

1. INTRODUCTION

- 1.1 At present aviation fuel is delivered to the Hong Kong International Airport via an existing temporary Aviation Fuel Receiving Facility sited off Sha Chau. This facility is located within the Sha Chau and Lung Kwu Chau Marine Park. The facility does not have the capacity to meet the forecast demand for aviation fuel from the immediate future to the operational lifetime of the airport. In addition, the Airport Authority Hong Kong has a commitment to have a permanent facility, whereupon the existing facility would cease to be used routinely and would be kept for emergency back-up only.
- 1.2 A preferred location for the strategically important permanent facility has been identified on existing reclaimed land at Tuen Mun Area 38, see Figure 1.
- 1.3 The project is a designated project under the terms of the Environmental Impact Assessment Ordinance and, as such, an Environmental Impact Assessment is required to support an application for an Environmental Permit. An EIA of the PAFF facility (EIAO Register Number AEIAR-062-2002), was prepared and submitted under the EIAO in May 2002 and subsequently, Environmental Permit EP-139/2002 was granted on the 28th August 2002. However, the decision by EPD to grant the Environmental Permit was subject to a Judicial Review and the Court of Final Appeal quashed the Environmental Permit in its judgment of July 2006.
- 1.4 Thus, while some construction works for the PAFF have been undertaken from November 2005, they were suspended following the Judgement of the Court of Final Appeal of July 2006, in order to continue with the development of the project, the project needs to once again go through the statutory procedures under the EIAO in

order to obtain a new environmental permit.

- 1.5 Thus, the EIA report of April 2002 has been revised per the Judgment of the Court of Final Appeal and its statutory interpretation of the EIAO and updated to take into account subsequent changes to the site layout and the surrounding area including additional sensitive receivers. The key issues, findings and conclusions are presented in this Executive Summary.

2. SITE SELECTION AND COMPARISON OF ALTERNATIVES

- 2.1 The search for a suitable site for the permanent aviation fuel facility and related comparative assessment has taken place over more than a 10 year period in full consultation with the regulatory authorities.
- 2.2 A number of potential sites including Sham Shui Kok, Sham Wat, Bluff Point, Kau Yi Chau, East of Sokos, Tsing Yi and those near the airport and in the Tuen Mun area, have been considered. The proposed location at Tuen Mun Area 38 is considered to be the environmentally most preferred of all these sites. This site is zoned for special industrial use and is located in a heavily industrialised setting, adjacent to Castle Peak Power Station, Shiu Wing Steel Mill and the proposed EcoPark.
- 2.3 Aviation fuel would be transported from the proposed jetty via a tank farm at Tuen Mun Area 38 to the airport by means of twin subsea pipelines. Alternative routings for this pipeline have been compared. The options include one in which construction of a pipeline ties into the Aviation Fuel Receiving Facility at Sha Chau, in order to make use of the existing twin subsea pipelines from Sha Chau to the airport. Another option comprises a longer route involving a completely new pipeline

running directly between Tuen Mun Area 38 and the airport. The environmentally preferred choice has been determined to be that which ties into the facility at Sha Chau.

- 2.4 The requirements for dredging and pipelaying are substantially reduced if continued use is made of the existing pipelines, whose lifespan is sufficient to meet the need for the airport's anticipated operational life. Disturbance to dolphins during construction would also be lessened and there are benefits for operational aspects. Usage of this pipeline will eliminate the need for routine offloading of aviation fuel at the back up facility at Sha Chau (to flush the pipeline and maintain the aviation fuel in an acceptable state). However, about 400m of twin pipelines will need to be constructed within the Marine Park.

3. DESCRIPTION OF THE PROJECT

- 3.1 The permanent facility at Tuen Mun Area 38 will consist of the following major elements:

- ◆ a jetty to accommodate aviation fuel tankers;
- ◆ a tank farm for storage of aviation fuel;
- ◆ on-site operational facilities including offices; and
- ◆ twin sub-sea pipelines to transfer the aviation fuel to the airport.

- 3.2 The project including planning, design, construction and commissioning is targeted to be completed for 2009. The PAFF and its surrounding area is shown in Figure 2.

