香港 國際機場 HONG KONG INTERNATIONAL AIRPORT

Hong Kong International Airport

Interim Updated Environmental Impact Assessment Report

June 2007

PART A INTRODUCTION

PART B NAMP-EIA ENVIRONMENTAL COMMITMENTS UPDATE

1.1 Background

The 1991 New Airport Master Plan (NAMP) and its October 1992 Supplement provided the basis for the construction of Hong Kong International Airport (HKIA). The three-part NAMP included Planning and Civil Engineering reports, the outcome of which were a range of conceptual infrastructure and facility designs, proposed construction methodologies and operational forecasts, based on which detailed designs were to be developed. An Environmental Impact Assessment (EIA) was then done which defined how the identified environmental impacts of building and operating HKIA could be minimised. It also proposed associated environmental controls, mitigation measures and monitoring and audit requirements for both airport construction and operations.

Elements of the NAMP were modified during the detailed design phase of the HKIA project. Modifications included changes to already agreed environmental controls, mitigation measures, identification of additional mitigation requirements as well as operational procedures to be developed and implemented during the operational phase of the airport so as to reduce potential environmental impacts from certain activities. Operational forecasts contained in the original NAMP have also been revised based on changes in traffic demand and aircraft technology.

A commitment was made during the NAMP process to update the 1991 NAMP-EIA before the airport opening, and thereafter at regular intervals in order to ensure all mitigation measures and commitments would remain relevant and applicable during the operational lifespan of the airport.

1.2 1998 NAMP-EIA Update

In February 1998 the first NAMP-EIA Update was published. The Update reported on the status of implementation of environmental commitments made in the 1991 NAMP-EIA relating to the design, construction and operations of HKIA. In addition, all environmentally significant physical and operational modifications to the NAMP, as implemented or envisioned in the period up to 1998, were detailed and the implementation status on associated environmental commitments was provided. A major deviation from the conceptual airport facility layout provided in the NAMP was the requirement to locate an aviation fuel receiving facility remote from the new airport island.

A standalone EIA was completed for this facility in 1995 and the environmental commitments arising from this were detailed in the Update along with implementation status. Other specialised environmental reports were also prepared over the period on a range of environmental issues, with outcomes summarised in the Update where relevant. The 1998 NAMP-EIA Update was reviewed and accepted by

the government, circulated to the Advisory Council on the Environment, and made available to the public.

1.3 2006 HKIA Interim Updated EIA Report

This 2006 Interim Updated EIA Report provides a further progress check on the implementation status of 1991 NAMP-EIA environmental commitments relating to the design and development of HKIA. Again, environmentally significant physical and operational modifications to the NAMP, as implemented or envisioned in the period from February 1998 to the end of 2006 are detailed along with the implementation status of relevant and associated environmental commitments.

1.4 Interim Updated EIA Report Structure and Organisation

Part A provides context and background information on Interim Updated Report content as well as an explanation on what will and will not be covered.

Part B covers the issues addressed in the 1991 NAMP-EIA under the same environmental issues headings as were used in the 1991 NAMP-EIA and in the 1998 NAMP-EIA Update. In this update, the two separate sections of Issues Relating to Airport Construction and Issues Relating to Airport Operation that formed the layout in the 1998 NAMP-EIA Update are combined as one. Under each environmental issue heading an initial sub-section will cover Airport Development Environmental Commitments, comprising a summary and close-out on the implementation of the 1991 NAMP-EIA airport construction mitigation measures, commitments, and monitoring and audit actions that remained incomplete, or still in progress, at the time of the 1998 NAMP-EIA Update.

The remainder of each environmental issues sub-section then provides an update on the relevant environmental controls, impact minimisation and mitigation measures, and any related monitoring and audit that has taken place relating to each issue over the period covered by this Interim Updated Report. Where relevant, a specific commitment from the 1991 NAMP-EIA will be repeated in italics and referenced, with the 2006 Updated Interim Report detail added in bold font. In cases where only a general update summary is required, normal text will be used.

Part C provides a summary of the Airport Authority's approach to identifying and managing the environmental and health risks faced in operating the airport and developing the airport business and outlines the approach to environmental management and arrangements for environmental monitoring and audit at HKIA.

For the first six months of operations from July 1998, HKIA was a one-runway operation. The second (northern) runway opened in December 1998 with HKIA operating in a dual runway, segregated mode since then. HKIA has expanded since opening broadly in line with predictions in the NAMP, although cargo facility expansion has grown ahead of original projections.

In financial year 2005/06, 270,000 aircraft movements gave rise to total airport passenger throughput of 41.6 million with 3.5 million tonnes of cargo handled at HKIA.

Exhibit 2.1 illustrates the airport layout at the end of 2006. Since the 1998 NAMP-EIA Update, the vast majority of airport development and facility expansion has been broadly in line with the preliminary specifications and outline conceptual design guidelines allowed for in the NAMP.

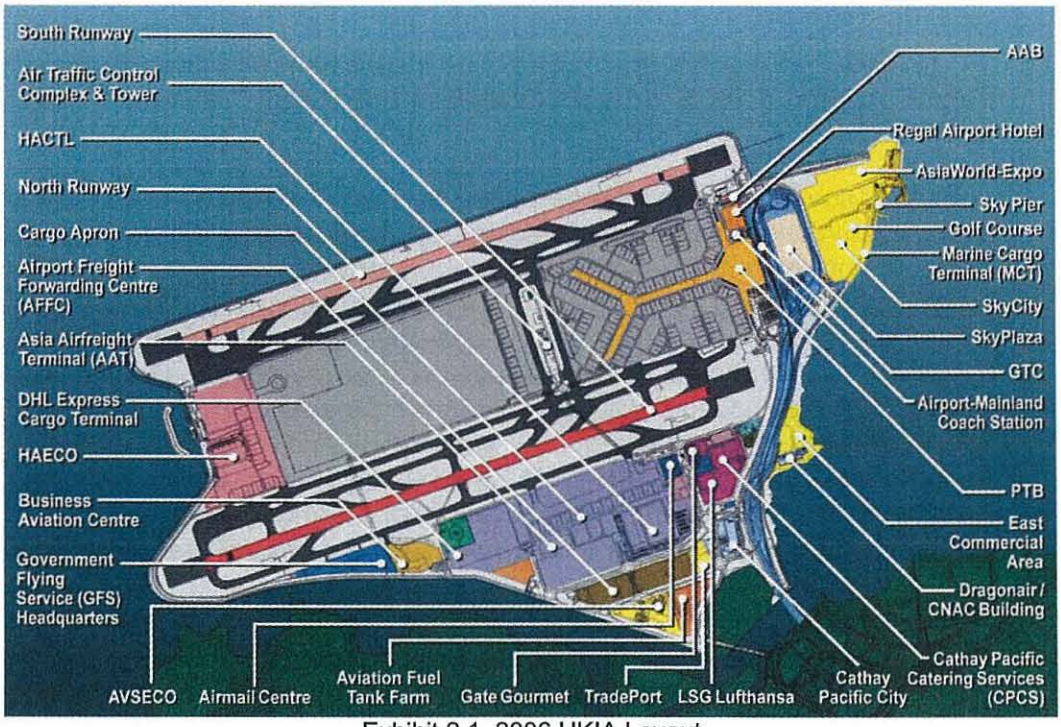


Exhibit 2.1 2006 HKIA Layout

The 1998 NAMP-EIA Update covered the implementation of 1991 NAMP-EIA recommended mitigation measures for the bulk of airport construction and reported on the establishment of Environmental Monitoring and Audit programmes set up in agreement with the Environmental Protection Department (EPD) to support the major reclamation effort and all airport facilities and infrastructure development required for airport opening.

Airport opening effectively meant the completion of the majority of the airport construction effort. It also meant that most of the development phase environmental commitments, mitigation measures and related monitoring, and audit requirements specified in the 1991 NAMP-EIA had also been completed. Several construction projects were still underway at airport opening, for example the Passenger Terminal northwest concourse and northern runway

works. The environmental controls and mitigation measures relevant to these works therefore remained in effect beyond airport opening.

Environmental Review of Scheme Design

The 1998 NAMP-EIA Update described the process developed to ensure proper incorporation of 1991 NAMP-EIA mitigation measures and other commitments into the detailed designs for the airport buildings and infrastructure. The process established ensured that as conceptual designs for airport facilities, infrastructure and other land uses were taken forward to detailed design, an environmental review of the scheme design was conducted by each design consultant. This involved comparing what was envisioned in the NAMP for the conceptual design of the facility, infrastructure or other land use against what was being proposed in the detailed design, with NAMP-EIA mitigation measures having to be accounted for and, where necessary, amended or supplemented in order to sufficiently mitigate or allow for any additional environmental impacts identified.

All Environmental Reviews were submitted to the EPD for review and sign off. This represented a key information exchange mechanism during the airport development process, and helped to facilitate the review and acceptance of the implementation status of 1991 NAMP-EIA mitigation measures by all relevant statutory authorities.

The environmental review process has continued and in the period since 1998 has been applied to significant development taking place at HKIA. Details on the environmental outcomes and commitments from all environmental reviews on developments undertaken since 1998 are summarized in Section 4 of this Update.

Environmental Impact Assessment

An important environmental checking safeguard has also been adopted since airport opening. It is designed to identify whether new developments planned at the airport trigger the requirement for an environmental permit under the 1998 EIA Ordinance. This check is undertaken as early as possible in the airport facility planning process with the need for airport-related developments to obtain an environmental permit now having been identified on two occasions.

The best operational and environmental option for replacing the temporary Aviation Fuel Receiving Facility (AFRF) near Sha Chau with a Permanent Aviation Fuel Facility (PAFF) was determined to be Tuen Mun Area 38 in the Western New Territories. As this facility in this location had not been evaluated in the original NAMP-EIA, and because it qualified as a Designated Project (DP) under sections B.1, H.2 and L.4 of Schedule 2 of the EIA Ordinance, an environmental permit was required for the PAFF. Due process under the EIA Ordinance was followed and an environmental permit was issued in August 2002.

Following a legal challenge on the decision to approve the EIA report (and issue an environmental permit) the environmental permit for the PAFF was withdrawn in July 2006. At the end of 2006, the Authority was in the process of revising the PAFF EIA to facilitate a further application for an environmental permit for the PAFF project (Note: an EP was issued by EPD on 30 May 2007 further to the formal submission of a revised EIA Report to EPD on 22 December 2006).

An EP was also required for a temporary-use 9-hole golf course in the northwest of HKIA. The golf course is not an airport-related development and as a golf course classifies as a Designated Project under Section O.1 of Schedule 2 of the EIAO, an EP was required. Construction of the golf course was at an advanced stage by the end of 2006.

In the 1998 NAMP-EIA Update, recommendations and mitigation measures from the AFRF at Sha Chau EIA were detailed, along with their implementation status. In this Updated Interim Plan, detail on the implementation of all remaining commitments and mitigations associated with the AFRF-EIA are again summarised, in Section 4.

Noise and Air Emissions from HKIA Operations

A commitment from the NAMP is that operational forecasts should be updated periodically, with operational noise levels modelled and predicted based on expected modes of operation for certain years - in Noise Exposure Forecasts. The same operational forecasts are to be utilised, along with actual and projected airport facility development details, in order to produce air emissions inventories for HKIA operations. When such data is used in conjunction with other local air pollutant inputs, dispersion modelling of air pollutants under different circumstances is then possible, as was done in the 1991 NAMP-EIA.

HKIA Updated Interim EIA Report

An important recent development has been the HKIA 2025 Study, which was published at the end of 2006. This study has considered all potential future growth strategies at HKIA by critically assessing the demand, supply, and competition / co-operation dynamics that HKIA will face in the future. Growth strategies identified in the study include the potential requirement for a third runway at HKIA at some time in the future. As a third runway at HKIA has not previously been considered, detailed engineering and environmental feasibility studies are required both to determine a suitable location and layout for a third runway and to determine its viability - these are due to commence in 2007. The first step of the third runway study will explore possible improvements in air traffic management procedures and equipment and determine the optimized capacity of the existing two runway operation, thereby providing a best estimate for when a third runway may be needed. The environmental feasibility study will then develop detailed Noise Exposure Forecasts and air emissions inventories and include related modelling based on operational forecasts for both a three runway operation and an optimized two runway operation.

Before the completion of the above study, reliable information is not available to update the projections on Noise Exposure Forecasts and air emissions. The projections are therefore excluded from this Updated Interim Report.

HKIA EIA Further Update

Noise forecasts and air emissions inventories and modelling based on future years and comparing two runway operations and three runway operations will be completed and reported in full in the context of the engineering and environmental feasibility studies for the third runway.

There have been a number of changes in environmental legislation and guidelines since 1998, some of which are likely to apply to activities and facilities for which the Airport Authority has direct responsibility.

3.1 Environmental Impact Assessment Ordinance

The Environmental Impact Assessment Ordinance (EIAO) came into effect on 1 April 1998. The EIAO requires that certain designated projects specified under its Schedule 2, unless exempted, must follow the statutory environmental impact assessment (EIA) process, and requires that environmental permits are obtained prior to construction and operation (and decommissioning, if applicable) of any qualifying project. No environmental permits are required for designated projects in Part I of Schedule 2 that have commenced construction or have been in operation before 1 April 1998. The airport is therefore an exempted designated project under Section 9 (2) (g) of the Ordinance.

Thus, the airport does not require an environmental permit to complete its construction or for its operation. However, material changes to exempted projects do require environmental permits under the Ordinance. A material change means a physical addition or alteration to a designated project which results in an adverse environmental impact as defined in Section 6.1 of the Technical Memorandum on Environmental Impact Assessment Process. Should there be a material change, then that change may be subject to the environmental permit process. Material change may be relevant to all proposed developments at HKIA, both those that qualify as designated projects under the Ordinance but were not conceptually envisaged in the original master planning process, or those that do not fit with the original airport land use planning outline.

3.2 Noise

3.2.1 Construction Noise

The Noise Control Ordinance (Exemption from Section 6 (1) and (2) (Chek Lap Kok)) Order (1991 and 1997) expired on 1 June 1999. Thereafter, all parties working at HKIA were required to comply with the Noise Control Ordinance. Under Section 6 (1) and (2) of the Ordinance, a permit must be in effect during restricted hours for general construction works using powered mechanical equipment.

An amendment to the Noise Control Ordinance (Cap. 400) came into effect on 8 October 2004, making corporate directors liable for repeated noise offences by their companies. This followed publication of two Codes of Practice describing good management practices for avoiding noise violations. Directors

receive a warning letter after a first offence. If another offence occurs within two years, they can be prosecuted. Defendants can use a due diligence defence if they have put an environmental management system in place and are operating it effectively.

3.2.2 Operational (Aircraft) Noise

Aircraft noise is regulated under the Civil Aviation (Aircraft Noise) Ordinance (Cap. 312). An amendment, Civil Aviation (Aircraft Noise) Ordinance (Amendment of Schedule) Notice 2002, changed the noise standard to Chapter 3 standards of noise as defined by ICAO in Chapters 2 and 3 in Volume I, Annex 16 to the Convention on International Civil Aviation (the Chicago Convention). In line with this change, the Civil Aviation Department (CAD) no longer permits noisier Chapter 2 aircraft to operate to or from HKIA.

3.3 Waste

3.3.1 Construction Waste

The Waste Disposal (Amendment) Ordinance (2004) (Cap. 354) provides for charging for disposal of construction waste at designated waste disposal facilities and for enhancing control on fly tipping of waste. Subsidiary legislation to the Waste Disposal Ordinance, the Waste Disposal (Charges for Disposal of Construction Waste) Regulation came into effect in January 2006. The regulation imposes charges on sorting facilities for reuse and recycling inert wastes and landfill wastes.

3.4 Air Quality

3.4.1 Vehicle Emissions and Motor Vehicle Fuel

Amendments to the Air Pollution Control (Vehicle Design Standards) (Emission) Regulations and the Air Pollution Control (Motor Vehicle Fuel) Regulation was made, and a set of new vehicle emission standards commonly known as Euro III was implemented in phases, starting from 2001. Further amendments were made in 2005 which required motor vehicles weighting up to 2.5 tonnes and first registered on or after 1 January 2006 to comply with the Euro IV emission standards, while diesel private cars first registered on or after 1 January 2006 are required to comply with the most stringent Californian standards.

3.4.2 Emission Reduction Devices

The Air Pollution Control (Emission Reduction Devices for Vehicles) Regulation came into effect December 2003, which

requires pre-Euro light diesel vehicles (up to four tonnes) to have approved emission reduction devices fitted prior to licence renewal starting from December 2003. An amendment to this regulation in 2005 required all pre-Euro diesel heavy vehicles, except long idling vehicles, to install approved emission reduction devices.

3.4.3 Petrol Filling Stations

The Air Pollution Control (Petrol Filling Stations) (Vapour Recovery) Regulation came into effect in 1999, which requires petrol filling stations and petrol delivery vehicles to be equipped with effective vapour recovery systems, and to observe good practices during petrol unloading. An amendment to this regulation was made in 2005, requiring all petrol filling stations to be equipped with a vapour recovery system to reduce the emissions of volatile organic compound during vehicle refuelling.

Environmentally Significant New Airport Development 4

4.1 Summary

In the period since the last Update, a number of significant airport developments and expansion projects have been planned, many of which progressed to design and construction. When any new development is planned, the process described in Section 2 is followed in order to ensure proper incorporation of 1991 NAMP-EIA mitigation measures and other environmental commitments. All significant new development that has taken place at HKIA since 1998 is summarised in Section 4.2 below, which includes a summary of the environmental assessment and EPD liaison done on each project and, where relevant, requirements for additional environmental controls or mitigation measures. Although such development is not classified as environmentally significant, the standard environmental review process is adopted in all cases by the Airport Authority to ensure no unexpected environmental issues crop up as a result of new development.

During this time, the AFRF near Sha Chau has continued to operate with operational environmental commitments continuing to be applicable. The status of AFRF commitments is updated in Section 4.3 below. In addition, in the period since 1998, two airport-related development projects have triggered the requirement for an environmental permit under the EIAO, with permits obtained prior to commencement of construction. Reference to these projects, and associated major environmental controls, commitments and mitigation measures, is briefly covered in Section 4.4.

