

# “ENVIRONMENTAL CONCEPTS IN THE WETLAND PARK”

## Introduction

The International Wetland Park and Visitor Centre (to be known as Hong Kong Wetland Park) is currently under construction on a 64 hectare site on the north-eastern edge of Tin Shui Wai New Town. The Park is envisaged as a prime example of environmental practice and sustainable development ; unique to Hong Kong, in Asia and possibly even in the world; seeking to provide equally for the very varied and potentially conflicting functions of conservation, tourism, education and recreation.

The site was originally envisaged as purely a conservation or ecological mitigation initiative, required as one of the conditions of the Town Planning board approval to the development of the Tin Shui Wai Reserve Zone as the major second development phase of the Tin Shui Wai New Town (TSW). The planning intention was to provide opportunities for mitigation of the substantial loss of wetland habitats due to this urban development. In addition, the proposed ecological mitigation area (EMA) would act as a much needed buffer between Tin Shui Wai and the internationally important wetlands of the Inner Deep Bay Ramsar Site and Mai Po Marshes to the north-east. As part of their overall responsibility for the site formation and engineering infrastructure for the TSW development, Territory Development Department (TDD) have taken on the EMA, construction of which is now nearing completion on site, to provide a wide range of freshwater, brackish and inter-tidal wetland habitats.

However, in 1995, the Visitor and Tourism Study for Hong Kong (VISTOUR), commissioned by the Hong Kong Tourist Association (HKTA), recommended that new tourist attractions and facilities should be developed to sustain the long-term growth of the tourism industry. The development of new attractions based around the diverse natural heritage of Hong Kong was identified as an important initiative in the diversification of the territory’s tourist facilities, including the most important

wildlife conservation sites such as Inner Deep Bay and Mai Po, which support a wide diversity of wildlife including a number of critically endangered bird species.

The idea for the Wetland Park arose from this vision, building upon the existing EMA plans to create a major tourism, educational and community facility based around the ecological themes of wetland conservation. The HKTA commissioned the International Wetland Park and Visitor Centre Feasibility Study to ascertain the viability of expanding the EMA into a wetland attraction of international significance. The Wetland Park was envisaged as a primary vehicle for demonstrating the diversity of Hong Kong’s wetland ecosystems and highlighting the need to conserve them – in so doing it would

- create a visitor attraction of international status
- diversify the visitor experience in Hong Kong for overseas visitors
- complement, and relieve pressure on, the existing Mai Po Nature Reserve as an alternative educational, interpretive and resource centre, supporting the conservation of internationally important wetlands
- provide major opportunities for environmental education and public awareness in recreated natural habitats.

Architectural Services Department were represented on the Task Force set up to oversee the Feasibility Study and ensure that these varied objectives could be achieved whilst at the same time enhancing the originally intended conservation aims for the site.

Subsequently, in his 1998 Policy Address, the Chief Executive listed the revival of tourism as one of his main policy aims, following which the Government designated the proposed Wetland Park and Visitor Centre as a Millennium project, acknowledging the importance that the HKSAR Government now places on conservation, environmental education and the promotion of eco-



tourism. The project was thus to be funded through the Public Works Programme, under the remit of the Tourism Commission, and with Architectural Services Department (ArchSD) designated as the works agency and Agriculture, Fisheries and Conservation Department (AFCD) as the management and maintenance department.

## Design Approach

Environmental consciousness has been the keyword for ArchSD's project team since the inception of the project. Full multi-disciplinary expertise has been assembled, both in-house and supplemented by specialist landscape architectural and exhibition consultants, to apply their diverse knowledge and skills to meeting the stringent requirements of the unique brief for this project. Environmental issues have been the principal determinant of our approach to every aspect of the project including site layout, hierarchy of intended site usage, building form, landscape and habitat creation, building services installations and the choice of materials.

## Site Layout

The visitor facilities to be provided can be divided into two Main components – an indoor visitor centre and outdoor Exhibit areas. The Wetland Park is expected to attract over 500,000 visitors per year when fully developed and the management of this level of human activity to avoid conflict with the key environmental principles is a principal determinant of the adopted layout.

The indoor Visitor Centre is expected to draw the largest number of visitors and is purposely sited close to the entrance to the site and the urban area. Thereafter a series of display gardens, exhibition ponds and recreated habitats lead progressively to the satellite building Discovery Centre or outdoor classroom, and beyond via a series of boardwalks to the bird hides and more remote outer habitat areas, closer to the Ramsar site, where visitor number are expected to be much lower. Although even the main Visitor Centre is hidden within the landscape to maintain the overall environmental outlook of the project (see below), the level of built form and intensity of usage diminishes as one moves further into the site, away from the urban development and towards the Ramsar site, and the recreated natural habitats take over.