- 3.3 About 6.75 ha of land are required to house the aviation fuel tank farm and associated facilities taking up a small part of Tuen Mun Area 38. The proposed site is zoned for industrial use. The closest residential development Lung

Kwu Tan is located approximately 2 km away, and comprises low-rise village type housing. The nearest major population centre is the Melody Garden Estate in Tuen Mun, some 3 kilometres distant. There is, also, a planned Holiday Camp to the north-east of the site along Lung Man Road which is about 550-600m away.

- 3.4 The tank farm will initially house eight storage tanks each providing a storage capacity of between 22,000m³ to 35,000m³. Thereafter additional tanks would need to be constructed to provide an ultimate design capacity of about 388,000m³. The tank farm will be provided with bundwalls and contained drainage.

- 3.5 Other tank farm facilities include an office building for administrative and security control, leak detection instrumentation, fire fighting and emergency spill equipment, workshops and basic infrastructure including roads, telecommunications, drains, power supply and lighting.

- 3.6 Aviation fuel will be offloaded at a twin berth jetty sited approximately 200m offshore in about 17m of water. The jetty will be constructed on tubular piles. Tankers with capacity ranging from 10,000 to 80,000 dwt are expected to berth at the jetty typically three times per week initially, rising to an average of about three and a half larger tankers per week over the life of the facility. Aviation fuel will run to shore through submarine pipes protected by rock armour which would not protrude above the existing seabed.

- 3.7 Defensive fenders will be provided on the shore side of the jetty to protect against possible collision from small craft straying into the area. Coupling points on the vessels would be provided with slop trays to catch minor spills of

aviation fuel during coupling and de-coupling.

- 3.8 Aviation fuel will be delivered to the airport site by means of buried 500mm diameter twin sub-sea pipelines which will connect to the existing facility at Sha Chau. The length of the twin subsea pipelines will be about 4.8km. The pipelines will be installed in a dredged trench and protected with rock armour not protruding above the existing seabed.

4. KEY ISSUES

- 4.1 There are a number of important environmental issues associated with the project. These have all been thoroughly addressed in this EIA and those that require special mitigation measures and controls are highlighted below.
- 4.2 The proposed pipeline requires dredging and other marine works, a very small portion of which will be within the marine park. Sediment released to the water column could have an adverse impact on the natural marine ecology, fisheries and other users of the sea including leisure and industrial activities. Ecological receivers of particular concern include fish, dolphins and corals.
- 4.3 The proposed pipeline crosses a seabed which has a rich maritime history. Care is required to avoid works encroachment on any hitherto unidentified historical relics of cultural heritage value.
- 4.4 It has been identified in this EIA that routine operations at the facility will not pose particular concern. With careful design and management, no significant adverse impacts are expected. Nevertheless, handling bulk quantities of aviation fuel presents concerns associated with any accident or incident which could have an impact including that on human life. Hazard to life and the impact of aviation fuel spills on the

land and marine environment were therefore identified as some of the most important issues considered in this EIA.

5. APPROACH TO ASSESSMENT

- 5.1 The study scope and assessment requirements were defined in detail in the study brief issued by EPD under the Environmental Impact Assessment Ordinance. In addition, the assessment has followed the guidelines issued by EPD within the EIAO Technical Memorandum.
- 5.2 The assessment approach was based on the following process:
- ◆ scoping key environmental media that could potentially be affected by the project;
 - ◆ identifying regulatory requirements characterising the existing environment;
 - ◆ identifying sensitive receivers and key environmental issues;
 - ◆ assessment of the likely extent of adverse impacts;
 - ◆ identification of mitigation and monitoring measures; and
 - ◆ conclusions on acceptability of any residual impacts.
- 5.3 Assessments of the extent of adverse impacts of particular concern have been addressed quantitatively as far as practicable. These calculations have been undertaken by means of mathematical modelling for air quality, odour, water quality, oil spill dispersion and hazard to life, using methodologies in accordance with the EIAO Technical Memorandum (EIAO-TM) and the Study Brief.