4.2 Significant Airport Development and Expansion Projects

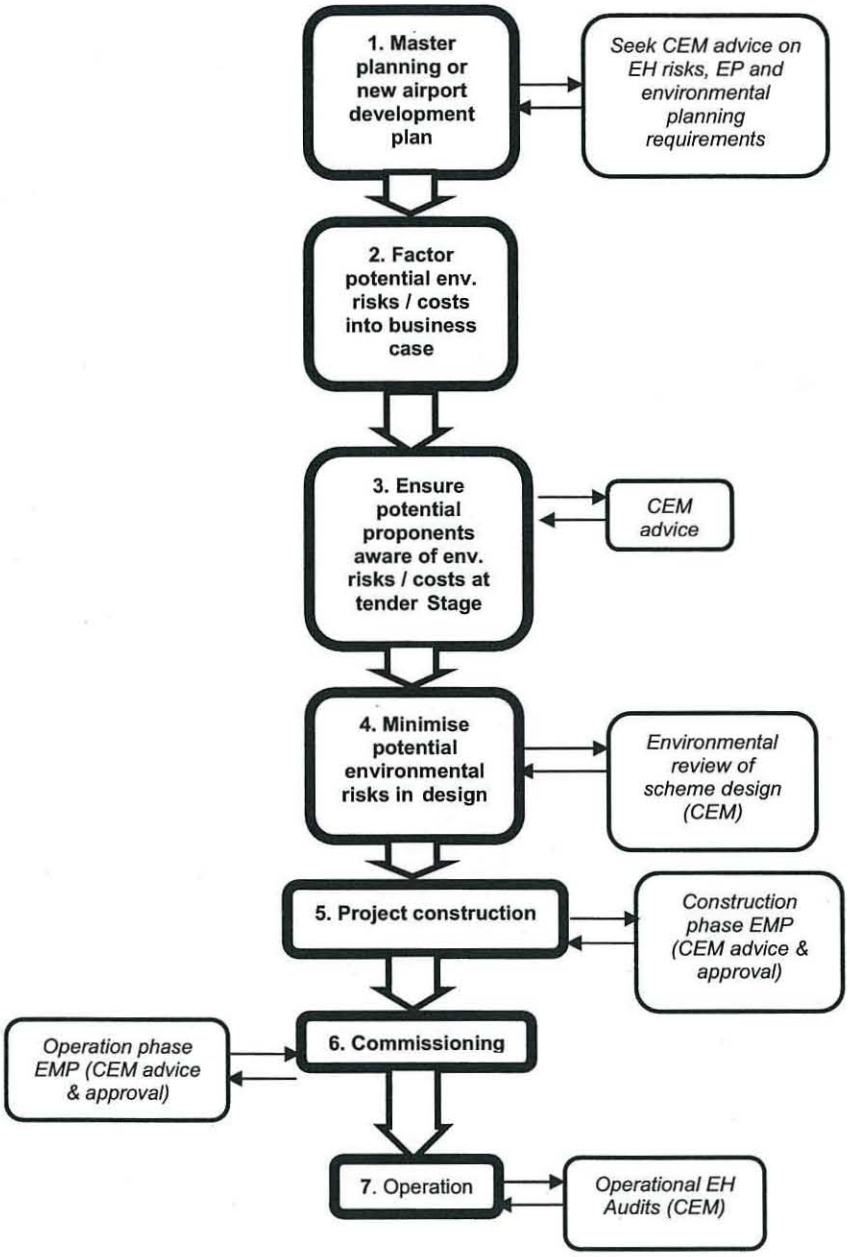
The NAMP made provision for expansion in phases to meet growing passenger numbers and air cargo volumes over a 50-year period. The original operational forecasts of 87 million passengers and 9 million tonnes of cargo per annum remain valid, although the ways and means of moving towards these projected capacities are subject to change over time depending on many factors.

A number of airport development and expansion projects have been planned in the period since the 1998 NAMP-EIA Update, many having progressed to completion. Table 4.1 lists all such significant developments at HKIA. A summary of the environmental assessment done on each project and, where relevant, any requirements for amended or additional environmental controls or mitigation measures is included. All developments described did not require an environmental permit prior to construction; rather, all were subject to the standard environmental assessment procedures as implemented by the Airport Authority. The flowchart in Figure 4.1 shows the process whereby environmental issues are identified and managed in relation to new HKIA development from the planning stage through to building or facility operation.

Table 4.1 Major Airport Development and Expansion Projects 1998-2005

Development	Summary of Environmental Planning / Statutory Requirements	New Environmental Commitments / Mitigation Measures	Completion
Marine Cargo Facility	- Fits with NAMP defined airport-related development area land-use. - No EP requirement. - Environmental review of scheme design done. - Construction and operational environmental management plans. - Completed. - AA due diligence monitoring and audit ongoing.	- **No new marine construction.** - **AA to construct connection to nearest existing foul sewage manhole.** - **otherwise, standard statutory requirements.**	2001
Tradeport Logistics Centre	Same as Marine Cargo Facility.	- **Standard statutory requirements applicable and development subject to routine Airport Authority EM&A.**	2002
PTB East Hall Expansion	Same as Marine Cargo Facility.	- **Standard statutory requirements applicable and development subject to routine AA EM&A.**	2003
DHL Express Cargo Terminal	Same as Marine Cargo Facility.	- **Standard statutory requirements applicable and development subject to routine AA EM&A.**	2005
Asia Airfreight Terminal Expansion	Same as Marine Cargo Facility.	- **Standard statutory requirements applicable and development subject to routine AA EM&A.**	2006
International Exhibition Centre	Same as Marine Cargo Facility.	**Standard statutory requirements applicable and development subject to routine AA EM&A. IEC developer incorporated thermal storage cooling system into design of building for energy cost efficiencies.**	2005
SkyPier II	- Proposed expansion of the ferry pier(s) was projected in the NAMP here and covered by the 1991 NAMP-EIA. - No EP requirement.	- **Standard statutory requirements applicable and development subject to routine AA EM&A.**	Expected 2007
SkyPlaza (passenger processing facility, office, retail and entertainment complex)	- Fits with NAMP defined "Airport Related Development" area land-use. - No EP requirement. - Construction and Operational Environmental Management Plans completed. - AA due diligence monitoring and audit ongoing.	- **Environmental Issues Working Paper undertaken at design stage instead of ER** - **Standard statutory requirements applicable and development subject to routine AA EM&A.**	Expected Early 2007
Automated People Mover Extension	- Fits with NAMP defined airport-related development area land-use. - No EP requirement. - Construction and operational environmental management plans completed. - AA due diligence monitoring and audit ongoing.	- **Environmental Issues Working paper undertaken at design stage instead of ER.** - **Standard statutory requirements applicable and development subject to routine Airport Authority EM&A.**	Expected Early 2007
Additional Aviation Fuel Tanks at On-airport tank farm	Same as Marine Cargo Facility.	**New tanks and associated tank farm infrastructure required to meet all of the commitments specified for the original facility, including storm water runoff draining away from the sea channel.**	Expected 2007
HAECO – New Maintenance Hangar	Same as Marine Cargo Facility.	- **Standard statutory requirements applicable and development subject to routine AA EM&A.**	Expected Early 2007

Figure 4.1 Development environmental issues identification and management



Key:

CEM - Corporate Environmental Manager
EH - Environmental and Health
EP - Environmental Permit
EMP - Environmental Management Plan

SkyPlaza is the passenger processing facility, office, retail and entertainment complex.

SkyCity Nine Eagles Golf Course represents an innovative temporary use of airport land.

Bird's eye view of SkyCity.

4.3 Aviation Fuel Receiving Facility EIA (1995) Summary and Recommendations

4.3.1 Summary of Issues

The AFRF just off Sha Chau Island, located several kilometres north of HKIA, was not evaluated in the original 1991 NAMP-EIA. This meant the Airport Authority had to undertake a detailed standalone EIA on the AFRF in 1995. The recommendations contained in that document were incorporated into the Airport Authority's planning process and were covered in the 1998 NAMP-EIA Update. Environmental impacts recognised and assessed as part of the EIA included a thorough assessment on all of the environmental aspects of the proposed facility in line with the administrative EIA requirements applicable at the time, with a key focus being the potential impacts on water quality and marine ecology. In the 1998 Update a status check on all of the commitments made in the AFRF-EIA was included in each of the environmental issues chapters. In this update, all of the commitments that were not completed or have remained relevant over the intervening period are updated in the tables below for both construction and operations.

The Aviation Fuel Receiving Facility near Sha Chau has operational environmental commitments that continue to be applicable.

4.3.2 Current Status of Implementation

At the airport's opening, the AFRF had already been commissioned and was receiving and transferring aviation fuel to the on-airport tank farm. Design and construction commitments and mitigation measures had largely been addressed by the relevant parties and status on these was detailed in full in the 1998 Update. A major focus of the environmental impact mitigation effort was to minimise the potential impacts of construction on *Sousa chinensis* – Chinese White Dolphins – that frequent north Lantau waters, as well as broader efforts to learn more about their abundance and distribution in North Lantau Waters. Dolphin mitigations were done in agreement with The Agriculture, Fisheries and Conservation Department (AFCD)and are further reported below.

Table 4.2 summarises the recommended mitigation measures contained in the AFRF EIA that remain relevant. The table does not include any update on construction phase recommendations relating to tidal flows, water quality and marine ecology as related commitments and mitigations were addressed in full at the time of the 1998 Update. Recommendations relating to operational tidal flow, water quality issues and marine ecological operational commitments are updated as such recommendations were still being implemented after 1998. Table 4.2 also identifies the responsible party for the implementation of the recommendation and gives its current status.

Table 4.2 AFRF-EIA Recommended Mitigation Measures

EIA reference	Recommended mitigation Measure	Responsibility	Implementation Status
Operational Impact on Water Quality and Water Movement Impact			
Sec. 5.1.5 p.107-108	Solid and liquid wastes should be handled, stored and disposed of in accordance with waste management practices defined by the tenderer and EPD regulations and requirements.	Franchisee	**All solid and liquid wastes are handled, stored and disposed of in accordance with EPD regulations and requirements and best practice guidelines – operational practices are routinely audited by Airport Authority staff.**
Sec. 5.1.5 p.108	Discharge of oil from vessels into the sea is forbidden and dedicated vessels should contain solid and liquid waste storage tank facilities.	Vessel supplier	**Discharge of bilge water and oily waste is not permitted at the AFRF. Bilge water disposal receipts for all bilge wastes disposed of are retained by AFSC Operations. Such practice is subject to regular audit by Airport Authority staff.**
Sec. 5.1.5 p.108	Dedicated fuel shuttle vessels are to be used at the facility. These should be single propeller vessels with a schilling rudder and bow thrusters.	Vessel supplier	**Highly manoeuvrable vessels have been deployed in accordance with the supplier agreement.**
Sec. 5.1.5 p.108	Restrictions on vessel speed to be imposed on the approach to the facility.	Franchisee	**Vessel operators comply with all applicable speed restrictions.**
Sec. 5.1.5 p.108	Low impact dredging techniques recommended for maintenance dredging activity.	Franchisee	**The franchisee has undertaken two rounds of maintenance dredging - closed clam-shell dredgers have been used and all relevant licenses and approvals were obtained.**
Sec. 5.1.5	The tenderer's detailed design should identify rapid, non-toxic spill response technologies to be implemented on the facility.	Franchisee	**The franchisee has implemented this and regular spill response exercises are undertaken in conjunction with MD and spill response authorities.**
Sec. 5.3.4 p.116	The recommended waste disposal requirements for the AFRF should be incorporated into the Comprehensive Environmental Management Plan to be developed for the entire new airport operation.	AA/ Franchisee	**The franchisee has developed an Environmental Management Plan for the AFRF.**
Operational Impacts on Marine Ecology			
Sec. 5.4.3 p.123	The use of larger dedicated fuel vessels is preferable to minimise the number of daily trips, hence minimising sediment resuspension, noise and physical harm potential.	Vessel Supplier	**Dedicated fuel vessel size was agreed at just under 5,000 dwt.**
Sec. 5.4.3 p.124	Vessel crew training to minimise impact on dolphins.	Franchisee	**Crew training undertaken for dedicated vessel crews.**
Operational Stage Dolphin Monitoring			
Sec. 7.6 p.184	The Indo-Pacific Humpbacked Dolphin monitoring programme should be continued during the operation of the AFRF at a tentative frequency of every six months.	Franchisee	**As agreed with AFCD, the operational phase monitoring programme continued for a period of one year, split into two six-month monitoring periods, on the commencement of operations. The first 6-month period took place from July to December 1998, the second from October 1999 to April 2000. The conclusion from the operational monitoring was that abundance of dolphins in the North Lantau area appeared to have stabilised to levels similar to those found before AFRF construction commenced. It was therefore agreed with AFCD that further monitoring in conjunction with AFRF operations would not be necessary.**

In addition to the recommendations made in the AFRF-EIA, a number of important recommendations and commitments related to minimising the impact on the Chinese White Dolphin, including general requirements for additional research were made by Dr Bernd Würsig, an internationally renowned marine mammal expert, working for the Airport Authority. His

paper *Health and Survivability of the Indo-Pacific Humpbacked (Chinese White) Dolphin, Sousa chinensis: Recommended Mitigation and Research Needs Relative to a Proposed Aviation Fuel Receiving Facility at Sha Chau, Northwest Hong Kong* was done at the time of the AFRF-EIA and many of the recommendations in that paper remain valid. Table 4.3 summarises the recommendations made in Würsig's paper that remain relevant, identifies the responsible party for the implementation of the recommendation and provides the current status.

Table 4.3 Dr. Würsig's Recommended Dolphin Conservation Measures and Studies.

Reference	Major considerations to Allow the AFRF to Proceed	Responsibility	Implementation Status
Para. II A	The AFRF is to be temporary.	AA	**A detailed summary on the search for a Permanent Aviation Fuel Facility (PAFF), including reasons why the temporary facility had to be utilised for longer than anticipated is provided in Chapter 2 of the PAFF EIA (EIA-127/2006) (Please refer to:** http://www.epd.gov.hk/eia/register/report/eiareport/eia_12720 06/report_cover.htm).
Para. II B	Create a marine sanctuary.	AFCD/AA	**The Sha Chau and Lung Kwu Chau Marine Park was designated on 22 November 1996. Airport Authority agreed to fund the recurrent costs in planning and managing the Marine Park for the operational lifetime of the AFRF at Sha Chau – Airport Authority continues to fund the recurrent costs in planning and managing the Marine Park and will continue to do so until the PAFF becomes operational.**
Reference	**Recommended Mitigation Measure**	**Responsibility**	**Implementation Status**
Para. I C	Assure that vessel screw or associated noise of tankers and other support vessels <300 Hz.	Vessel Supplier	**Vessel design specifications were implemented through the supplier agreement. In addition, a peer-reviewed noise study paper assessing underwater sounds near the fuel receiving facility was published in a major international journal. The paper concluded that "tanker noise was within the specifications of the Airport Authority". (Ref: B. Würsig, C.R. Greene Jr, Underwater sounds near a fuel receiving facility in western Hong Kong: relevance to dolphins. Marine Environmental Research 54 (2002) 129-145, Elsevier)**
Para. I D	Provide propelling shrouding to reduce noise.	Vessel Supplier	**See response to Para. 1c.**
Para. I E	Assure that solid and liquid wastes are properly contained.	AA/ Franchisee/ Contractor/ Vessel Supplier	**Effective containment practices implemented by the franchisee.**
Para. I G	Provide daily time out.	Franchisee/ Contractor	**Effectively being implemented by the franchisee.**
Para. I H	Create an artificial reef.	ACFD	**AFCD has implemented an artificial reef programme in phases, which includes reefs within the Sha Chau and Lung Kwu Chau Marine Park and the MEZ immediately northeast of HKIA. The MEZ Reef was part-funded by Airport Authority, which contributed HK$1.2 million.**
Para. I I	Provide periodic review of newly analysed data by Dolphin Management Plan Committee (ie, the MMCWG as referred in Para. III A).	AA/AFCD	**AFCD have continued to add to the dolphin distribution and abundance database since 1998 and additional survey and monitoring data is both reviewed by Dr. Jefferson and regularly reported to the MMCWG.**

Reference	Summary of Focused Studies	Responsibility	Implementation Status
Para. III A	(1) Develop a dolphin management plan; (2) Form a Dolphin Management Plan Committee; and (3) Appoint a reputable dolphin expert to advise the government on dolphin issues.	AFCD	**(1) and (2) A Marine Mammal Conservation Working Group (MMCWG) under the Marine Parks Committee of the Country and Marine Parks Board continues to advise government on marine mammal conservation and research issues in Hong Kong and on the development of conservation and management plans for marine mammals.** **(3) Dr Thomas Jefferson (an experienced post-doctorate level cetacean expert) was appointed by AFCD in April 1996 to continue studies on the Chinese White Dolphin and to advise the MMCWG and government on dolphin conservation. Dr Jefferson continues to provide input and direction to AFCD research and conservation efforts and regularly reports to the MMCWG on findings.**
Para. III E	Conduct photo-recognition studies outside Hong Kong Waters.	AFCD	**AFCD pursue all opportunities to cooperate and exchange information with Mainland Government officials and further work on dolphin population biology and abundance has been undertaken in the broader Pearl River Delta.**
Para. III G	Create an artificial reef.	AFCD	**See Para 1H I earlier table.**
Para. III H	Conduct radio-tracking	AFCD	**Dr Jefferson's initial view on this was that capturing animals for radio-tracking studies had the potential for serious harm to individual dolphins so this was not pursued.**
Reference	**General Studies and Procedures**	**Responsibility**	**Implementation Status**
Para. IV A	Determine population range, size and trends of dolphin in and around Hong Kong waters.	AFCD	**See response to para. III A.**
Para. IV B	Conduct a genetic analysis.	AFCD	**A programme of genetic analysis has been undertaken, initially using samples from dolphin stranding carcasses. In recent years the practice of live biopsy sampling has gained acceptance with dolphin researchers and has been trialled successfully in Hong Kong by Dr Jefferson with no observable ill-effects on dolphins. Samples from live dolphins have proved much more useful in terms of genetic analysis and other research**
Para. IV C	Determine habitat requirements of dolphins in Hong Kong and elsewhere.	AFCD	**See response to Para. III A and III E. By 2005, the understanding of the population biology of the Chinese White Dolphin was much improved over the previous 10 years, with an effective government-backed conservation strategy in place**
Para. IV D	Assess dolphins' reaction to development.	AA/AFCD	**The dolphin monitoring programme in association with the AFRF at Sha Chau and in continuing studies since then provided useful data.**
Para. IV E	Determine health status of Indo-Pacific Humpbacked Dolphins.	AFCD	**See response to Para. III A.**
Para. IV F	Conduct age and reproductive studies.	AFCD	**See response to Para. III A.**

The Agriculture, Fisheries and Conservation Department has implemented an artificial reef programme in phases, which includes reefs within Sha Chau and Lung Kwu Chau Marine Park, and in the MEZ immediately northeast of HKIA.

As a result of the recommendations made by Dr Bernd Würsig and to increase knowledge on the Chinese White Dolphin, the Airport Authority funded Dr Thomas Jefferson, to undertake a seven-month study on the population ecology of the Chinese White Dolphin from October 1995 to April 1996. Dr Jefferson's study was extended in April 1996 for two years by AFCD. Between 1998 and 2005, further studies under the guidance of AFCD have been carried out with Dr Jefferson continuing to provide expert input.

To help further our understanding of the Chinese White Dolphin, the Airport Authority funded Dr Thomas Jefferson to undertake a seven-month study on its population ecology.

Many of the recommendations made in Dr Würsig's paper have specifically been taken forward by AFCD with some oversight and input being provided by a Marine Mammal Conservation Working Group set up in 1996. The working group is still active. The major findings and outcome from the initial

four years of Dr. Jefferson's dolphin monitoring work with the Airport Authority and with AFCD were reported in the October 2000 edition of *Wildlife Monographs* (No. 144) "Population Biology of the Indo-Pacific Humpbacked Dolphin in Hong Kong Waters" (Supplement to the Journal of Wildlife Management Vol. 64, No. 4, October 2000).

Attenuation of Percussive Piling Noise

One of the key ecological mitigation measures required during the construction of the AFRF was a requirement to investigate and implement measures that would attenuate percussive piling noise.

As reported in the 1998 Update, a bubble curtain was deployed around all piles being driven during the construction of the AFRF. A scientific assessment of the effectiveness of the bubble curtain in attenuating noise was undertaken and results showed that the bubbles effectively reduced noise levels.

A peer-reviewed noise study paper was published in a major scientific journal which concluded that "...the bubble curtain effectively lowered sound levels within 1km of the piling activity and the experiment and its application during construction represented a success...". *(Ref: Würsig B., Greene C.R. and Jefferson T.A. Development of an air bubble curtain to reduce underwater noise of percussive piling.* Marine Environmental Research *48 (1999) 1-15, Elsevier)*.

An air bubble curtain was developed to reduce underwater noise from percussive piling.

