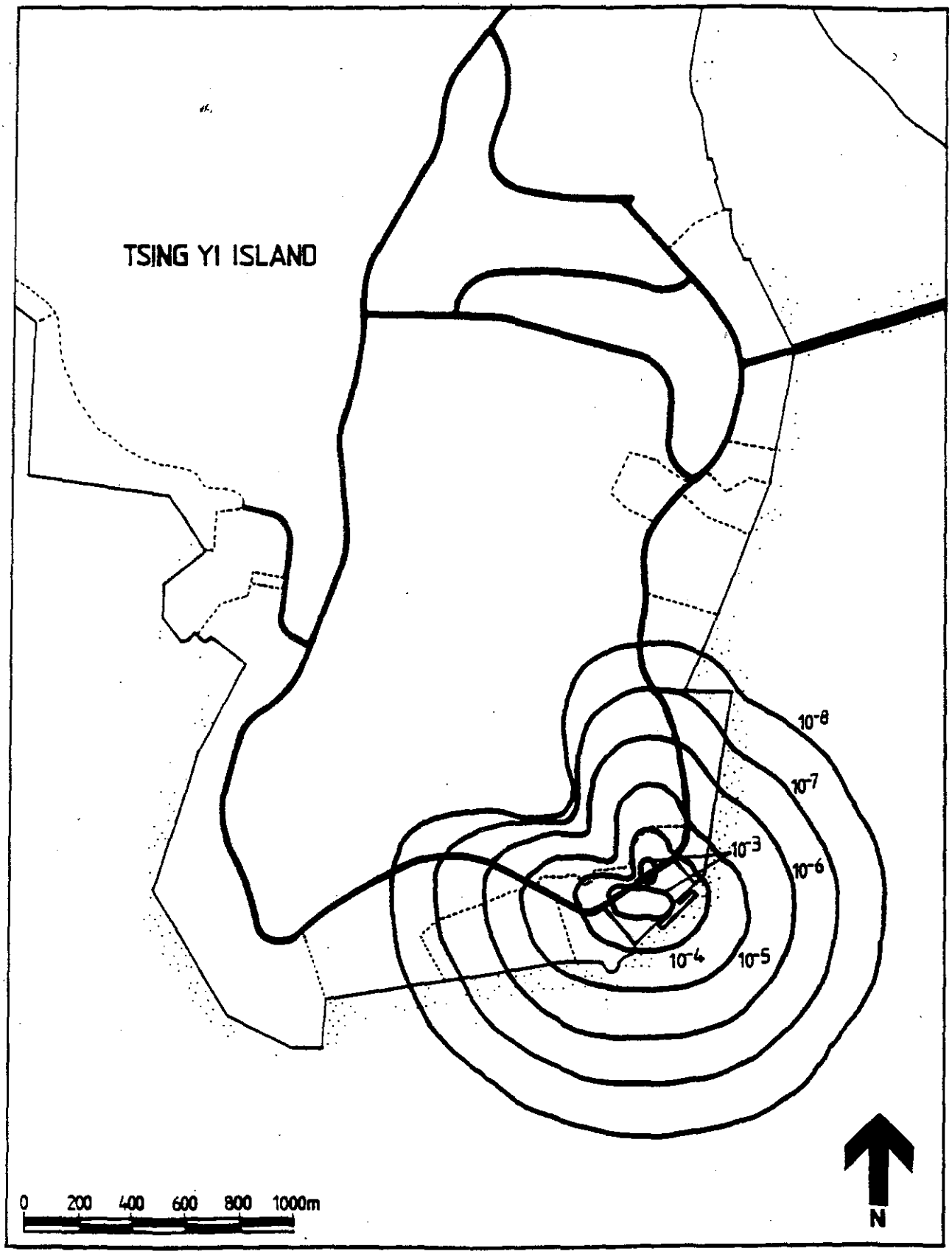
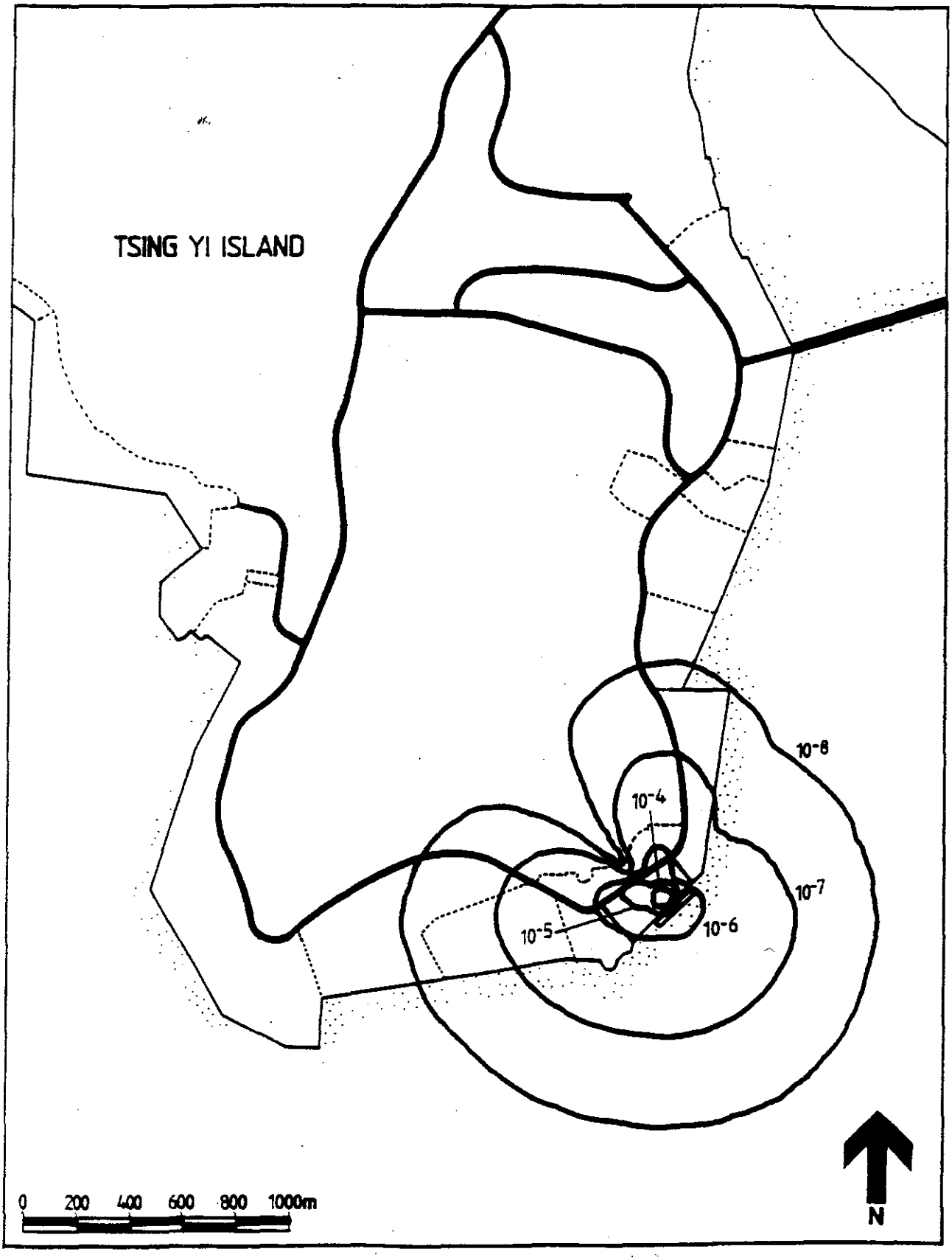