6. EIA FINDINGS

Air and Noise

- 6.1 With the implementation of standard good working site practices to control dust emissions, no adverse impacts on air quality are expected during construction. There will be low level fugitive emissions of aviation fuel vapours during operations. Concentrations of vapour reaching open air will be low and projections show that they will be unlikely to impact on air quality. Odours from aviation fuel vapours would be barely detectable at the site boundary and would not significantly affect the surrounding environment.
- 6.2 There are no airborne noise sensitive receivers in the study area of the site which is in a heavy industrial setting and thus airborne noise is not identified as a key issue for this project. Nevertheless, good practice mitigation measures have been recommended to keep noise levels to a practical minimum.

Water Quality, Marine Ecology and Fisheries

- 6.3 The project will involve dredging, pipelaying and backfilling in open waters. There is a weight of evidence to indicate that the sediments to be dredged for the pipeline are largely not contaminated such that they might reasonably be expected to not exert any significant ecotoxicological impact if disturbed during the course of the Project. Similarly dredging would not result in appreciable nutrient enrichment of marine waters. Sediment plume modelling demonstrates that sediment released to the water column is likely to settle rapidly and is unlikely to affect compliance with the statutory Water Quality Objectives for key water quality parameters such as suspended sediment and dissolved oxygen. In addition,

adverse impacts from dissolved contaminant levels in the water column are not to be expected and will remain well below those set for long term exposure for the preservation of marine life. With the implementation of a range of recommended mitigation measures no sensitive flora and fauna are expected to be impacted as of result of disturbances to water quality or deposition of suspended sediment.

- 6.4 Site works will be controlled to prevent erosive losses during ground works and discharge of polluted effluents such that no adverse impact of water quality would be expected.
- 6.5 Construction of the pipeline would result in temporary loss of seabed habitat. However this is essentially insignificant within the context of the large amount of adjacent heterogeneous benthic habitat. Recolonisation is expected to be reasonably rapid thereby returning the habitat and prey items important for fish. Fish of the type found in the study area are tolerant to temporary elevations of suspended sediment concentrations and overall it is considered that the impact of the project on fisheries resources is likely to be insignificant.
- 6.6 The study area is frequented by marine mammals, particularly the Chinese White Dolphin. This species is very mobile and would be likely to avoid areas subjected to general water quality and marine traffic disturbance during activities such as dredging and pipelaying. However, percussive piling activities for the construction of the jetty have already been undertaken in accordance with the then valid Environmental Permit EP-139/2002/A and further marine piling activities that could generate noise impacts to the dolphins are not required.
- 6.7 Nevertheless, an exclusion zone will be implemented during dredging activities in the Marine Park and along the length of

the pipeline and dredging works will be restricted to a daily maximum of 12 hours within daylight hours except for the section crossing Urmston Road Channel. All dredging works will also avoid the main calving season of the Chinese White Dolphin from March to August inclusive. Post construction phase dolphin abundance monitoring will be undertaken.

- 6.8 Routine operations at the site would not result in discharge of polluting effluents. The potential for minor losses and spills will be mitigated through design of plant and provision of containment facilities such that no residual impacts on water quality or biota are expected.

Hazard to Life

- 6.9 The potential hazardous scenarios from the initial development and final development phases of the PAFF tank farm, jetty, marine approach and subsea pipeline have been identified. A quantitative risk analysis has been carried out to assess individual and societal risks associated with these scenarios.
- 6.10 The PAFF will store Jet A1, which is used in commercial airliners around the world and is similar in character to domestic kerosene. Jet A1 behaves very differently to fuels such as gasoline or LPG in that it does not generally produce a flammable vapour. Without heating, Jet A1 spill is much more difficult to ignite.
- 6.11 The operation of the PAFF will reduce the overall marine transport collision risk because less vessels will be required and the route will be shorter. Additionally, the tankers will all be double hulled and make use of marine pilots and tug boats.
- 6.12 The design of the PAFF will meet or exceed best practice and a range of operational safeguards will be incorporated. Containment systems

include a partly sunken bund with greater than usual capacity and additional impervious security walls and landscaping to contain spills. Both the extent of the containment systems and the spacing of the tanks from the site boundary exceed those required under relevant codes of practice. It is not normal practice to control ignition sources off-site and terminal facilities like the PAFF frequently co-exist close to residential areas and other industries as they are not generally seen as presenting a high risk.