Operational Environmental Management

The AFRF has continued to operate since 1998 as the primary delivery means of aviation fuel to HKIA. After an extended site search, Tuen Mun

Area 38 was identified as being the best operational and environmental option for a permanent means of delivering aviation fuel to HKIA. An Environmental Permit to develop and operate the PAFF was issued in August 2002.

Following a legal challenge on the decision to approve the EIA report (and issue an environmental permit) the environmental permit for the PAFF was withdrawn in July 2006. At the end of 2006, the Authority was in the process of revising the PAFF EIA to facilitate a further application for an environmental permit for the PAFF project (Note: an EP was issued by EPD on 30 May 2007 further to the formal submission of a revised EIA Report to EPD on 22 December 2006).

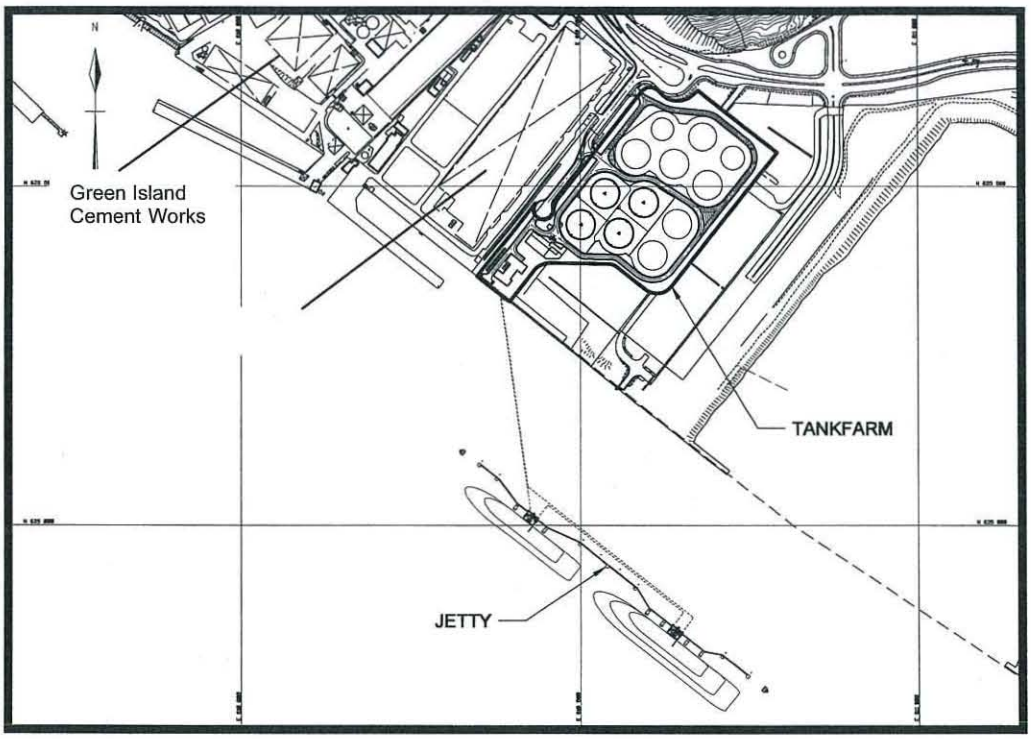
In the AFRF operational period, all of the recommendations relating to environmental management at this facility have been implemented with measures subject to regular audit by Airport Authority staff. The following is a summary of all applicable environmental management measures:

- All sewage wastes are collected and stored in a waste storage tank, with contents routinely taken for treatment and disposal by a licensed sewage waste contractor.
- Domestic wastes are sorted by type at source; recycling and reuse will be employed wherever practicable.
- Chemical waste is collected and stored in accordance with regulations and routinely collected and transported offsite by a licensed chemical waste contractor.
- Solid wastes are taken away by a licensed chemical waste contractor before being disposed of to a designated landfill approved for chemical waste.
- Discharge of bilge water and oily waste will not be permitted at the AFRF. Bilge water is required to be discharged into appropriate bilge water reception tanks and taken to the Chemical Waste Treatment Centre (CWTC) at Tsing Yi with receipts retained on vessel.
- Vessels operators are responsible for the safe and proper disposal of MARPOL wastes.

4.4 Environmental Permit (EP) Projects

The need for airport-related developments to obtain an environmental permit has been identified on two occasions since enactment of the EIAO in 1998.

The best operational and environmental option for replacing the temporary AFRF near Sha Chau with a PAFF was determined to be Tuen Mun Area 38 in the Western New Territories. As this facility in this location had not been evaluated in the original NAMP-EIA, and because it qualified as a designated project in the EIAO, an environmental permit was required.



The Permanent Aviation Fuel Facility will be located in Tuen Mun Area 38 in the Western New Territories.

In addition, an environmental permit was determined to be needed for a temporary-use 9-hole golf course in the northwest of the airport island, because it qualified as a designated project and because the golf course could not be classified as an airport-related development. Available details on all projects required to obtain an environmental permit is provided on the Environmental Protection Department's Website (see Table 4.3 below). Therefore no detail on environmental commitments and follow through on commitments is included in this update.

Table 4.3 – EPD links to Airport Authority Projects Requiring Environmental Permits

Permanent Aviation Fuel Facility	
EIA Report	http://www.epd.gov.hk/eia/register/report/eiareport/eia_1272006/report_cover.htm
Environmental Permit	http://www.epd.gov.hk/eia/register/permit/latest/ep2622007.htm
Sky City 9-Eages Golf Course*	
Project Profile	http://www.epd.gov.hk/eia/register/profile/latest/dir126.pdf
Environmental Permit	http://www.epd.gov.hk/eia/register/permit/latest/ep2292005.htm

* Direct application for EP approved

Although EPs are required for these projects, all arrangements for airport development environmental management still apply, for example, the requirement for Airport Authority staff to conduct environmental audits at both the construction and operational stages for these facilities.

Reference: Aviation Fuel Receiving Facility EIA, 1995, ERM (HK) Ltd.

5.1 Airport Development Environmental Commitments

5.1.1 Summary of Issues

One of the major challenges of developing the airport in North Lantau waters related to placing a 14-sq-km manmade platform in an area where substantial and complex tidal currents are experienced.

Airport development environmental mitigations relating to tidal flow and water quality focused on monitoring the impact of the extensive marine borrow and backfill activities, being done in conjunction with the reclamation, on marine water quality – both around the site of the platform and around the numerous marine borrow and backfill sites that were used in Hong Kong waters. In addition, some commitments were made relating to having appropriate arrangements in place for sewage collection and disposal during the airport development period, and to having adequate water quality controls in place, for example around concrete and asphalt batching plants.

A key focus of the 1992 NAMP-EIA Supplement (done as a result of the airport platform being shifted east to west as a design change) was whether the revised channel geometry in the southern sea channel would result in any deterioration in sea channel hydrodynamics and associated water quality. As well as moving portions of the platform from east to west, the platform shift also resulted in the need to remove the Sha Lo Wan headland from the western entrance to the sea channel, which resulted in a revised geometry for the west end of the sea channel.

In addition, the 1995 Aviation Fuel Receiving Facility EIA required the implementation of a range of environmental controls and mitigation measures relating to jetty construction, pipeline laying and the creation of an access channel and turning circle for fuel tankers. These related to minimising impacts on water quality and came with associated water-quality monitoring and audits requirements.

The start of reclamation works at Chek Lap Kok.

HKIA under construction.

5.1.2 Current Status of Implementation

a) *A flushing channel, which would maintain tidal flows and water speeds similar to those at present, was previously*

strongly recommended to PAA and was approved. Implementation of the channel will prevent potential siltation and enhanced phytoplankton growth in East Tung Chung Bay. (P28-8, 1991 NAMP-EIA)

The 1998 NAMP-EIA Update reported that the flows in the completed sea channel between the airport and North Lantau were found to meet and exceed the flushing characteristics assumed in the airport platform design study (Greiner-Maunsell, 1996). The same study also found that net deposition in the channel was not occurring based on bathymetric data or on water speed and suspended sediment analysis, and that the sea channel would be self-cleansing. Studies indicated that there would not be a need for maintenance dredging to maintain the final configuration of the channel.

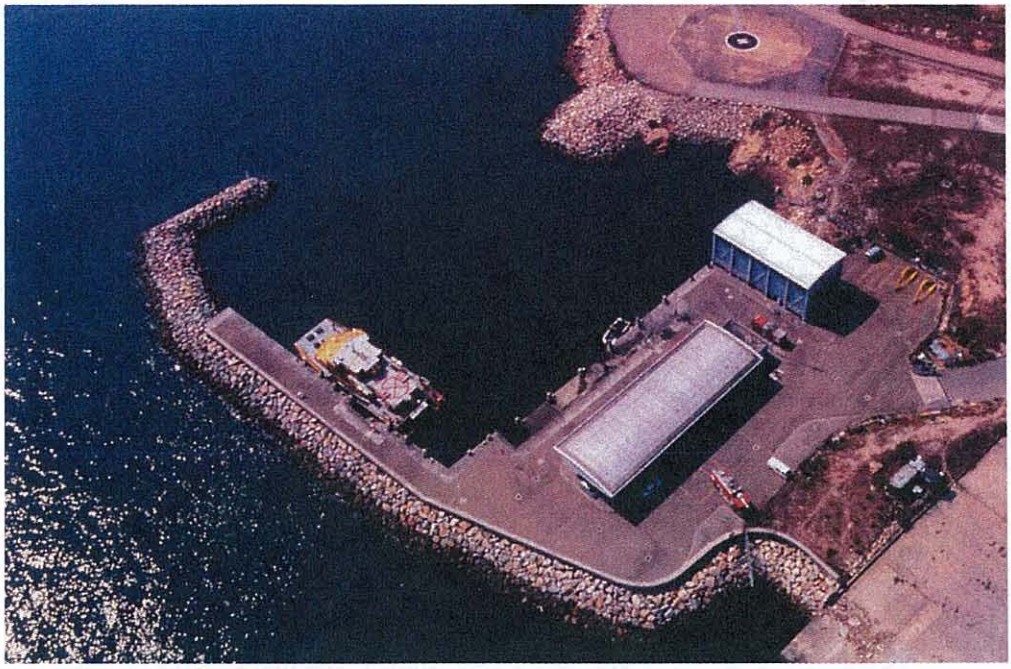
Since 1998, the Airport Authority has routinely updated the bathymetric survey of the seabed around the airport platform in order to monitor any trends in both scouring and sedimentation, and this is further reported on later in this section.

Periodic non-statutory water quality monitoring has been undertaken in the sea channel and East Tung Chung Bay, which confirms that there has not been any significant deterioration in water quality attributable to either the configuration of the sea channel, or arising from airport stormwater runoff. Findings from the non-statutory monitoring programme are reported further in section 7.1.3.

Monitoring of the southern sea channel showed no deterioration in water quality.

b) *A water-quality monitoring programme should be implemented by the Airport Authority and carried out by the engineer. Monitoring should be undertaken at the airport site and borrow areas to determine background conditions, assess compliance during the works and as a final check on water quality once the scheme has been completed. Water-quality monitoring stations should be sited to reflect the position of sensitive receivers. Background monitoring at all gazetted areas should commence as soon as possible after the contract is awarded (P28-8, 1991 NAMP-EIA).*

Marine works still underway at the time of the 1998 Update with the potential to impact both tidal flows and water quality was limited to the relatively minor dredging and filling works associated with construction of the Sea Rescue Facilities (SRF).



Both Sea Rescue Facilities, east (top) and west, incorporated a breakwater.

The development of the design for the SRF at HKIA ultimately required that certain changes to the preliminary design put forward in the NAMP had to be made. For example, both SRFs incorporated a breakwater. Between April 1997 and February 1998 the Airport Authority conducted an EPD-agreed water-quality monitoring programme around the two marine works sites for the SRFs. On completion of the works a short period of post project audit monitoring was undertaken.

Results from the remaining monitoring were consistent with earlier results from this programme and were reported to the EPD. In line with the findings from other airport-related monitoring, a number of exceedance incidents were recorded over the period of works in this area. However, the combination of complex tidal and local current regimes in the monitoring areas, potential impacts from other projects undertaking marine works within the same works areas, and significant daily and seasonal external influences meant that directly attributing recorded exceedances around these works to the relatively minor SRF works activities was not possible.

c) *Contractors should be required to provide portable sewage facilities for construction workers and to make appropriate arrangements for sewage collection and disposal (P28-8, 1991 NAMP-EIA).*

Around the time of HKIA's opening the Airport Authority's temporary sewage outfall was decommissioned, with the associated screening plant demobilised. Further to the demobilisation of the plant, all foul sewage arising from newly developed permanent airport facilities was discharged to the airport communal foul sewage network. Ongoing construction work and supporting office functions undertaken in locations distant from communal foul sewers made use of either regularly desludged holding tanks or chemical toilets.

d) *Contractors should be required to provide silt traps at concrete-batching and asphalt plants to collect, settle and recycle water used for dust suppression purposes and vehicle washing (P28-8, 1991 NAMP-EIA).*

The number of concrete batching plants active on the airport reduced to two shortly after airport opening, primarily supplying concrete to the Terminal Building North West concourse works. In addition, one asphalt plant continued to provide asphalt to the northern runway works. All plants were required to meet applicable statutory licensing requirements and, in addition to this, adequate measures were safeguarded via specific clauses within contract General Specifications to ensure that any water arising from site activities did not discharge directly to the sea, and that sediment traps were installed and correctly utilised at all sites. Common practice at

batching plants was the reuse of supernatant in the concrete production process or in dust suppression activities.

5.2 Airport Operational Environmental Commitments

5.2.1 Summary of Issues

The 1991 NAMP-EIA made use of extensive modelling and simulations to determine the potential impact that the new airport platform might have on existing North Lantau tidal flows, siltation patterns and on water quality in general. In summary, the simulation predicted that:

- The reclamation would have little impact on flows remote (eg, over 3km) from the reclamation;
- In the area immediately to the west of the reclamation, flows would reduce significantly; and,
- Water velocities in the embayed area to the east of the reclamation also had the potential to reduce significantly.

Principal concerns relating to the changes in marine hydrodynamics were: the continued ability of the approximately 4km sea channel between the north Lantau coast and HKIA to effectively flush and provide sufficient water circulation to East Tung Chung Bay and the potential for longer term impacts from stormwater runoff to adversely impact area marine water quality. A number of mitigations were required relating to these potential impacts.

Also, a number of design and operations commitments were made relating to stormwater runoff and its management from the airport platform, as well as arrangements for collection and disposal of foul sewage, particularly from large scale generators of non-domestic sewage like aircraft caterers and the Fire Service Department's fire training facility.

5.2.2 Current Status of Implementation

a) *The sea channel, which is a PAA approved feature of the Master Plan, should be retained and protected to ensure that East Tung Chung Bay is properly flushed.*

As reported in the 1998 NAMP-EIA Update in section 6.1.2, "based on existing water quality in the area, tidal flow through

the sea channel is expected to adequately safeguard water quality within the channel and in East Tung Chung Bay, and it is not anticipated that maintenance dredging will be required to maintain the channel's final configuration. The Airport Authority will continue to undertake periodic bathymetric surveys."

The Airport Authority has continued to undertake periodic bathymetric surveys in order to monitor changes in the sea channel and in other areas around the airport platform. In addition, a programme of non-statutory marine environmental monitoring has been undertaken, primarily relating to stormwater runoff and potential to monitor declines in the sea channel and regional water quality.

Exhibit 5.1 is an Isopach drawing showing depth changes on the seabed around the airport between 1998 and 2005. Survey results serve to identify potential siltation problems, and the need for any remedial measures can be closely tracked based on the revealed detail.

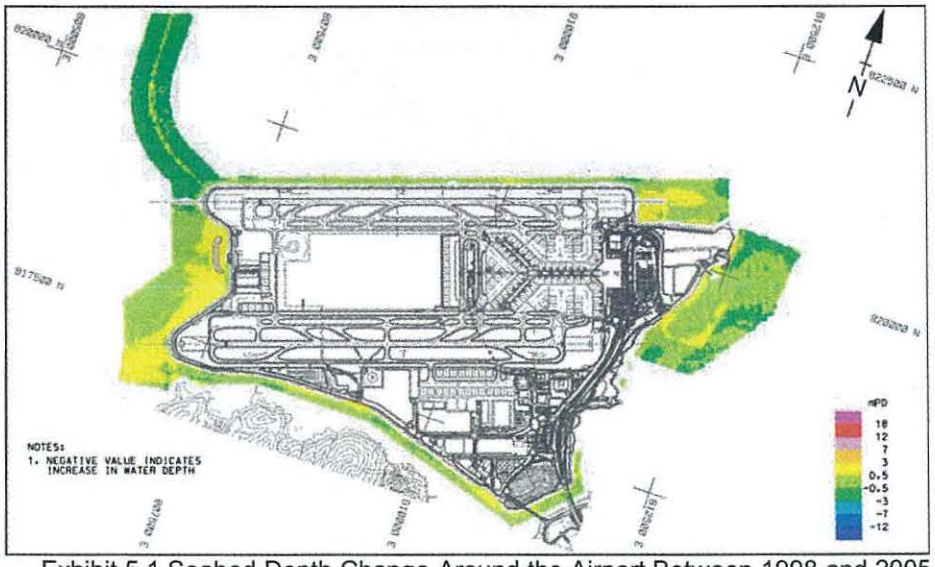


Exhibit 5.1 Seabed Depth Change Around the Airport Between 1998 and 2005.

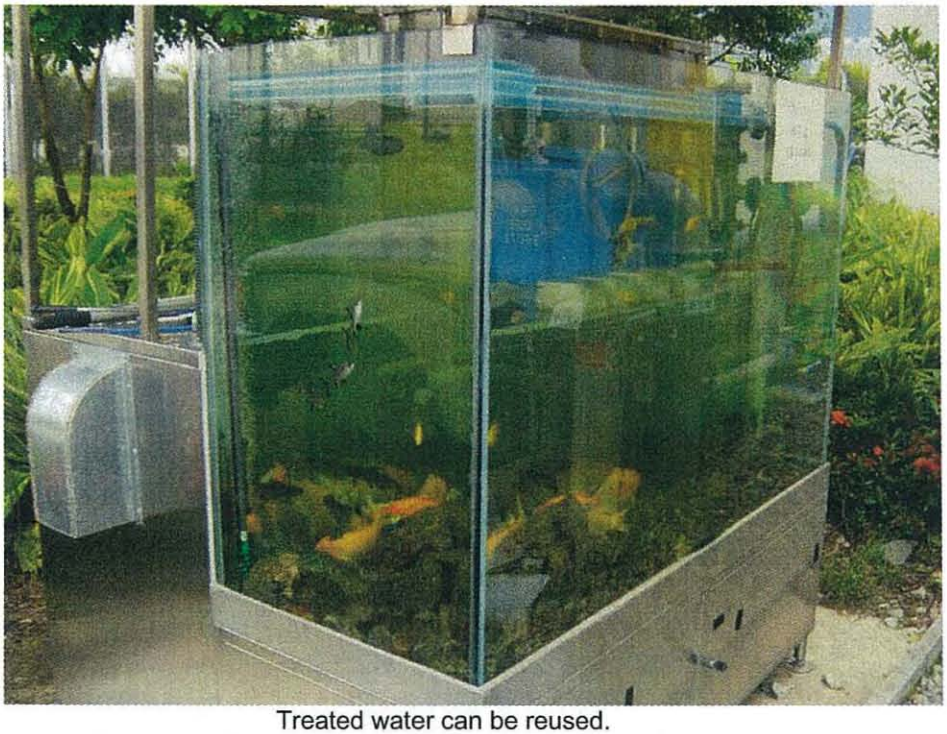
Survey results show that there is some siltation near the west sea rescue stations and under the second bridge crossing to Tung Chung, however the siltation has yet to pose a navigation problem as the vessels using these areas are of shallow draft. The area near the west fuel berthing facilities has recently been dredged to enable the west quay to be used as an additional means of aviation fuel supply by small fuel supply vessels. Ongoing monitoring identifies no immediate need for further maintenance dredging.

b) *PAA should provide dedicated aircraft washing bays with interception and discharge of runoff to foul sewer, and an automatic bypass to the storm sewer system under storm conditions. Tenants may need to consider flow balancing and/or pre-treatment of washwater to comply with the Technical Memorandum on Effluent Standards, or substitution of lighter detergent formulations used at low application rates.*

Aircraft washing takes place in dedicated bays.