FIGURE B: CONTOURS OF INDIVIDUAL RISK FOR ALL ACTIVITIES ON CWTF SITE EXCLUDING CHLORINE AND SULPHUR DIOXIDE



In summary, assuming Cl_2 and SO_2 were removed, the CWTF site would meet the Interim Risk Guidelines for both individual and societal risk without any difficulty. Additionally, the transport risks for these two gases would also be removed, although these risks were not estimated to be significant. No other aspects of the CWTF operations posed a significant risk to members of the public. The mitigation of Cl_2 and SO_2 risks require changes to some of the CWTF process units. These changes would involve additional costs, but the changes would not introduce other chemical reagents or processes that carry any significant risks.

6.0 CONCLUSIONS

The management of waste represents one of the most pressing environmental problems confronting the Hong Kong community. The EIA/HA concludes that there are significant environmental benefits associated with the CWTF. Toxic and hazardous materials that are presently discharged directly into sewers, open drains and coastal or harbour waters will be detoxified, destroyed or otherwise treated, and then stabilised for disposal. The Government has established strict pollution control regulations that apply to all these activities at the CWTF.

The processes and management proposed by Enviropace, and the environmentally protective mitigation measures that are built into the CWTF design, are among the most advanced in the world. The potential environmental impacts and hazards associated with the construction and operation of the CWTF can be managed without causing any long term, detrimental effects on the environment and without subjecting people in the vicinity to any significant risks.

7.0 PROJECT STATUS

Based on the results of the EIA and HA studies, it was determined that the use of chlorine and sulphur dioxide as process reagents would be eliminated from the CWTF. Alternative processes will be employed that mitigate the potential risks associated with these substances.