- 6.13 The major hazards to life from the PAFF operations are from liquid pool fires due to major spills on the site or to the sea. Jet A1 burns with a very smoky flame and a significant hazard to life is only predicted for people directly impacted by the flame, which is unlikely outside the fence even if a major fire occurs on-site.
- 6.14 The risk to life from the identified scenarios at the PAFF site, including 100% instantaneous tank failure and fire, are concluded to be acceptable according to the risk criteria set out in Annex 4 of the EIAO-TM.
- 6.15 Hazards such as groundings and strikings at the jetty or involving approaching aviation fuel tankers have also been examined. Jet A1 fuel on the sea surface would be difficult to ignite. Nevertheless worst case modelling, assuming surface fires, has been undertaken. The highest individual risk levels, predicted at the jetty and adjacent to the stormwater/drainage outlet from the tank farm, also lie within the acceptable risk criteria of the EIAO-TM. Further, the societal risk lies in the acceptable region of Annex 4 of the EIAO-TM.

Fuel Spills

- 6.16 Notwithstanding, the very low probability of the spill events, there is the potential for spills into the marine

environment to affect marine ecological sensitive receivers. The worst case scenarios have, therefore, been evaluated by means of mathematical hydrodynamic and water quality models to assess the likely spread of a series of credible worst case spill incidents.

6.17 Aviation fuel is subject to decay through a number of natural processes including rapid evaporation, emulsification, sedimentation and biodegradation. The modelling studies indicate that slicks, from events including grounding of the largest tankers expected to use the facility, would dissipate rapidly within a matter of days and before reaching many sensitive receivers and that those sensitive receivers which might be impacted by the plume, impacts will be of a very short duration (a few hours) unlikely to cause significant ecological impact. However, comprehensive contingency plans will be drawn up to specify the method by which to contain and remediate any spilled oil and provide quick and effective response in the event of an emergency.

Landscape, Visual and Cultural Heritage

6.18 The project site is located in a heavily industrialised locality and the proposed facility is considered compatible with adjacent land uses. No significant landscape and visual impacts are predicted during either construction or operation phases. The disturbance to existing trees will be compensated during construction of the initial phase. Mitigation measures have been recommended which will reduce the adverse landscape impacts to “slight” and the adverse visual impacts to a “slight/moderate” or “slight” level.

6.19 The high quality landscape of the natural setting of Castle Peak behind the site would remain unaffected. The

development will not significantly impact the local landscape or important view sightlines. However, a comprehensive range of planting proposals including the use of the 1.5-2.0m perimeter landscaped bund will ensure that the tanks are screened from key visual receivers.

6.20 There are no declared monuments in or close to the site and there will be no impacts on any aspect of terrestrial cultural heritage. However, in respect of marine archaeology, as the baseline review revealed the study area had marine archaeological potential and assessment of the potential impacts showed that the construction of the pipeline trench did have the potential for adverse impacts, a marine archaeological investigation was undertaken. The survey did not reveal any material of cultural significance for the above surface anomalies detected. However, for two sub surface anomalies detected, a watching brief has been recommended during dredging within 25m of these objects.

Waste Management

6.21 Waste management issues have been assessed in line with the principles of the waste management hierarchy promoted by EPD. In order of priority these involve :

- ◆ Avoidance;
- ◆ Minimisation;
- ◆ Reuse and Recycling;
- ◆ Treatment; and
- ◆ Disposal.

6.22 Numerous recommendations on good practice and mitigation measures have been recommended to put these principles into effect.

6.23 The largest waste stream by volume will be dredged mud which will be disposed of offshore at a disposal site administered by the Civil Engineering

and Development Department. The results of the sediment testing along the pipeline alignment show that some sediment samples could be classified as Category M material based on ETWB TWC 34/2002 and special disposal arrangements may be necessary. The actual disposal location will be determined in due course by DEP in conjunction with the Marine Fill Committee during the application for a Dumping at Sea Ordinance Permit.

- 6.24 Construction and demolition waste arising from excavation and site formation works will be re-used on site to form a landscape mound for planting. Other waste streams are relatively low in volume. Types and quantities of all residual wastes expected to arise during construction and operation have been identified, quantified and suitable disposal sites identified.
- 6.25 Measures have been identified to ensure safe handling of chemicals used on site and to minimise arisings of chemical waste. Similarly measures are recommended to ensure safe handling and disposal of all chemical wastes.
- 6.26 Measures for safe disposal of sewage and other effluents including storm drainage in both the construction and operational phases are recommended.