Arrangements for aircraft washing remain the same as reported in the 1998 update. Five dedicated wash bays located around the terminal building are equipped with systems to intercept and divert wash waters to the Airport Authority's Grey Water Treatment Plant when washing takes place, with bypass systems incorporated to the storm sewer system under storm conditions.

Wash waters are diverted to the Grey Water Treatment Plant.



Treated water can be reused.

Maintenance base washstands are being relocated as a result of the construction of a new aircraft maintenance hangar. Arrangements for waste water collection and disposal will remain the same at the relocated wash stands – namely, interception and diversion to an underground storage tank. When this tank is full, effluents are pumped from the tank and

taken to an appropriate treatment facility. During rain events water is diverted to the storm sewer system.

Wash bays were relocated as a result of the construction of an additional aircraft hangar.

c) *PAA should provide or specify in lease conditions, centralised vehicle washing facilities, preferably with brush washing and water recycling, to be used by tenants undertaking vehicle washing.*

The Airport Authority has constructed a vehicle wash facility at its Vehicle Examination Centre. The wash facility incorporates a water recycling and treatment system, prior to discharging to the foul sewer. Airport Franchisees and tenants are required to obtain WPCO licences from the EPD and must comply with all statutory requirements for wastewater discharges from their own facilities, including for vehicle washing activities. Compliance with local statutes is checked on a routine basis during Airport Authority audits of Tenant facilities. Vehicle washing facilities are also located in the landside petrol filling stations.

The Airport Authority has obtained statutory discharge licences from the EPD under the Water Pollution Control Ordinance (WPCO). The Airport Authority is required to monitor the quality of wastewater discharges in many cases as a licence requirement. Details of Airport Authority statutory licences are listed in the table below.

Quality of wastewater discharges is monitored at HKIA.

Table 5.1 Airport Authority Water Pollution Control Ordinance Licences

Type of Discharge	Licence	Monitoring Requirements
Foul sewage discharge from the Airport Authority's premises, including: - PTB - GTC - APM maintenance facility - Trichurator A & B - VEC - Airport Authority Building (AAB)	5 years	Monthly monitoring of the following parameters is required: - Oil & grease - Chemical oxygen demand - Biochemical oxygen demand - Total phosphorus - Formaldehyde
Cooling water discharge from seawater cooling system in: - PTB - GTC - AAB	2 years	- Daily monitoring of temperature - Weekly monitoring of total residual chlorine - Monthly monitoring of Amine
Storm water discharges through the Airport Authority-owned petrol interceptors	5 years	No sampling and reporting is required

d) *PAA should develop a standardised spill response for fuel or oil spills, involving the use of vacuum suction or absorbent*

materials for small spills on non-critical areas, and water dispersion and containment in the storm sewer system for large spills on critical areas such as runways. An emergency response plan should be developed for the latter, using a computer programme of the storm sewer system to identify appropriate containment locations.

The Airport Authority's overall contingency response plan is developed and maintained by its Airport Management Division as part of the "Emergency Procedures Manual".

Spill response at the airport involves the co-ordination of many different parties with varying levels of responsibility. For aviation fuel spillage, the lead response agency is the Airport Fire Contingent of the Fire Services Department. Clean-up activities are the responsibility of the airline, Into-plane Fuelling Franchisee and the line Maintenance Franchisee. Spills entering the marine environment also require the involvement of the Marine Department and EPD in the response.

Spills to occur from time to time at airports, however the majority of these are minor in nature. Table 7.2 presents a list of possible causes of spill and assigns the most likely party responsible for clean-up.

Table 5.2 Potential Locations and Causes of Fuel Spills

Cause/Location	Party Responsible for Clean-up
Refuelling of aircraft at the Passenger Terminal Building and Air Cargo stands	Airline, Into-plane Fuelling Franchisees, and/or Line Maintenance Franchisees providing first response.
Refuelling of aircraft at Government Flying Services	Government Flying Service
Refuelling at Business Aviation Centre	Business Aviation Franchisee and /or Into-plane Fuelling Franchisees
Improper operation of fuel hydrant controls	Into-plane Fuelling Franchisees
Overfilling of fuel storage tanks or break in fuel line	Fuel System Franchisee
Spillage at Petrol Station	Petrol Station Franchisee
Vehicle fuel leaks/venting from parked/taxiing aircraft	Vehicle fuel leaks – Vehicle Owner Parked/Taxiing Aircraft – Airline, Into-plane Fuelling Franchisees, and/or Line Maintenance Franchisees providing first response.
Refuelling of aircraft at main apron	Airline, Into-plane Fuelling Franchisees, and/or Line Maintenance Franchisees providing first response.

If a fuel spill should take place and it is not possible to identify the offender, then the Airport Authority will take appropriate

clean-up action through the Apron Cleaning Contractor and/or its Term Maintenance Contractor.

e) *PAA should provide oil interception systems for the removal of oil and fuel from stormwater. These should include tilted plate oil interceptors serving the main apron areas where refuelling occurs, and interceptors at the fire training facility. Requirements for oil interceptors at the fuel farm and bypass interceptors at car parks and vehicle refuelling stations should be specified in lease conditions as appropriate. PAA should maintain oil booms for emergency deployment at the main stormwater outfalls.*

The Airport Authority has continued to install oil interception systems as required to fit the land use and size of different areas. All government tenants and commercial franchisees have been notified of the requirement for interceptors and they have been installed in all new airport facilities as required, with WPCO licences obtained from the EPD.

The Airport Authority maintains an appropriate level of spill response capability via agreements with its term maintenance contractor. The contractor has sufficient spill response equipment available to effectively respond to all spill scenarios that are likely to be encountered at HKIA, and the contractor is on call 24 hours a day.

f) *PAA should consider a penalty system for fuel and oil spills associated with poor maintenance of aircraft, vehicles and refuelling systems. Detailed records of all spills should be kept for auditing purposes.*

The Airport Authority holds liable any tenant or other party responsible for a spill. For every aviation fuel spillage case within the airfield, the Airport Authority will conduct investigation to find out the cause of the incident and to identify preventive measure(s), and a review panel comprised of the involved airline, line maintenance franchisee, Into-plane Fuelling Franchisee and Civil Aviation Department will be established to review the case. A report will then be submitted to Civil Aviation Department on the findings and conclusions. The Authority's Airport Management Division maintains a log and case files of all spills.

g) *PAA should ensure regular and effective maintenance of storm drains and oil interception and removal installations. PAA*

environmental staff should be given a mandate to monitor the maintenance operations.

The Airport Authority's Technical Services Unit undertakes maintenance of storm drains and oil interceptors. The Airport Authority's Environmental Group audits these activities as part of its operational environmental monitoring and audit programme. In addition, government and private tenants are responsible for maintaining their own oil interceptors and are required to conduct regular audits on these systems as part of their own EM&A and EPD license compliance programmes.

h) *PAA should maintain a centralised inventory of chemicals and review new chemicals before adoption. An operations manual should be developed by PAA environmental staff detailing good practice procedures for the storage, handling and use of chemicals, and clean-up strategies for chemical spills once land use and design details have been finalised. Tenants should be required through lease conditions to adopt these good practice procedures.*

The Airport Authority maintains a centralised inventory of chemicals, and ensures that any new chemical used within the Airport Authority's premises is reviewed before approval. All employees handling, storing or using chemicals are trained in the proper handling of these materials, and in proper clean-up techniques. Tenants, pursuant to their lease conditions, are responsible for the proper management of their chemicals in accordance with the relevant regulations.

i) *PAA should highlight the requirements for monitoring licensed trade effluents in lease conditions, and should undertake monitoring of stormwater quality, including discharges from oil interception systems and the main stormwater outfalls. Monitoring data for both foul and stormwater discharges should be audited on a regular basis by PAA environmental staff to check compliance with standards and the need for improved pollution control measures.*

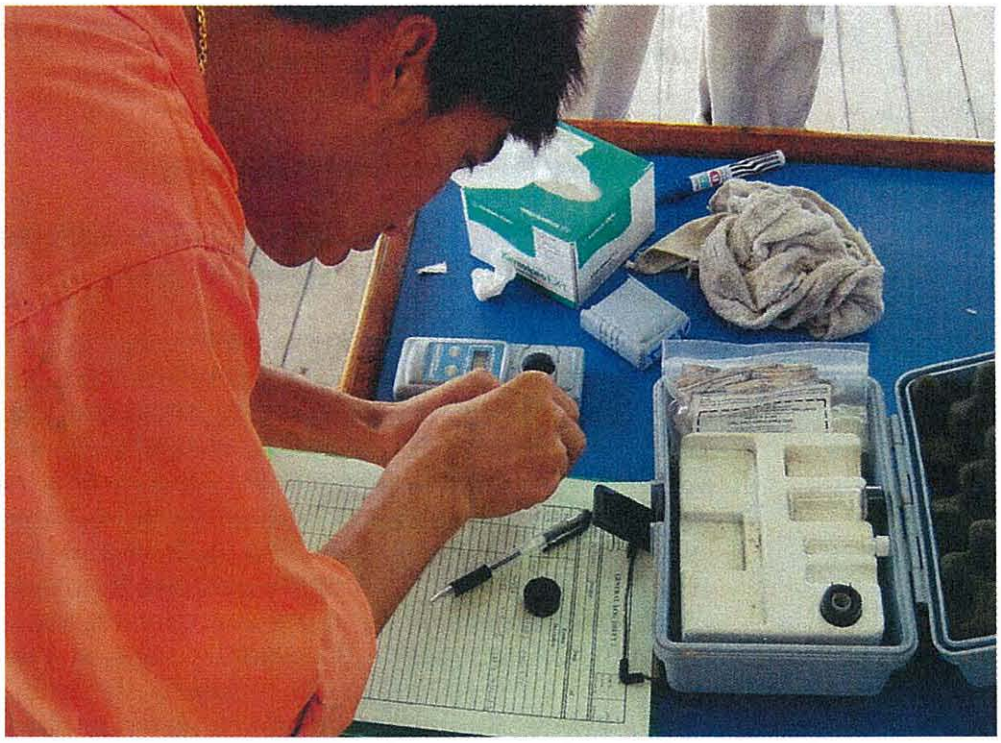
Pursuant to the terms of their lease agreements, all franchisees and tenants are required to complete an EMP, which identifies statutory licence responsibilities and associated environmental management strategy. Where licences are required, it is the responsibility of the tenant to obtain these licences and to comply with licence conditions (including monitoring). As part

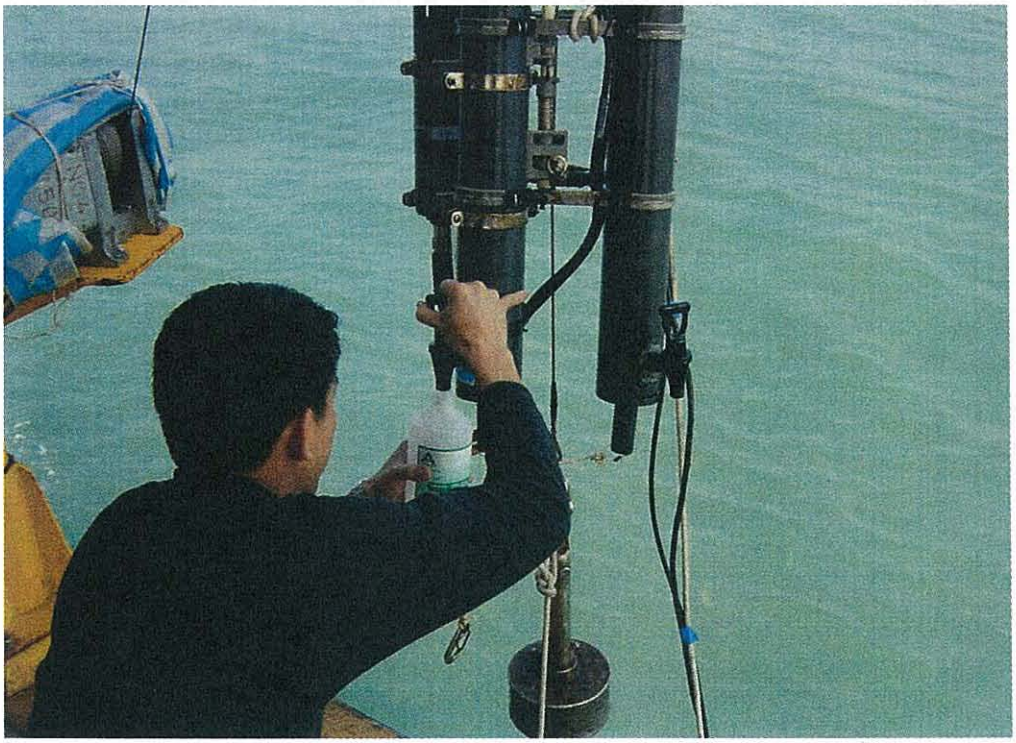
of their EMPs, airport tenants are also required to conduct regular audits of environmental compliance.

5.2.3 Non-Statutory Marine Environmental Monitoring

5.2.3.1 December 1998 to November 1999 Non Statutory Marine Environmental Monitoring Study

In order to demonstrate that water quality was being maintained in East Tung Chung Bay and the sea channel, and to demonstrate that potential pollutants loads from the operating airport were not adversely impacting the surrounding marine environment, the Airport Authority committed to undertaking a programme of non-statutory marine environment monitoring over the first year of airport operations. The three-part study consisted of water-quality monitoring in the sea channel between the airport platform and the North Lantau coast; an evaluation of water quality impacts in area waters surrounding the airport platform from cooling water discharges passing through HKIA stormwater outfalls; and an assessment of marine sediment quality over time around HKIA. The EPD agreed that this three-part study would meet the specific requirements for operational non-statutory stormwater monitoring detailed in the 1991 NAMP-EIA.





Marine water monitoring is carried out to assess water quality.

Marine Water Quality Studies

The broad objectives of this part of the study were:

- The determination of the significance of stormwater discharges from the airport platform with respect to water quality relative to existing baseline data;
- An assessment of the likely impact of any changes in water quality due to the stormwater discharges on marine ecology and sensitive receivers; and
- The differentiation, to the extent practicable, between impacts resulting from the stormwater discharges from the airport and discharges from other contributors, including Tung Chung New Town and the North Lantau Expressway.

Monitoring of a range of pollutant parameters was undertaken at 10 monitoring locations and two control stations once per month for 12 months. The one-year study concluded in summary that:

- Compared with available baseline data, there was no indication that stormwater runoff from the airport, or any other local contributors, was having an adverse impact on marine water quality;
- All data collected was found to comply with Water Quality Objectives (WQOs) established for the North Western Water Control Zone and there was no indication that stormwater discharges from HKIA were having an adverse impact on water quality;
- Total Residual Chlorine (TRC) levels (in cooling water discharges) were within the expected Control Station range of 0.015±0.005mg/L;
- TRC distribution and levels in East Tung Chung Bay were not found to tie in with the levels of TRC in cooling water discharges from Airport Outfall 10; and,
- No Biocide concentrations (in cooling water discharges) attributable to airport operation were detected.

Sediment Quality Studies

The objective of the marine sediment-monitoring programme is to assess any longer term impact of pollutants in airport stormwater discharges on sediment quality at seabed locations near to the airport. A baseline

sediment quality survey was carried out at the start of the programme, with a second identical sediment quality survey being carried out 11 months later. Additional historic sediment quality data for North West New Territories coastal waters was also used in the assessment of the sediment quality.

The one-year study concluded, in summary, that:

- There was no significant difference in sediment quality between the baseline survey of March 1999 and the second survey 11 months later;
- There was no significant difference between the data sets collected in this study and those obtained before and during the airport construction from similar locations; and,
- By implication, the stormwater discharges from airport operation have not had a significant impact on sediment quality.

Cooling Water Dispersion Study

Some AAHK buildings and a number of tenant facilities make use of seawater for cooling. Seawater is pumped to all cooling water users from AAHK seawater pump houses. The seawater undergoes electrochlorination before passing through heat exchangers and being returned to the sea through several stormwater outfalls. The system is also treated with biocide once per week,. A water-quality monitoring programme was undertaken such that monitoring was carried out over 24-hour periods on large and small amplitude tides in the wet and dry seasons. The monitoring stations were located 50m and 200-300m from each outfall. The locations of the monitoring stations were selected based on the results of computer model simulations and the programme was designed to identify any water quality gradients that might result from the cooling water discharges.

The objectives of this part of the study were:

- To identify any impacts on water quality in receiving waters and, if any, on marine ecology;
- To determine the extent of elevations in temperature, TRC and Biocide concentrations around cooling water discharge outfalls, and whether or not any such

elevations are significant with respect to the relevant WQOs and limit levels set by the EPD; and,

- Identify the extent of any mixing zone outside of which the WQOs and EPD target concentrations are likely to be met.

The study concluded that:

- No consistent mean temperature gradients were detected in a mixing zone. Average temperature differences between the outfall and mid-field stations were generally small (<0.2℃) and could be naturally occurring;
- Differences in daily averaged and instantaneous water temperatures between control and outfall stations were generally small and did not exceed WQOs;
- The data did not identify any consistent gradients in the TRC concentrations that would indicate a well-defined impact from the cooling water discharges and allow a mixing zone to be identified. The radius of any TRC mixing zone, therefore, would be less than the distance from the outfall to the nearest monitoring station (50m) and the general background TRC that was consistently observed at most stations is possibly being generated elsewhere;
- In many instances, the TRC concentrations measured at the offshore locations (200-300m from outfalls) and the control station were higher than those measured close to the outfall (50m away), which suggests a source of TRC other than the airport cooling water discharges; and,
- The active ingredient in the biocide, amine, was periodically detected at concentrations showing negligible dilution following discharge and at times many hours after the biocide injection. It was concluded that the manufacturer's recommended test was non-specific and was detecting naturally occurring amine generated by phytoplankton activity. It was therefore concluded that elevated levels measured in the receiving waters were not due to HKIA cooling water discharges.

The one-year study found that the operation of HKIA was not having a discernable impact on water and sediment

quality in adjacent waters in terms of potential pollutants in stormwater runoff.

The non-statutory marine environmental monitoring programme has been updated twice since the first round, once over the period November 2002 to October 2003, with a further update currently underway (October 2005 to October 2006). The objective of undertaking these further monitoring efforts remains the identification of any adverse impacts on marine waters or seabed sediment quality around HKIA.

5.2.3.2 November 2002 to October 2003 Non-Statutory Marine Environmental Monitoring Update

In 2002, the AAHK commissioned the second round of non-statutory marine environmental monitoring to update the findings of the first round. Water and sediment quality monitoring were conducted with monitoring locations and water-quality parameters monitored remaining essentially the same, although fewer monitoring stations were monitored.

Based on the monitoring results, the update concluded that the stormwater discharges from the airport platform did not appear to be having an adverse impact on water quality in the monitoring area. It was, however, noted that relatively high concentrations of TRC were recorded on several occasions, although this was likely the result of increased household usage of chlorinated disinfectant to prevent Severe Acute Respiratory Syndrome (SARS) during the period when high TRC was measured.

The overall findings of the marine environmental monitoring study update were that there are no apparent spatial or temporal trends, either in close proximity to HKIA or more broadly in North Lantau waters, which are indicative of deteriorating water or sediment quality. Stormwater discharges associated with HKIA do not appear to be impacting either local or more regional water and sediment quality.

5.2.3.3 November 2005 to October 2006 Non-Statutory Marine Environmental Monitoring Update

A third round of non-statutory marine environmental monitoring was completed in late 2006. Water and

sediment quality monitoring was conducted using the same monitoring locations and water-quality parameters as used in the 2002 / 2003 update.

Data collected in this round of monitoring shows that water quality parameters analysed were generally in the range recorded in the North West Water Control Zone and there is no indication of water quality deterioration over time and it is unlikely that cooling water and stormwater discharges from HKIA have caused adverse impact on marine ecology in the vicinity of HKIA.

Similarly, although spatial variations in sediment contaminant concentrations were recorded, differences were small and nothing suggested anthropogenic influence. It was found that there was low likelihood that stormwater discharges from HKIA were having any impact on sediment quality around the HKIA platform.

Figures 5.2a to 5.2j show the key water-quality parameters over time from all non-statutory monitoring done to date and Figures 5.3a to 5.3i show the key sediment quality parameters over time from all monitoring (both also show EPD's comparative routine monitoring results).

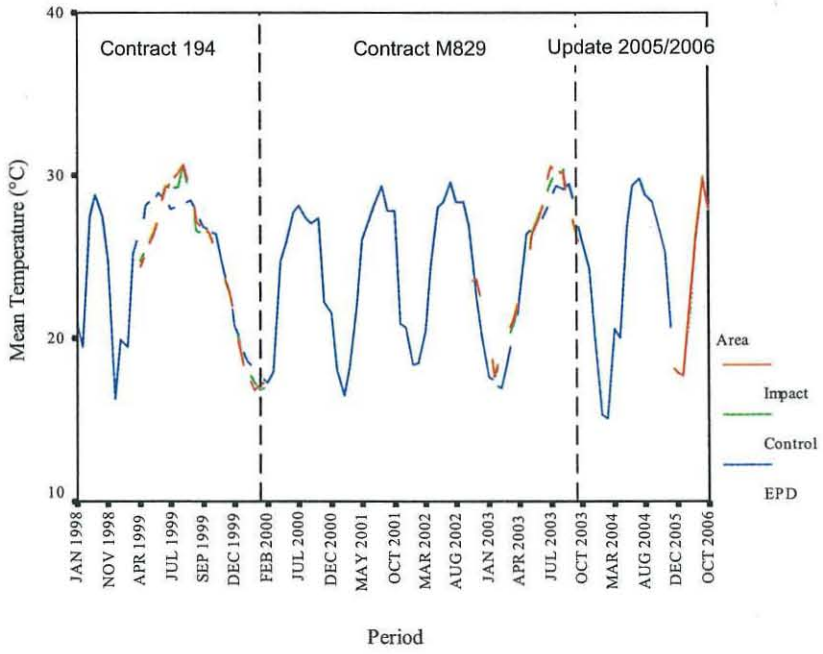


Figure 5.2a Surface water temperature recorded under the Non-Statutory Marine Environmental Monitoring Programme and EPD Routine Water Quality Monitoring.

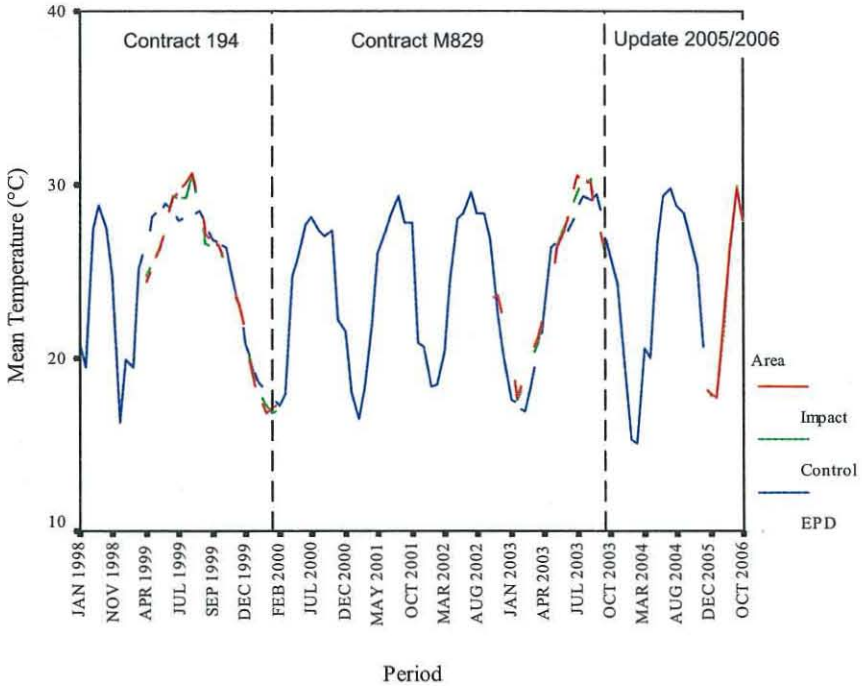


Figure 5.2b **Mid-depth water temperature recorded under the Non-Statutory Marine Environmental Monitoring Programme and EPD Routine Monitoring.**

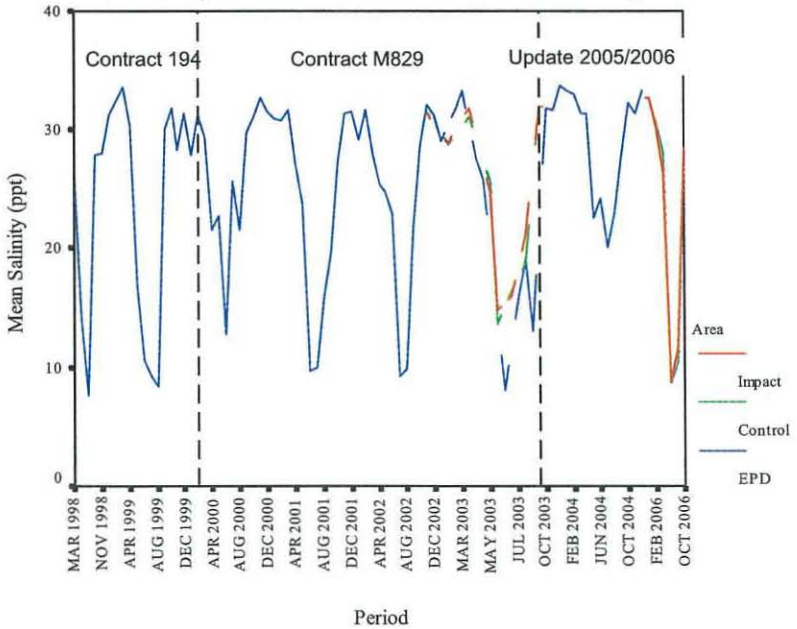


Figure 5.2c **Surface salinity recorded under the Non-Statutory Marine Environmental Monitoring Programme and EPD Routine Water Quality Monitoring.**

Note:
Impact = Stations 2,4,6,7 and 10; Control = Stations C1 and C2; EPD = NM6; Values less than reporting limit (LoR) were substituted with half reporting limit (i.e., ½ LoR).

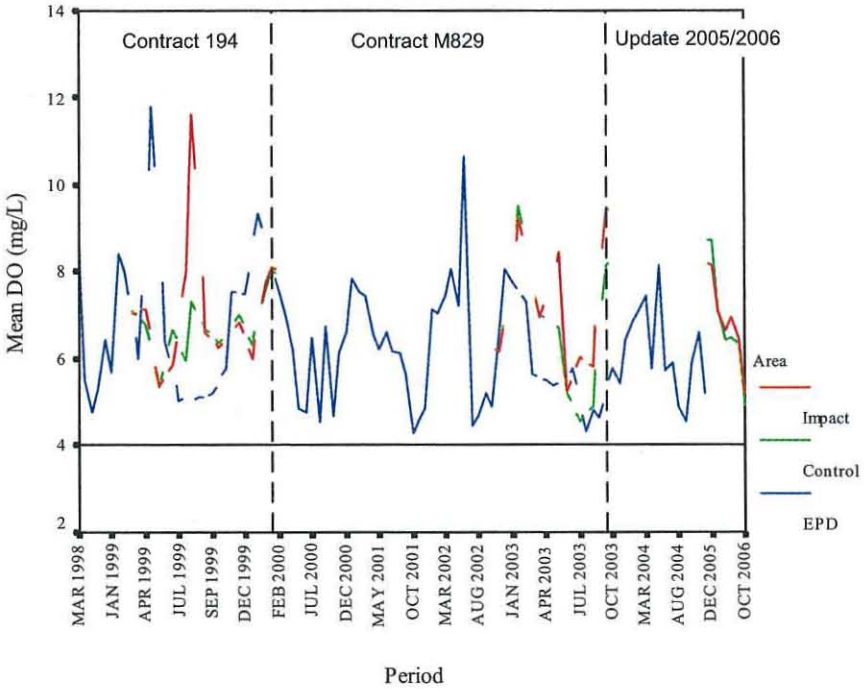


Figure 5.2d **Mid-depth/depth-averaged dissolved oxygen concentrations recorded under the Non-Statutory Marine Environmental Monitoring Programme and EPD Routine Water Quality Monitoring.**

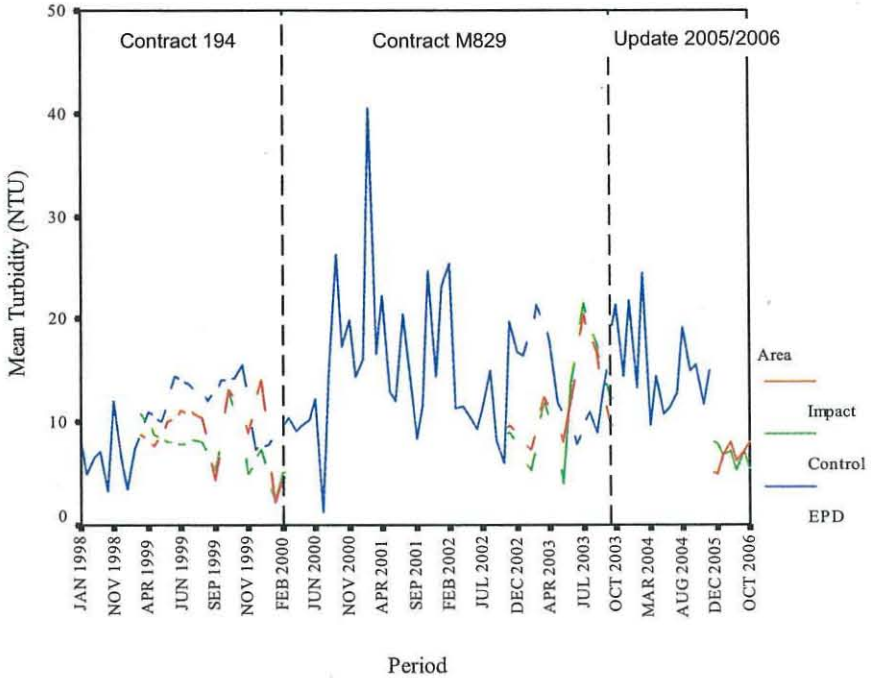


Figure 5.2e **Mid-depth/depth-averaged turbidity recorded under the Non-Statutory Marine Environmental Monitoring Programme and EPD Routine Water Quality Monitoring.**

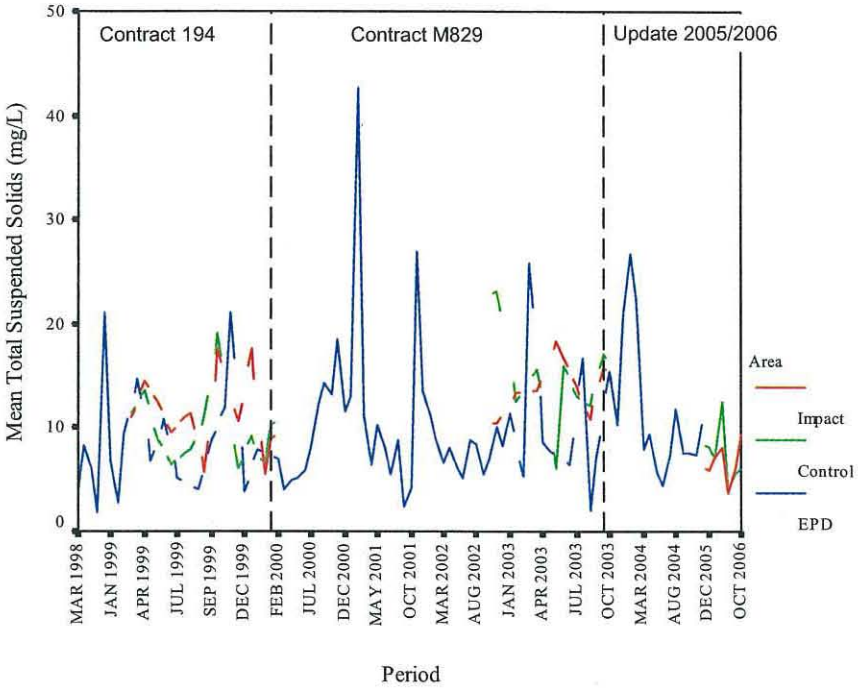


Figure 5.2f **Mid-depth/depth-averaged total suspended solids concentrations recorded under the Non-Statutory Marine Environmental Monitoring Programme and EPD Routine Water Quality Monitoring.**

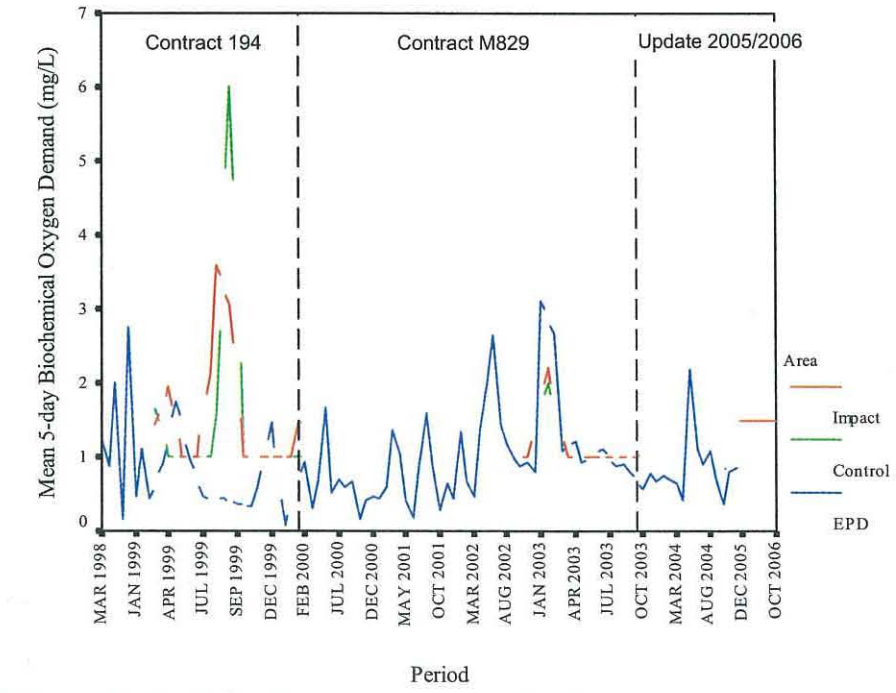


Figure 5.2g **Mid-depth/depth-averaged 5-day biochemical oxygen demand concentrations recorded under the Non-Statutory Marine Environmental Monitoring Programme and EPD Routine Water Quality Monitoring.**

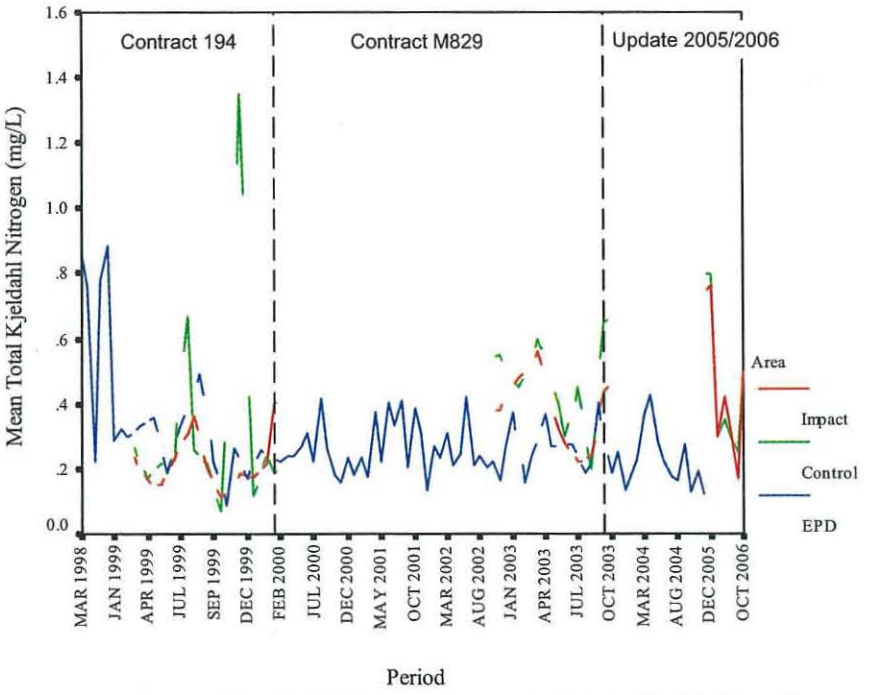


Figure 5.2h **Mid-depth/depth-averaged total Kjeldahi nitrogen concentrations recorded under the Non-Statutory Marine Environmental Monitoring Programme and EPD Routine Water Quality Monitoring.**

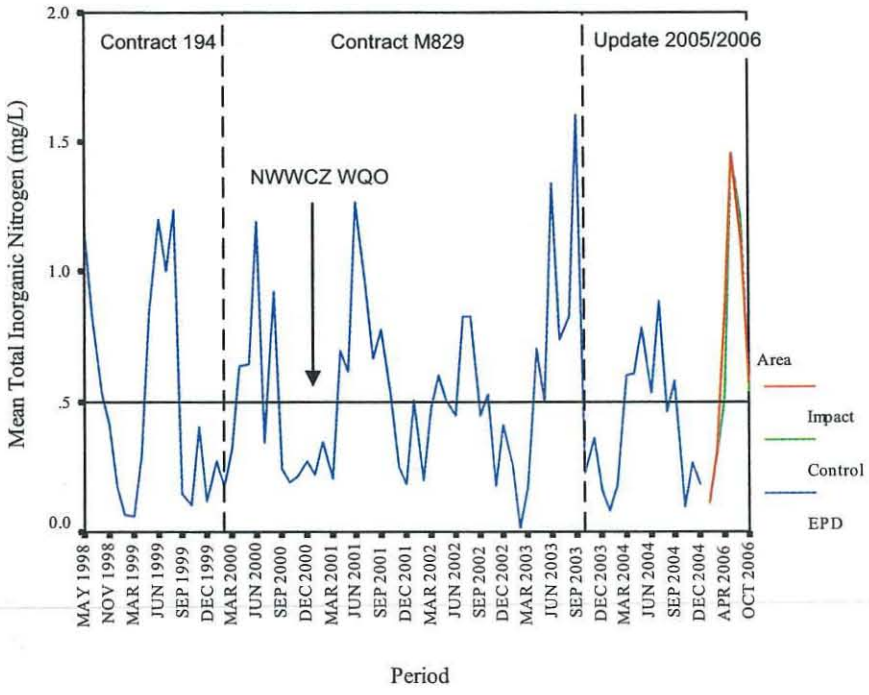


Figure 5.2i **Mid-depth/depth-averaged total inorganic nitrogen concentrations recorded under the Non-Statutory Marine Environmental Monitoring Programme and EPD Routine Water Quality Monitoring.**

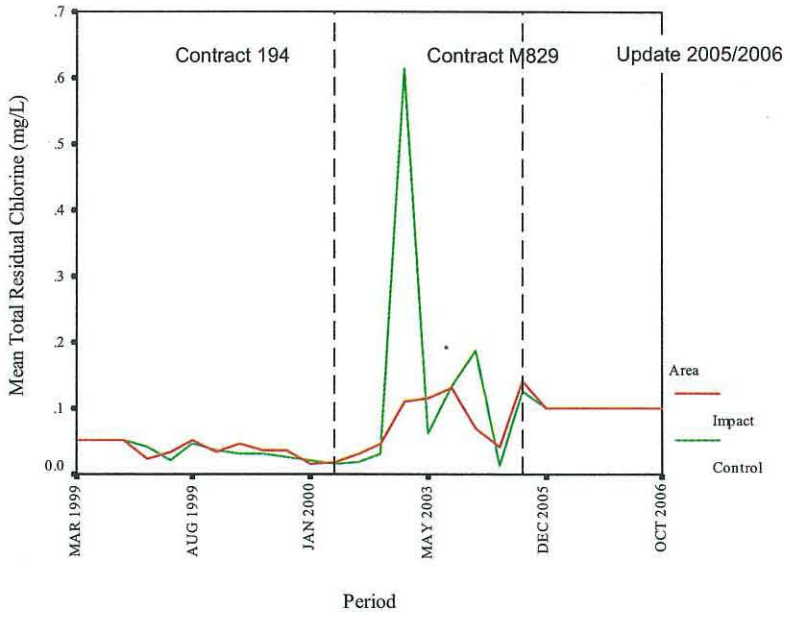


Figure 5.2j Mid-depth/depth-averaged total residual chlorine concentrations recorded under the Non-Statutory Marine Environmental Monitoring Programme.