7. MITIGATION AND MONITORING

7 The EIA process has facilitated integration of environmental considerations into the fundamental design process for the project. The principal mitigation measures identified are those achieved through siting and plant design. In addition, a number of specific construction and operational phase measures have been identified to minimise potential adverse environmental impacts. The most notable of these have been discussed above. A complete listing of all

recommendations and in-built mitigation measures are detailed in the form of an Implementation Schedule. These measures will be implemented by the AAHK (the project proponent) through its Franchisee, and enforced by EPD by means of the regulatory empowerment of the Environmental Impact Assessment Ordinance.

- 7.1 A monitoring and audit programme will be implemented by the proponent to confirm that all recommended mitigation measures have been implemented or amended, if subsequently found necessary. A design audit is recommended to identify measures which are to be integrated into the design. These items will include:
- ◆ land/marine spill response plan;
 - ◆ pipeline leak detection and automatic shut-down system;
 - ◆ pipeline rock armour protection;
 - ◆ tank high level shut-down;
 - ◆ tank bunding;
 - ◆ tank leak drainage isolation and containment system;
 - ◆ on-site fire fighting equipment;
 - ◆ jetty protection;
 - ◆ aviation fuel delivery emergency shut-down valves; and
 - ◆ landscape design drawings.
- 7.2 During the construction phase, ambient water quality will be monitored when marine construction works are taking place within 1000m of the Sha Chau and Lung Kwu Chau Marine Park. Monitoring stations shall also be positioned 500m to the north/northwest and south/southeast of any dredger during other dredging activities outside this designated 1000m boundary to the marine park. Measurements of suspended solids, turbidity and dissolved oxygen shall be taken on a routine basis to enable any deteriorating water quality to be readily detected and timely action to be taken to rectify the situation. A

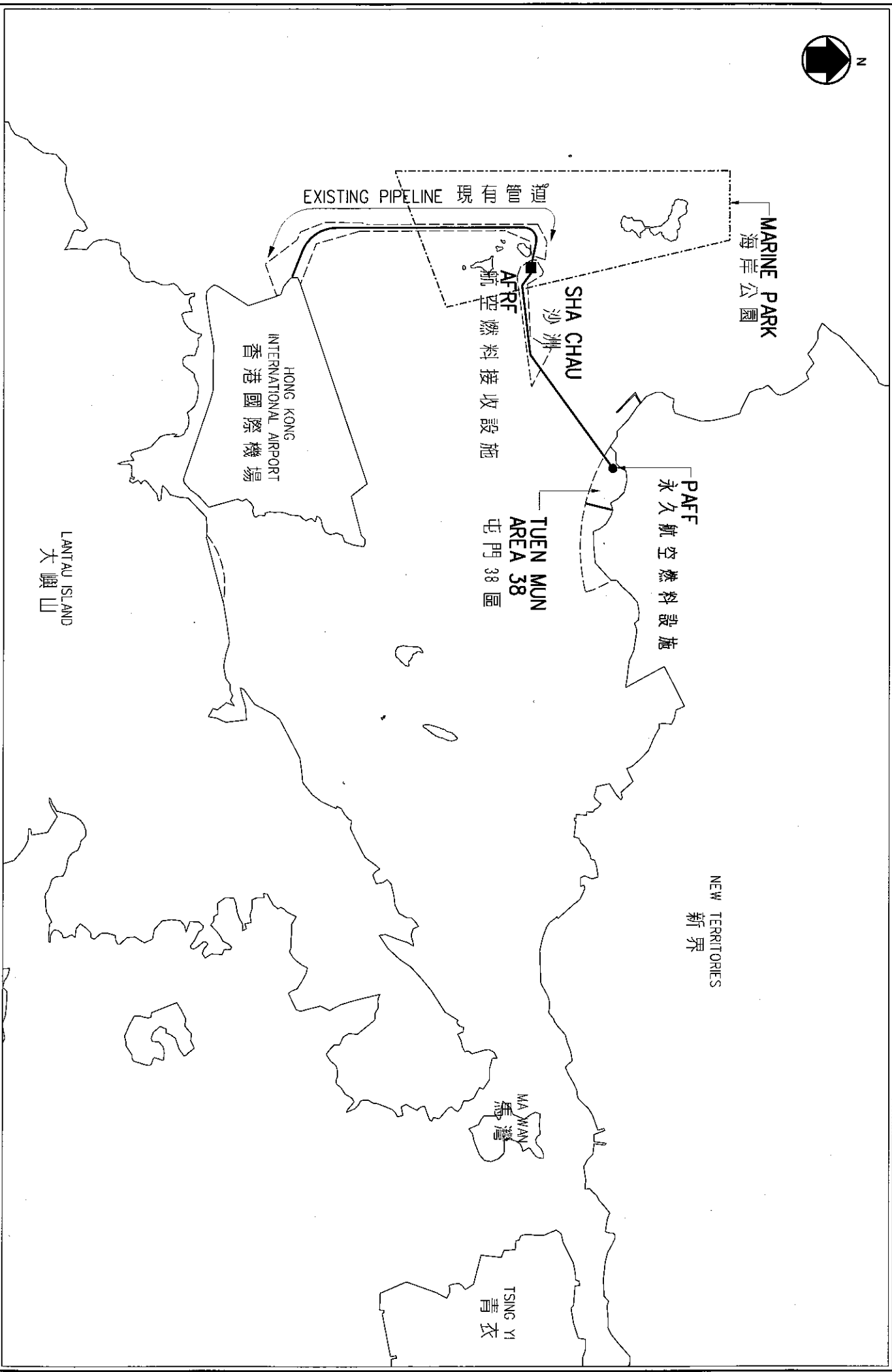
250m dolphin exclusion zone will be applied during these dredging activities, both within the marine park and along the entire pipeline, to ensure that no dolphins are within the vicinity for a period of 30 minutes before dredging can commence. Dredging works will be restricted to a daily maximum of 12 hours within daylight hours except for the section crossing Urmston Road Channel and will also avoid the main calving season of the Chinese White Dolphin from March to August inclusive.