Note:
Impact = Stations 2,4,6,7 and 10; Control = Stations C1 and C2; EPD = NM6; Values less than reporting limit (LoR) were substituted with half reporting limit (i.e., ½ LoR).

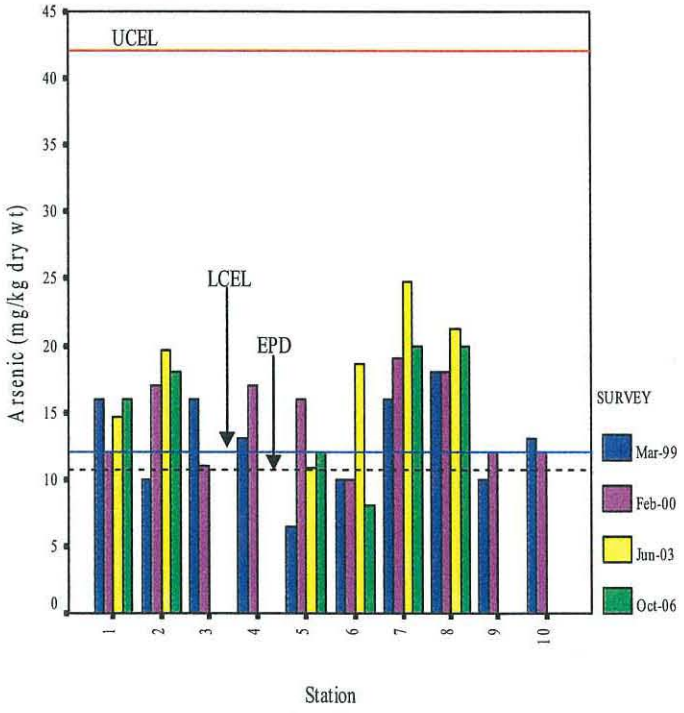


Figure 5.3a Arsenic concentrations recorded under the Non-Statutory Marine Environmental Monitoring Programme and EPD Routine Sediment Quality Monitoring.

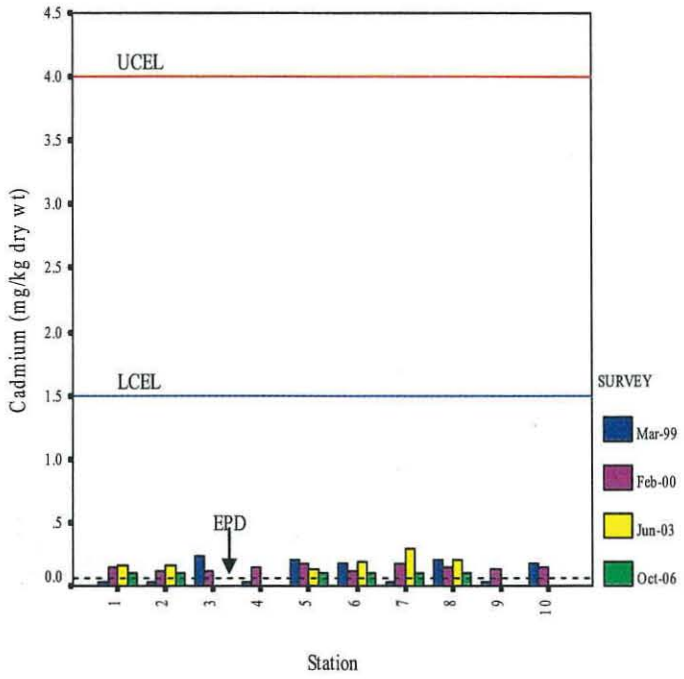


Figure 5.3b **Cadmium concentrations recorded under the Non-Statutory Marine Environmental Monitoring Programme and EPD Routine Sediment Quality Monitoring.** (During the October 2006 monitoring, all measurements were below reporting limit of 0.2 mg/kg dry wt.)

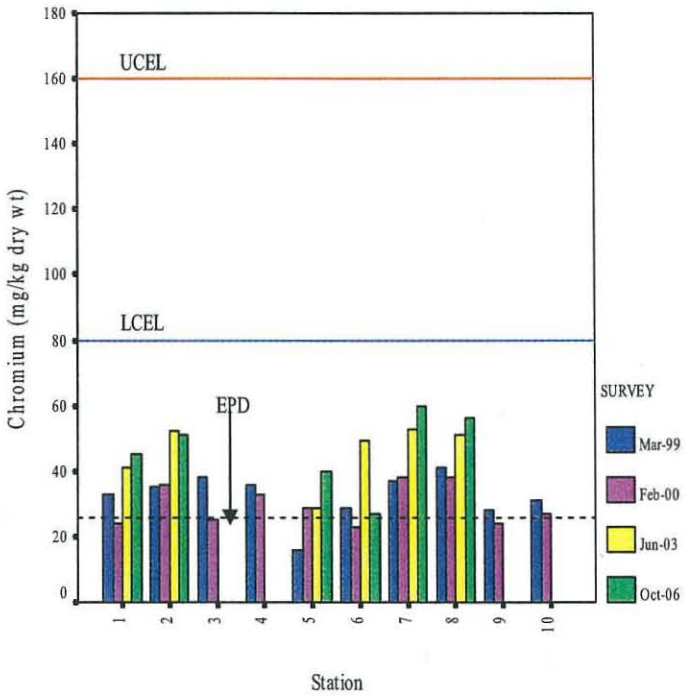


Figure 5.3c **Chromium concentrations recorded under the Non-Statutory Marine Environmental Monitoring Programme and EPD Routine Sediment Quality Monitoring.**

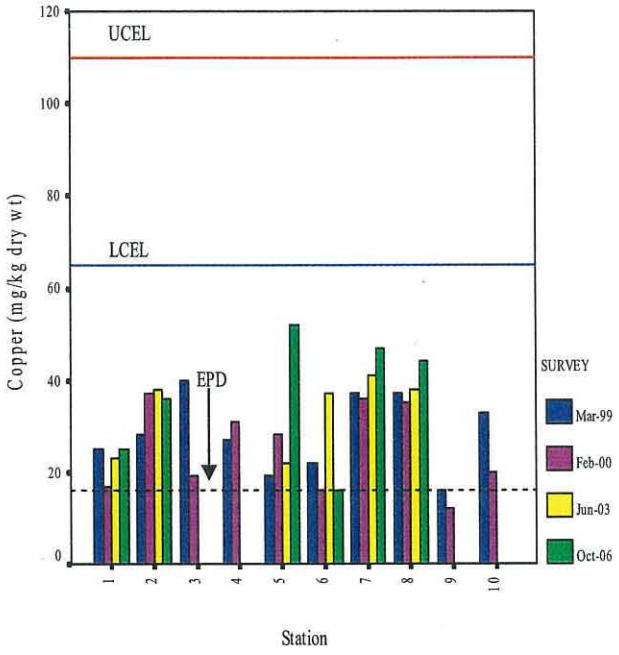


Figure 5.3d **Copper concentrations recorded under the Non-Statutory Marine Environmental Monitoring Programme and EPD Routine Sedimen**

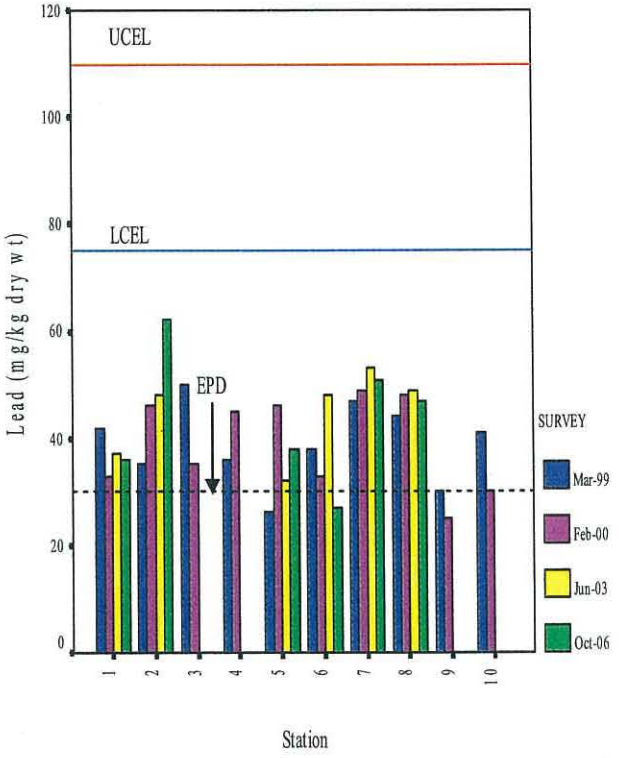


Figure 5.3e **Lead concentrations recorded under the Non-Statutory Marine Environmental Monitoring Programme and EPD Routine Sediment Quality Monitoring.**

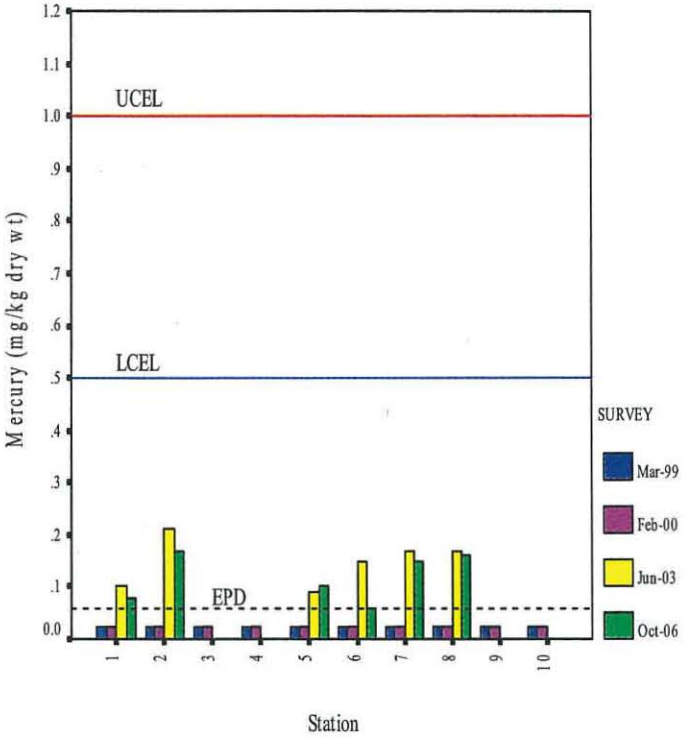


Figure 5.3f **Mercury concentrations recorded under the Non-Statutory Marine Environmental Monitoring Programme and EPD Routine Sediment Quality Monitoring.** (Measurements in 1999 and 2000 were below reporting limit of 0.05 mg/kg dry wt)

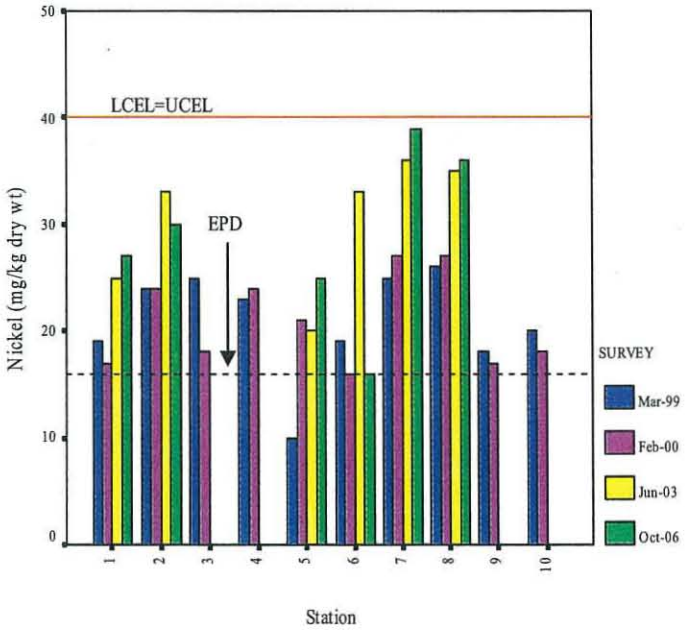


Figure 5.3g **Nickel concentrations recorded under the Non-Statutory Marine Environmental Monitoring Programme and EPD Routine Sediment Quality Monitoring.**

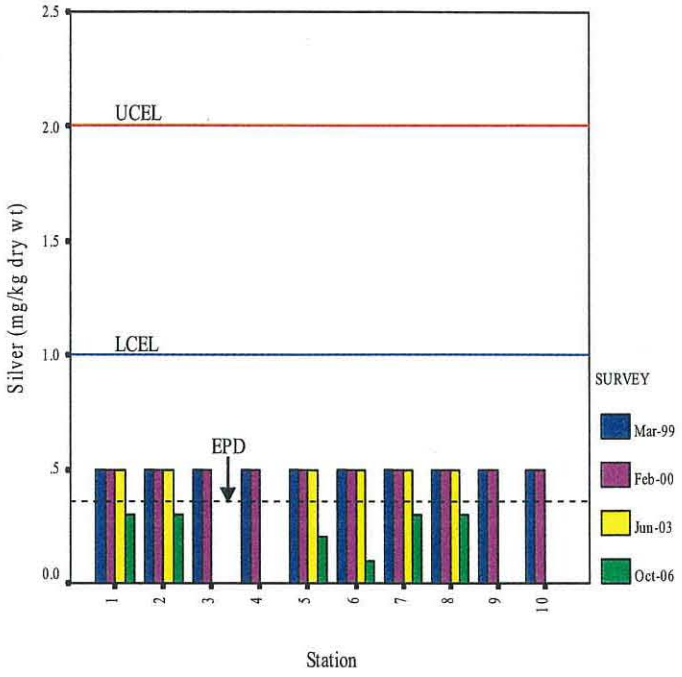


Figure 5.3h Silver concentrations recorded under the Non-Statutory Marine Environmental Monitoring Programme and EPD Routine Sediment Quality Monitoring.

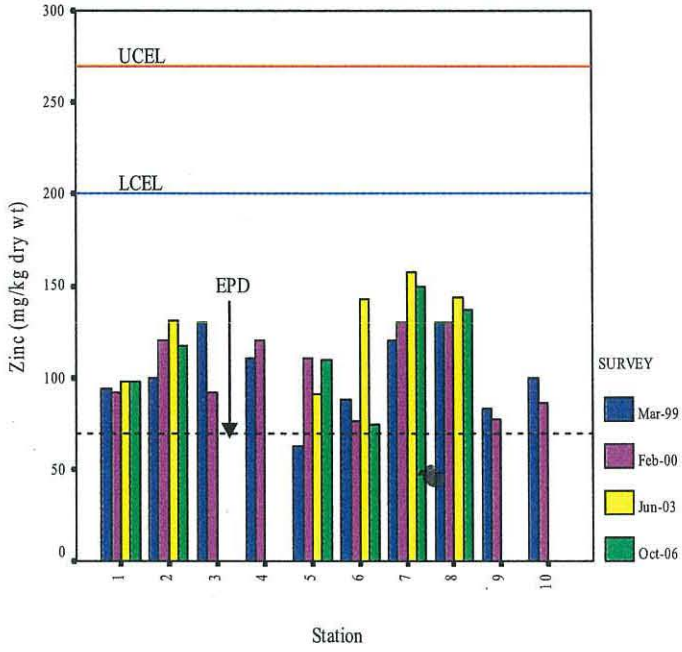


Figure 5.3i Zinc concentrations recorded under the Non-Statutory Marine Environmental Monitoring Programme and EPD Routine Sediment Quality Monitoring.

Note: EPD = Time-averaged value of EPD NS6 station between 1998 and 2004. Values less than reporting limit (LoR) were substituted with half reporting limit (i.e., ½ LoR).

6.1 Airport Development Environmental Commitments

6.1.1 Summary of Issues

The substantial expansion of the original Chek Lap Kok Island inevitably led to actual and potential impacts on area marine ecology, which extended to the numerous marine borrow and backfill areas used for the reclamation; this was anticipated in the 1991 NAMP-EIA and its Supplement. Impacts of airport construction on marine biota predominantly related to the destruction of benthic fauna in the immediate vicinity of dredging, reclamation and back-filling activities, and disturbance to fauna in surrounding areas through the dispersion of suspended sediments.

The 1991 NAMP-EIA included marine ecological surveys of the different marine communities expected to be affected by the development of HKIA, including bottom invertebrate communities, shorelines and on other marine ecology including fish diversity and marine mammals. Airport development environmental commitments and mitigations were mainly intended to offset, compensate and mitigate these anticipated impacts from the reclamation phase.

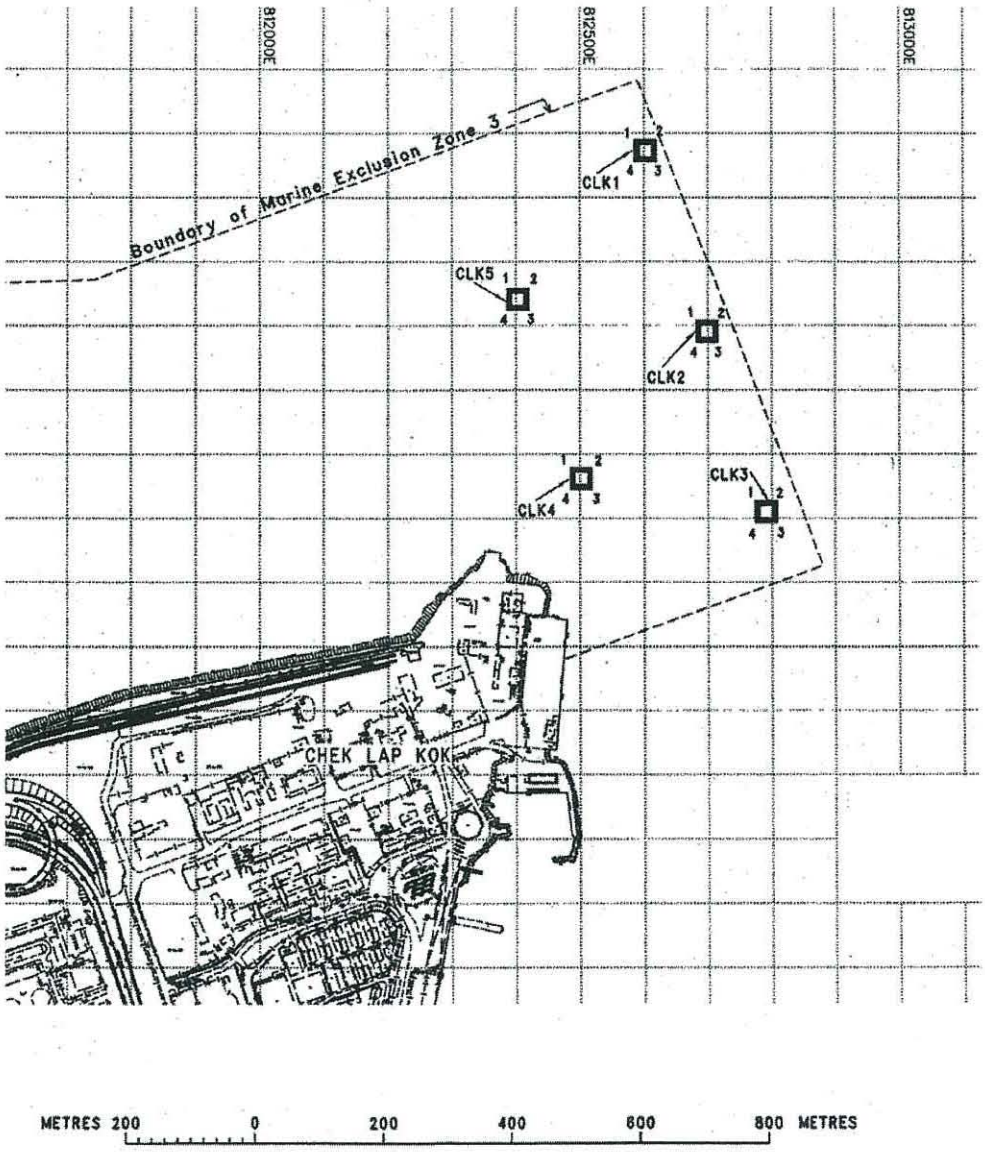
In addition, the 1995 Aviation Fuel Receiving Facility EIA required the implementation of a range of marine ecological environmental controls and mitigation measures. A key issue identified during the EIA process was the potential for impacts on local populations of the Indo-Pacific Hump-backed dolphin (*Sousa chinensis*) and the determination of best practice working methodologies in developing of this facility to minimise potential impacts on the poorly understood local dolphin population.

6.1.2 Current Status of Implementation

a) *Bi-annual surveys of sublittoral communities affected by the airport, and by new Port and Airport Development Strategy (PADS) construction projects, should be carried out by the government for six years after completion of construction. Inspection of the mangrove and eel grass community south of Tin Sam jetty should be carried out on a quarterly basis during airport construction to assess dredging impacts.*

Per agreements between the AFCD and the Airport Authority, the proposed monitoring programme was modified to support AFCD fisheries conservation efforts

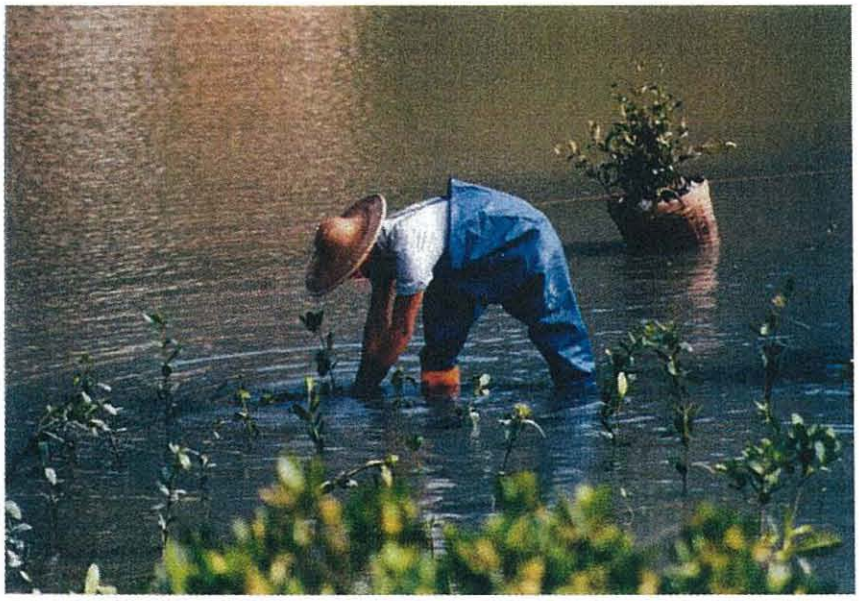
for North Lantau waters. AFCD proposed to construct a number of artificial reefs within the Marine Exclusion Zone (MEZ) surrounding the new airport, and the Airport Authority agreed to transfer the approved benthic survey funds to AFCD on a cost-share basis in which the Airport Authority funded HK$1.2 million for the development, installation and stocking of artificial reefs within the MEZ immediately north east of HKIA.



Artificial reefs were constructed within the Marine Exclusion Zone surrounding the new airport.

b) *Should surveys of the existing Zostera beds indicate deterioration, consideration should be given by the government to the possibility of transplanting Zostera turfs from Tung Chung Bay to any new mudflats engineered for mangrove replanting adjacent to PADS developments along the North Lantau coastline.*

Government surveys of the Tin Sam Jetty seagrasses during the reclamation period indicated that increased suspended solids levels related to reclamation activities apparently were having a negative impact on seagrass beds. In view of this impact, the Airport Authority (then the PAA) provided HK$0.2 million to the AFCD (then the AFD) to fund a University of Hong Kong study to evaluate the potential for transplanting a part of the seagrass community to other suitable sites away from Tin Sam. This study was complimentary to a three-year ecological study on seagrass.



Mangrove swamps were replanted.

The three-year ecological study joint-funded by the Airport Authority and the Government was completed in 1997 and it demonstrated that seagrass can be successfully cultivated under laboratory conditions with subsequent transplantation to the natural environment possible. The seagrass in the area was confirmed to be *Zostera japonica* (rather than *Zostera nana* as previously identified) and a new *Zostera japonica* seagrass community was discovered at Pak Kok Wan near Lai Chi Wo.

Conclusions from the final report have been an important help for AFCD in developing a long-term conservation plan for seagrass in Hong Kong. A territory wide seagrass survey was conducted from 2002-2005 so as to update the baseline information of seagrass in Hong Kong. Seagrass beds were found in 17 different sites in the survey, covering all the five seagrass species (*Halophila ovalis*, *Halophila minor*, *Halophila beccarii*, *Zostera japonica*, and *Ruppia maritime*) recorded in Hong Kong. Two new sites (Sheung Sze Wan and So Lo Pun) of *Zostera japonica* were also recorded in the survey. AFCD will continue the monitoring of the existing seagrass beds. Specific studies, such as transplanting of seagrasses to new sites, will also be explored to enhance the conservation of seagrasses in Hong Kong.

6.1.3 Aviation Fuel Receiving Facility EIA (1995) Summary and Recommendations

Potential impacts on marine ecology identified for both the construction and operational phases of the AFRF became a major challenge in the course of undertaking the EIA and gaining approval for the facility. All of the commitments made in the 1995 AFRF EIA were itemised in the 1998 NAMP-EIA Update, with responsibility for implementation and implementation status provided. In this Update, a summary of the key issues relating to the development and operation of this facility and a status update has been provided in Section 4.

6.2 Airport Operational Environmental Commitments

6.2.1 Summary of Issues

On completion of the Airport Platform in mid 1995, substantial additional impacts on marine ecology were not expected. The main potential impacts were expected to arise as a result of the discharges of foul sewage or contaminated stormwater. Foul sewage from HKIA is pumped to the treatment works at Siu Ho Wan and treated prior to discharge through a long outfall terminating near the Brothers. Impacts from this discharge were assessed under the North Lantau Development Study.

Many potential sources of stormwater contamination at an operating airport were identified relating to runoff from potentially polluting areas, maintenance activities and so on. In order to prevent or minimise the potential for adverse impacts on the marine community structures and composition around the airport, a number of recommendations and mitigation measures were proposed.

Again, those recommendations and mitigation measures relevant to the development of the AFRF are updated separately in Section 4.

6.2.2 Current Status of Implementation

a) *Mitigation measures as recommended in the tidal flow and water quality section should be adopted in order to minimise stormwater contamination. Stormwater drainage from potentially contaminated areas should be discharged to dispersive receiving waters, wherever*

practicable, as opposed to sheltered areas such as the sea channel.

Mitigation measures recommended relating to measures to control quality of runoff from HKIA as described in section 6.1.2, have been implemented. Stormwater drainage from potentially contaminated areas (i.e. aircraft aprons, aviation fuel tank farm) is discharged to dispersive receiving waters as opposed to sheltered areas such as the sea channel. This principle has been adopted in new development since 1998, including, for example, the expanded aviation fuel tank farm area.

b) *Monitoring of sublittoral communities as recommended for the construction phase, i.e. by carrying out bi-annual benthic surveys for six years after completion, should also be used to determine operational impacts. Monitoring should be extended to intertidal sites on North Lantau and control sites remote from the airport at Tai O and South Lantau, measuring changes in representative species such as oysters and barnacles on shore transacts, to determine impacts on littoral communities.*

Per agreements between the AFCD and Airport Authority, the proposed monitoring programme was modified to support AFCD fisheries conservation efforts for North Lantau waters. AFCD proposed to construct a number of artificial reefs within the Marine Exclusion Zone (MEZ) surrounding the New Airport. The Airport Authority agreed to transfer the approved benthic survey funds to AFCD on a cost share basis with them, in which the Airport Authority contributed HK$1.2 million to the development, installation and stocking of artificial reefs within the MEZ immediately North East of HKIA. AFCD continue to monitor the reefs on a routine basis.

7.1 Airport Development Environmental Commitments

7.1.1 Summary of Issues

The impact of airport construction was the destruction of almost all of the terrestrial flora and fauna on Chek Lap Kok Island and the displacement of a large percentage of its avifauna. Chek Lap Kok's wetland habitats were recognised as the most valuable of the habitats destroyed, containing mangroves, the freshwater Romers Tree Frog (*P. romeri*) and protected pitcher plants. The 1991 NAMP-EIA also identified a number of off-site airport construction impacts, but as these were exclusively the responsibility of the government, the status of implementation is not discussed in this update, although requirements have been completed as required.

7.1.2 Current Status of Implementation

The 1991 NAMP-EIA identified that the loss of habitats, flora and fauna on Chek Lap Kok could not be mitigated directly. However, a number of measures to compensate for this loss were recommended and the status of these recommendations was reported in the 1998 NAMP-EIA Update. For the record, all planned activities involving the displacement of terrestrial habitat on Chek Lap Kok, the Sha Lo Wan headland, the Brothers and Lam Chau have been completed, with the results as projected in the 1991 NAMP-EIA and 1992 EIA Supplement. In some cases, a further update on specific compensatory and mitigation measures is possible and is provided here:

a) *Field investigations and laboratory studies on the Romers Tree Frog were recommended and information obtained from these studies provided data on the habitat requirements of the species essential for the development of a conservation and habitat management strategy.*

A Hong Kong Jockey Club-funded study on the tree frog found, in summary, that: captive breeding was possible with frogs removed from Chek Lap Kok; that many wetland sites elsewhere in Hong Kong supported their own populations; and, that when tree frogs are introduced in new Hong Kong wetland sites they are able to breed successfully. Ongoing monitoring of the release sites used in the study has confirmed that the releases have been a success, with viable populations continuing to be observed.

Studies of the Rommer Tree Frog show that releases to new habitats away from Chek Lap Kok have been a success.

b) *Creation of new mangrove habitats outside the seawalls of the North Lantau Development or other PADS developments should be implemented by Government once schemes are finalised and appropriate areas can be identified. Alternatively, mangroves could be recreated in already disturbed coastal areas on North Lantau, such as the disused salt pans at Tai O. Creation of mangrove communities in existing natural shoreline areas is not recommended as it would risk damaging coastal environments which could otherwise be preserved.*

An Airport Authority part-funded university study identified many mangrove stands in Hong Kong, of which 23 were studied in depth with the most important mangrove stands identified. The study found that it would be feasible to convert the disused Tai O salt pans into a "created habitat" for mangrove replanting. Since 1998 it was decided that the creation of a new mangrove habitat at the disused Tai O salt pans would be done in conjunction with the construction of a sheltered boat anchorage in the area.

The construction of a sheltered boat anchorage at Tai O was completed by Civil Engineering and Development Department (CEDD) in 2005 and in conjunction with the anchorage project, a 12-hectare intertidal area was established in which 7 hectares of mangroves (about 90,000 mangrove seedlings) were planted in phases between 2005 and 2006. Four native mangrove species – *Avicennia marina*, *Aegiceras corniculatum*, *Bruguiera gymnorrhiza*

and *Kandelia obovata* – were selected as the major species in the mangrove planting. Maintenance works will be carried out after the planting works so as to enhance the establishment of the mangroves planted. Preliminary results showed that more than 90% of the mangrove seedlings planted has survived and the diversity of intertidal fauna has increased. The Airport Authority contributed HK$3.7 million to the mangrove replanting effort in 1999.

c) *Representative freshwater wetland habitats elsewhere within the Territory should be protected by the government by their inclusion within the Country Parks system.*

The Airport Authority contributed funding towards a 3-year university study on freshwater wetland habitats in Hong Kong, which was completed in 1996. The outcome of the study was that 13 freshwater wetland sites were selected and recommended for conservation by either extending the existing Country Park boundaries or listing them as SSSIs. Two of the recommended marshes, Luk Keng marsh and Sha Lo Tung marsh, have been zoned as Conservation Area/SSSIs in the relevant Outline Zoning Plans. Zoning of the other recommended sites (e.g. Cheung Sheung pond and marsh) will be considered when opportunity arises. Some of the sites will also be monitored or kept in view to further confirm/assess their ecological values for the conservation measures recommended in the report.

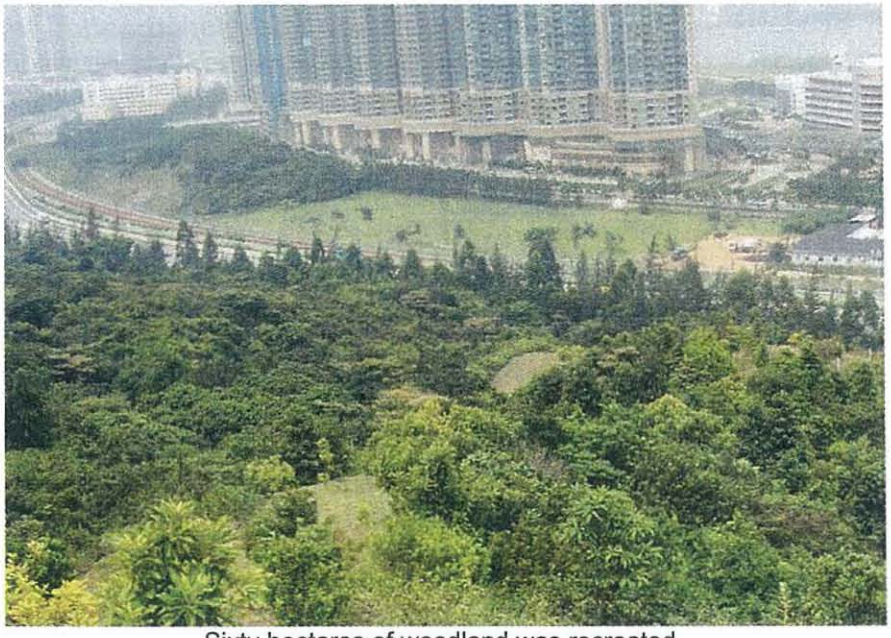
d) *A management strategy for woodland habitat on North Lantau should be developed and implemented by Government to improve conditions for wildlife. This should include enhancing natural woodlands by additional fringe and corridor planting, and planting of urban landscaping areas with native species.*

The Airport Authority helped fund a government project whose main objective was to re-create 60 hectares of woodland to compensate for the loss of 20 hectares of woodland habitats on Chek Lap Kok and North Lantau. The planting was carried out on hill slopes near Tung Chung and the intention is that the woodland will be managed for 10 years. Over 350,000 seedlings of some 60 species were planted and the average survival rate has been around 60%. Woodlands maintenance work, such as weeding and fertilising, continue on a regular basis.

e) *Lung Kwu Chau should be removed from the SSSI list, since sea eagles no longer nest there. Construction work*

should be restricted to September/October to avoid disturbance to cormorants and nesting Reef Egrets. The southern part of this island should be off limits to construction workers. If practicable, disruptive activities such as blasting should be restricted to September/October.

Lung Kwu Chau is retained as an SSSI as there have been breeding records of White-bellied Sea-eagles on the island in recent years.



Sixty hectares of woodland was recreated.

7.2 Airport Operational Environmental Commitments

7.2.1 Summary of Issues

The 1991 NAMP-EIA surmised that operational impacts on the terrestrial ecology of Chek Lap Kok would not arise, since almost all flora and fauna was destroyed during the construction phase. In addition, no significant off-site operational impacts were envisaged. The only section of the island remaining after construction was the southern-most headland, designated as an 'open space reserve'. The headland on its own was judged too small and dry to support any natural vegetation of conservation value, however some commitments relating to maintaining the natural character of the open space reserve were made.

7.2.2 Current Status of Implementation

(a) *The natural character of the southern headland should be preserved through the replanting of indigenous plant species. This should include the establishment of scrubland and woodland species and the retention of selective areas of open grassland.*

Additional planting around the headland has taken place with native or naturalised trees, shrubs and ground cover, in particular along the margins of the airport access transportation corridor and along the Eastern flank of the headland. The Mass Transit Railway Corporation (MTRC) has constructed a cable car angle station on the southern side of the headland, which required the removal of some additional vegetation. Environmental impacts relating to the construction of the entire cable car system were addressed in full in an EIA with an environmental permit issued for the project in 2003 (reference: http://www.epd.gov.hk/eia/register/report/eiareport/eia_0902003/Figuresrev1/TOCrev1.htm).

A Chinese-style pavilion with an information board identifying principal features at HKIA has been constructed on the summit of the headland providing a viewpoint across HKIA.

8.1 Airport Development Environmental Commitments

8.1.1 Summary of Issues

The excavation of Chek Lap Kok Island resulted in the need to remove existing vegetation and the generation of construction waste in the order of more than 40,000 tonnes per year during the excavation and construction phase. Hazardous materials on the airport development site were limited to those required for fuelling, servicing and repair of equipment, as well as the storage and use of materials used to make explosives.

8.1.2 Current Status of Implementation

The excavation of Chek Lap Kok took place in the early phase of the airport site preparation contract. All requirements and commitments relating to solid waste and hazardous materials of relevance to this stage of works were addressed, and the status on these commitments remains as reported in the 1998 NAMP-EIA Update.