- 7.3 In addition, a watching brief will be undertaken by a qualified marine archaeologist during dredging within 25m either side of two identified sub sea anomalies.
- 7.4 Regular site audits will be carried out to confirm that good working practice is adhered to at all times and the mitigation measures identified in the Implementation Schedules are being followed.
- 7.5 During the operational phase, the following will be undertaken:
- ◆ monitoring of landscape works once every 2 months for the first year to ensure the viability of the planting/replanting;
 - ◆ routine monitoring of water quality in the vicinity of the PAFF site to check the effectiveness of the proposed precautionary measures implemented for on-site spill control;
 - ◆ an Environmental Management System is recommended to be set up for the operational phase of the project to allow regular audits of the systems and mitigation measures incorporated in the project and the fuel spill contingency plan; and
 - ◆ a review of the EIA during the planning of the final phase of the development of the tank farm

would be undertaken if the latest technology, standards and statutory requirements are deemed at that time to have changed.

8. OVERALL CONCLUSIONS

- 8.1 The proposed Permanent Aviation Fuel Facility site at Tuen Mun Area 38 and route for the connecting pipeline to tie in with the existing twin subsea pipelines from Sha Chau to HKIA represents the best available environmental option which meets the fundamental requirements of the facility.
- 8.2 Implementation of a comprehensive list of mitigation measures as specified in the Implementation Schedule is recommended along with the environmental management regime detailed in the Environmental Monitoring and Audit Manual.
- 8.3 With the adoption of these mitigation measures, the project will not result in any unacceptable residual environmental impacts. It is also concluded that the individual and societal risks to life posed by PAFF are all acceptable according to the criteria of the EIAO-TM and the project will fully comply with all environmental regulations and standards prevailing in Hong Kong.



MARINE PARK
海岸公園

SHA CHAU
沙洲

AFRF
航空燃料接收設施

HONG KONG
INTERNATIONAL AIRPORT
香港國際機場

LANTAU ISLAND
大嶼山

PAFF
永久航空燃料設施

TUEN MUN
AREA 38
屯門 38 區

NEW TERRITORIES
新界

MA WAN
馬灣

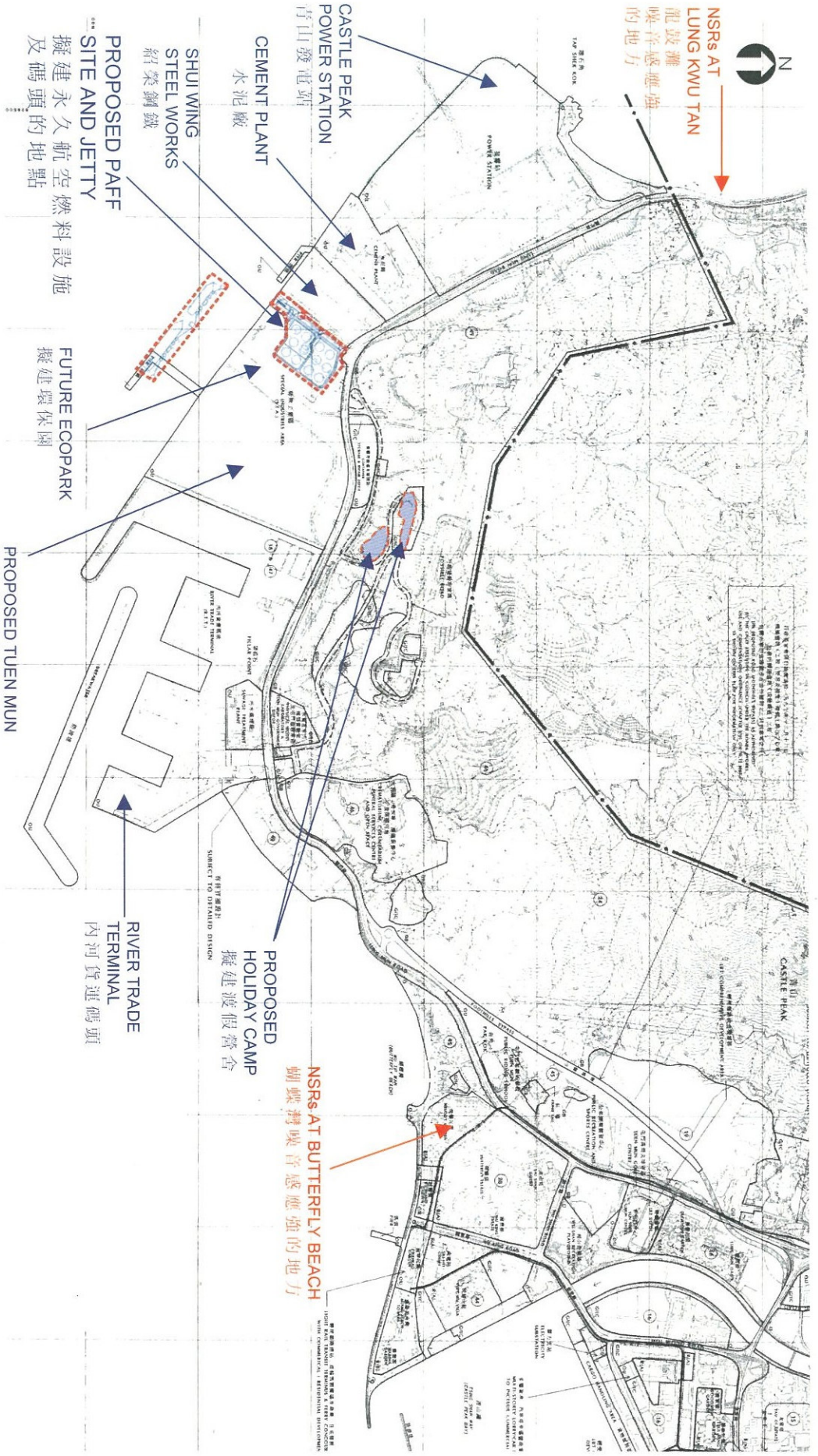
TSING YI
青衣

PERMANENT AVIATION FUEL FACILITY STUDY AREA

永久航空燃料設施研究範圍

Meinhardt

Form No. 1



PAFF and Surrounding Area

永久航空燃料設施及鄰近地區