Solid waste at HKIA, ready for appropriate disposal.

Nearly all of the potential solid waste impacts resulting from the airport construction have been mitigated. Construction wastes, including cleared vegetation, building wastes and other building inert materials were separated, with inert materials stockpiled in the mid-field area to the west of the Air Traffic Control Tower during construction. Most of the stockpiled materials have been reused in the later maintenance works and new airport developments. There is about 10% of the stockpile left for future reuse. All other

construction wastes have been removed from the airport and disposed of at landfills.

Domestic wastes arising from construction activity, accommodation camps and site offices were completely cleared before the airport opening. Scrap vehicles left after the construction and building works were also removed.

All potential hazardous materials and chemical wastes were properly handled and disposed of in accordance with statutory requirements.

Airport franchisees/tenants that are major waste producers at the airport were requested to prepare their operational waste management plans and submit to the Airport Authority before airport opening. Contents of the waste management plans mainly included the types of waste, forecasted quantities, names of waste management contractors and disposal sites.

8.2 Airport Operational Environmental Commitments

8.2.1 Summary of Issues

A 1994 waste management study, conducted on behalf of the Airport Authority, superseded the solid waste estimates that were projected in the 1991 NAMP-EIA. The study estimated that approximately 383 tonnes/day would be generated in 2010 and 946 tonnes/day in 2040. This included 32 and 40 tonnes/day of greywater treatment plant sludge in 2010 and 2040 respectively. Of this, the percentage generated from airside areas is estimated at approximately 12%; landside areas are 58-66%, with airport related activities consisting of the remaining 14-22%.

Plans for an on-airport Refuse Transfer Station (RTS) in the 1991 NAMP-EIA were also amended, in agreement with the government, with all suitable wastes from the airport ultimately being taken to the North Lantau Refuse Transfer Station for processing prior to onward transfer by barge to the WENT landfill. Other issues addressed in the 1991 NAMP-EIA related to fuel use and storage, and chemical use and storage; in particular, chemicals used in conjunction with maintenance activities and their proper disposal, and the proper storage and distribution of aviation fuel, and petrol and diesel.

8.2.2 Current Status of Implementation

Solid Waste Management

In 2006, approximately 120 tonnes/day of municipal solid waste was generated at the airport. Of this, about 16.65% was aircraft waste, 19.02% was commercial waste, 63.91% was solid waste generated from airport franchisees/tenants, and 0.42% was dewatered sludge from the greywater treatment plant.

Waste estimates were reviewed and revised in 2003 and 2005. It is now estimated that approximately 205 tonnes/day will be generated in 2025. The tonnage of aircraft waste generated is estimated at 36 tonnes/day, commercial waste 53 tonnes/day, franchisees/tenants waste 114 tonnes/day, and dewatered sludge two tonnes/day.

The Airport Authority is responsible for the waste generated from the areas managed by it, including the passenger terminal building, the airfield, public car parks, roads and airport ancillary buildings. Refuse rooms and waste compactor stations have been built and located near the sources of waste. Aircraft waste is collected and delivered to the airside waste compactor station by the line maintenance franchisees of the airlines. Waste generated from commercial outlets is collected and delivered to the refuse rooms by cleaners employed by the related companies. A waste management services contractor is employed by the Airport Authority for the operation of the refuse rooms and waste compactor stations, as well as the collection, recycling and disposal of waste. Non-recyclable wastes are delivered to the North Lantau Refuse Transfer Station (NLRTS) for disposal, while the recyclable materials are collected by recyclers for recycling. The dewatered sludge generated from the greywater treatment plant is collected and delivered to the NLRTS for disposal.

Waste generated from independent buildings of the airport franchisees/tenants is handled by the relevant franchisees/tenants. These buildings include the air cargo terminals, the marine cargo terminal, the cross-border ferry pier, aircraft catering facilities, aircraft maintenance facilities, ground maintenance support facilities, the freight forwarding centres, the logistics centres, the hotels, the international exhibition centre, airline headquarters buildings, the airmail centre and the other government buildings. All these franchisees/tenants have incorporated their own waste management strategies, including types of waste, generation,

collection contractor, reduction programmes and disposal sites in their environmental management plans.

In order to minimise the impacts, the Airport Authority and franchisees/tenants at the airport have worked together to reduce waste generated from their operations. In 2001, an airport community waste reduction task force was set up in accordance with the government's Waste Reduction Framework Plan 1998. Members of the task force include the Airport Authority, airport franchisees/tenants and the officials from the EPD.

Waste recovery, recycling and minimisation practices are implemented in the Passenger Terminal Building and other areas of the airport. Recyclable materials such as paper, cardboard, plastics, rubber tyres and metals are being sorted out for recycling. The Airport Authority and some airport franchisees/tenants have joined the government's Wastewi$e Scheme and have achieved a number of waste reduction targets. The Airport Authority has also been implementing the food waste-composting programme. Food waste generated from food outlets in the Passenger Terminal Building is separated at source and delivered to the waste compactor station at the airport for treatment by electric composters. The compost produced from the food waste is used as soil conditioner for the airport landscaping. Waste polystyrene packaging materials are also sorted out, compacted and then collected by a recycler for reuse. Specific recycling programmes are also implemented by airport franchisees/ tenants. For examples, recycling of used oil drums in the aircraft maintenance facility and wrapping plastic sheets in the air cargo terminals.

Fuel, Dangerous Goods and Chemicals

Proper storage facilities for hazardous materials, chemical wastes and dangerous goods are provided at designated areas of the airport by the Airport Authority and relevant franchisees/tenants. These facilities are built or installed to insure spillage prevention. Facilities are subject to regular inspections by the Airport Authority and relevant government authorities. All employees involved in handling hazardous materials, chemical wastes and dangerous goods are trained and provided with proper procedures to follow.

Air cargo classified as hazardous or as dangerous goods is handled by airlines, air cargo and logistics franchisees in compliance with the statutory requirements in relation to labelling, packaging, handling and storage.

Used lubricating oil generated from maintenance facilities is collected by licensed contractors and delivered to a recycling treatment plant off the airport site. Other chemical wastes, including spent battery electrolytes, paint residues, spent solvents and asbestos waste, are also collected by licensed contractors for off-site disposal.

All chemical waste producers, including the Airport Authority at HKIA, are registered with the EPD. All chemical wastes produced are contained, labelled, stored, collected and disposed of in accordance with the Waste Disposal (Chemical Waste) (General) Regulation. Collection and disposal of these chemical wastes are done by licensed contractors under a stringent trip-ticketing scheme.

Copies of dangerous goods licences, chemical waste registrations and trip tickets are kept by the relevant franchisees/tenants or waste producers for inspection by the Airport Authority's Environmental Group and officials of the related government departments.

Chemical spill response plans have been documented and implemented by the Airport Authority and relevant airport franchisees/tenants. Spill drills are also regularly conducted and reviews/updates of the response plans are made as and when necessary or required.

The original Aviation Fuel Tank Farm at HKIA.

Permission was granted for the addition of three extra fuel tanks.

The Aviation Fuel Tank Farm, situated adjacent to the southern headland reserve, has been designed to meet stringent fire safety and environmental requirements, including:

- Drainage from potentially polluting areas must not discharge to the sea channel, rather it must discharge to the east or west of the airport platform;
- A requirement for an inner bund capable of containing 105% of the storage volume of the largest storage tank;
- A requirement for an outer bund capable of containing 50% of the entire tank farm contents;
- Storm drainage from the tank farm must pass through oil/water separators prior to discharge to a storm drain;
- Adherence to relevant local and international industry codes and standards;
- On-site and off-site emergency plans for the airport tank farm developed and tested on a regular basis to cover the full spectrum of potential incidents and escalation;
- Spill trap skimmers at the relevant main airport stormwater outfall (to the sea);
- Penstocks at the relevant main airport stormwater outfall capable of completely blocking oil/fuel discharges to the sea; and
- Others, such as meeting, *inter alia,* Building Department and Fire Services Department requirements.

In 2004, EPD advised that three additional tanks being planned at the tank farm would not require an environmental permit. Design and construction of the tanks has incorporated all environmental controls and arrangements

that were applicable to the original tank farm and associated tank farm infrastructure.

In addition, all parking bays for fuel bowsers in the into-plane fueller areas are bunded. Aviation fuel pipes, pipelines and hydrants are subject to ongoing leak detection by the Fuel Supply Franchisee's leak detection systems during their operational life. All fuel pipes, pipelines and hydrants have been subject to pressure testing and, where installation has included underground welding, this has been subject to 100% radiography to ensure a complete seal.

8.3 Remaining Impacts

Due to increased air traffic, logistics activities and new developments at the airport, the potential for impacts arising from solid waste handling have increased. Hygiene problems, including pest infestation, are examples of potential impacts that need to be minimised. The Airport Authority has planned and implemented a number of pest control programmes since airport opening. Odour and visual impacts are also encountered when existing waste management facilities cannot cope with increased waste generation. The leachate from waste compactor stations is treated at the on-airport Waste Water Treatment Plant. The burden imposed on the Plant by the leachate is increasing due to greater waste quantities being handled by the compactor stations.

The Airport Authority has implemented a number of pest control programmes since airport opening.

Excavated materials generated from new airport developments are sorted, with most of the materials reused on-site. Any surplus materials are disposed of at public fills. Mixed debris with inert materials is disposed of at designated landfills in line with the new government scheme.

More types of chemical wastes are produced from changes in airport operations and government policies. New chemical waste types include waste cigarette lighters, rechargeable batteries and waste mercury-contained lamps; these are disposed of in the appropriate manner by the Airport Authority.

8.4 Monitoring and Audit Programme

To ensure good environmental practice and compliance with relevant regulations, regular environmental audits of both facilities and records of franchisees/tenants and contractors are conducted by the Airport Authority's Environmental Group.

The Airport Authority conducts strategic planning on waste management at the airport. The planning will include reviews on the waste generation, waste characteristics, handling capacity of the waste facility and regular review of waste reduction opportunities at HKIA.

9.1 Airport Development Environmental Commitments

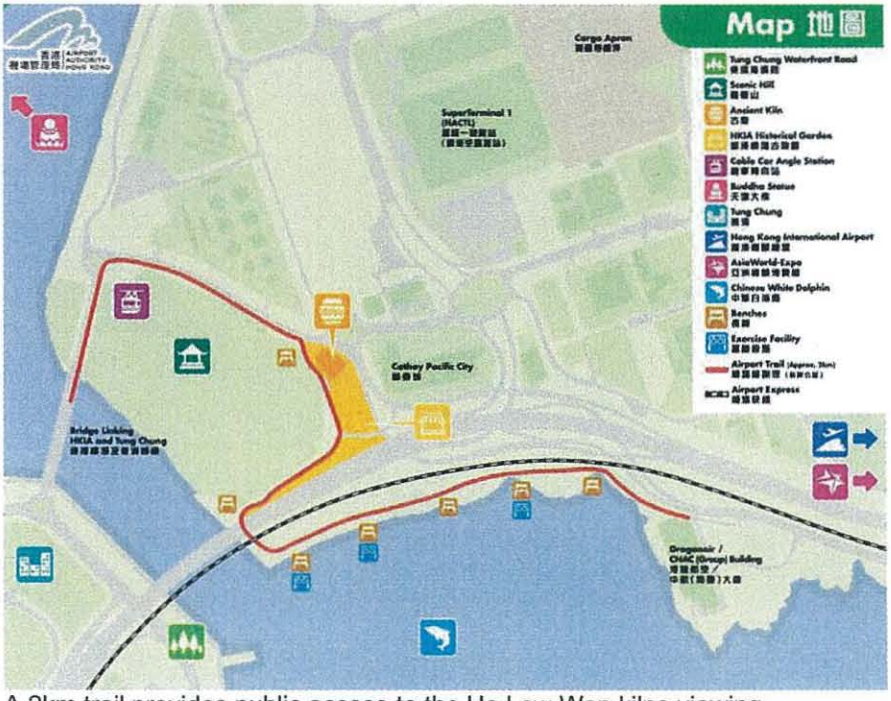
9.1.1 Summary of Issues

Seven important archaeological sites were excavated at Chek Lap Kok prior to the start of significant site preparation and excavation works, and excavations revealed much of interest with numerous artefacts being found and retained.

In order to preserve the evidence of the early occupation of Chek Lap Kok for the future, the Airport Authority extended the size of the open space headland reserve to include the Ha Lo Wan archaeological site, which meant that the lime-kiln complex, which would otherwise have been lost to development, could be retained.

9.1.2 Current Status of Implementation

The area around the Ha Law Wan kilns has been developed, with a viewing platform and an information panel now in place. Public access to the area is provided and a 2km walking/jogging trail has been constructed which passes immediately by the kiln area.



A 2km trail provides public access to the Ha Law Wan kilns viewing platform.

The Ha Law Wan kilns as viewed from the public Airport Trail.

9.2 Airport Operational Environmental Commitments

9.2.1 Summary of Issues

Operational commitments of relevance relate to the aesthetic aspects of the development of HKIA. The scale of the airport development entailed dramatic change to views throughout North Lantau, with the most significant visual impact considered to be within the near views from villages along North Lantau and middle-range views from Lantau Country Park.

9.2.2 Current Status of Implementation

The main areas where some account could be taken of visual impact were airport building design and localised screening.

Careful consideration continues to be given to the vetting, design and colour treatment of all airport buildings and signage at HKIA, with localised screening provided for certain developments, including the Grey Water Treatment Plant. The southern open space headland reserve has been undertaken with native or naturalised trees, shrubs and ground cover planted, in particular along the margins of the airport access transportation corridor and along the eastern flank of the headland. The mountains and the sea remain prominent features for passengers travelling to and from the airport, and are an important part of the HKIA experience.

Careful consideration was given to landscaping the airport environment.

10.1 Airport Development Environmental Commitments

10.1.1 Summary of Issues

In developing HKIA the Airport Authority was accountable to the government for the implementation of 1991 NAMP-EIA environmental commitments and had a legal obligation to meet all terms and conditions, including environmental, under the Government Land Grant for the airport site. The Airport Authority therefore had to ensure that all commitments in the 1991 NAMP-EIA were implemented and that, as a minimum, all aspects of HKIA development were undertaken in full compliance with Hong Kong's statutory environmental legislation.

During the airport development phase, the 1991 NAMP-EIA made no particular recommendations on the establishment of an Environmental Management System at HKIA, either for the reclamation and development stage or for the operational period. However, a recommendation was made that the Airport Authority should establish an environmental team to implement recommendations and commitments made in the 1991 NAMP-EIA; this team being established as the first phase of site preparation works got underway.

10.1.2 Current Status of Implementation

In achieving its scope of works, the environmental team had to establish an approach to environmental management that had the full support of senior management and which was able to meet the environmental challenges inherent in a very complex development constrained by an extremely short programme, further compounded by the remoteness of the site.

There were three groups of developers responsible for the various construction contracts: the Airport Authority (largest developer), the government and business partners (aviation franchisees and other commercial entities). At the construction stage there were well over 100 building and infrastructure contracts underway, involving a peak of over 20,000 people working on site on a daily basis.

The Airport Authority managed a number of the general logistical support requirements on the site itself, providing primary services to all contractors, developers and third parties. These included provision of temporary infrastructure as well as environmental services such as waste collection

and disposal, temporary sewage disposal systems, cleaning and maintenance services for common site areas, and advice and guidance to contractors on environmental issues. The Airport Authority ensured that detailed and enforceable environmental clauses were inserted in all construction contracts, relating to waste management, public health and pest control, and required that business partners adopted strict environmental guidelines/specifications in building their facilities.

Environmental team staff routinely audited the environmental performance of all of the main contractors, and auditing efforts were supplemented by routine visits to site by the EPD. In addition, regular coordination meetings were held with the EPD and other statutory authorities to track compliance and to ensure all EM&A commitments were being conducted satisfactorily.

As reported in Section 2 of this update, the environmental team introduced an EPD-agreed system to ensure that airport facility designs underwent a further qualitative environmental assessment, with each design consultant conducting an environmental review of their detailed design, including a comparison with the conceptual design envisioned in the 1991 NAMP-EIA. In these environmental assessments, 1991 NAMP-EIA mitigation measures were accounted for and, where necessary, amended or added to.

The 1998 NAMP-EIA Update and the 2006 EIA Interim Update effectively serve as a report card on the achievement of all commitments, and the implementation of monitoring and audit requirements at the HKIA development stage and demonstrates the effectiveness of the environmental management approach adopted.

10.2 Airport Operational Environmental Commitments

10.2.1 Summary of Issues

The challenge for the Airport Authority as the airport moved towards operations was to identify environmental liabilities under the Land Grant, under all relevant environmental legislation and from commitments made in the 1991 NAMP-EIA, and to further develop an environmental management system that, as well as safeguarding good environmental performance, ensured the accurate assignment of environmental liabilities to the appropriate members of the complex airport community.

Complex Airport Community

The Airport Authority owns buildings and facilities supporting airport operational and business functions and also effectively assumes the role of landlord for the many business partners (aviation franchisee and other commercial entities) and other tenants who supply a range of airport services, such as catering, cargo handling, aircraft maintenance, cleaning and refuelling. In addition to ensuring Airport Authority activities are carried out in an environmentally responsible manner, the EMS had to incorporate a due diligence responsibility to ensure that other airport tenants also undertake their business in a responsible manner.

10.2.2 Current Status of Implementation

To safeguard a good level of environmental protection and performance with business partners, the Airport Authority required as part of contractual agreements with business partners that each partner submit an Environmental Management Plan (EMP) prior to them commencing operations at the airport. EMPs required business partners to outline their business at the airport, detail aspects of their operations that may have environmental impacts, identify their environmental issues and liabilities, and account for statutory licensing requirements.

The information on statutory aspects gained before airport opening, and shared with statutory authorities, helped ensure that the airport was in full compliance with environmental requirements and continues to ensure this as new facilities are planned and developed.

The information provided in tenant EMPs has also formed the basis of an ongoing operational environmental monitoring and audit programme, through which the Airport Authority exercises due diligence in ensuring that environmental compliance continues to be achieved across the airport. All major business partners are regularly audited against the detail outlined in their EMPs. They are required to self-audit and regularly update their EMPs to ensure that changes in both environmental legislation as well as their own operational practices are accounted for.

The broad range of buildings and facilities at the airport, owned and operated by the Airport Authority, are also managed such that activities and operations meet a high standard of environmental performance. The Airport

Authority employs a broad range of maintenance, cleaning and other contractors, working on items as varied as runway rubber removal and line repainting, pest control and waste management, vehicle fleet maintenance and the operation and maintenance of the seawater pump houses used for providing seawater for cooling. The auditing programme also covers all of the major maintenance contractors.

10.2.3 Enhanced Environmental and Health Management System

The Environmental Management System developed by the environmental team has remained effective as the Airport Authority has developed its operations and expanded at the same time as evolving its business focus. The system was enhanced in 2004 to better tie the management approach in with the main stipulations and guidance provided by ISO 14001.

In 2006, further efforts have been taken to systematically determine the environmental and health issues that are of most relevance at HKIA and to benchmark the existing environmental management focus against that of other leading international airport operators and against recognized leaders in environmental, health and sustainability management in Hong Kong.

This has helped to better define the environmental and health risks of strategic importance to airport operations and development and the intention is to further enhance the management effort in the key 'risk to business' areas - at the same time as continuing with the management effort described above for the ongoing environmental monitoring and audit programme at HKIA.

The goal is the achievement of best industry practice in the management of environmental and health risks through identification and prioritization of key risk areas and the clear assignment of risk management responsibility within a system of goal setting, performance monitoring and system review over time in a cycle of continual improvement.