Design of the EMA works had already been completed by TDD, and construction commenced, before the Wetland park concept was proposed. However, through a series of detailed liaison meetings between AFCD, TDD and ArchSD since 2000, any potential conflicts between the EMA and the Wetland Park have been resolved and, in addition, it has been possible to make key changes in the EMA proposals; including their layout, hydraulic regime, site formation, drainage connections and landscape; to better suit the Wetland Park requirements. This close cooperation proved to be both environmentally sound and cost effective, minimising the incidence of potentially abortive works, reducing disturbance due to construction

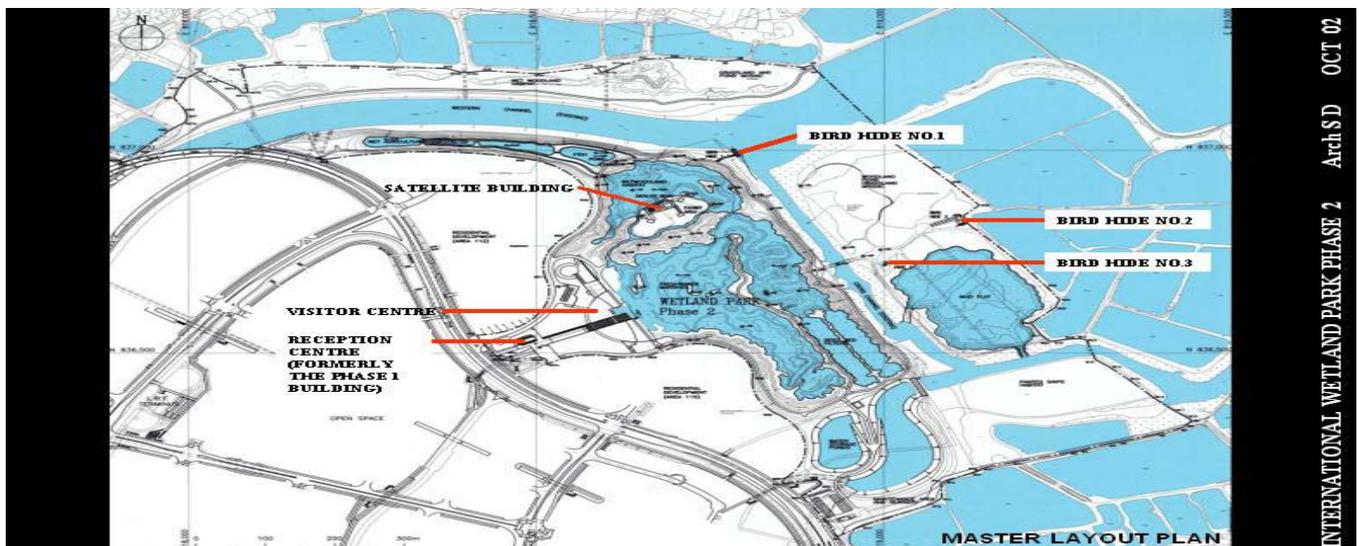


Figure 1 (Site Layout)



and allowing the recreated habitats to develop and establish sooner. Key aspects of TDD's work will also be picked up in the interpretive programmes in the Wetland Park, in particular the reed bed filtration system on which the water quality of the whole hydraulic system depends, and many of the recreated habitats, including tidal mudflats, freshwater marshes and lakes.



Figure 2 (Phase 1 Building)

As the Wetland Park was selected as a Millennium project, it was important to complete part of the works during 2000, both as a political statement of policy intent in the conservation field but also to give the public at large a flavour of what was to be expected from the Wetland Park project. ArchSD therefore designed a Phase 1 building to house a small exhibition gallery demonstrating the range of local wetland habitats, and landscape areas introducing visitors to Hong Kong wetland plants and animals. The project team's intention was to demonstrate sound environmental principles and sustainable development practice, concepts which will be developed further in the Phase 2 project and ultimately form an important part of the educational storyline of the Park – these include the handling of the building envelope and the adoption of screens and louvres to maximise energy efficiency; the use of natural materials including timber, stone and oyster shells; reliance on natural ventilation and lighting wherever possible; a trial geothermal cooling scheme for air-conditioning; and the extensive use of native wetland plant species, not commonly available in the Hong Kong nursery trade.

The design and construction of the Phase 1 facility was completed by ArchSD in only 9 months and opened to the public in December 2000. It was an immediate success and has attracted over 100,000 visitors per annum on average.

## **Phase 2 Architectural Principles**

Our approach to Wetland Park design has always given priority to environmental factors and this approach will be immediately obvious to visitors entering the site. The main Visitor Centre building, required to house extensive exhibition galleries over two storeys and a building footprint of approximately 10,000 square metres, is concealed beneath the landscape, giving the impression of a green hill rising above the entry plaza. The landscaped roof, as well as immediately announcing the environmental credentials of the scheme, is also instrumental in maximising the energy efficiency of the building – the form of roof construction, together with careful orientation of the building to minimise solar gain, allows the building to achieve a very low Overall Thermal Transfer Value (OTTV) of only 16W per square metre. In addition, visitors may stroll up the gently sloping lawns of the roof to where a spectacular panorama of the surrounding wetland habitats will unfold before them.

Sustainability extends throughout the detailing of the building. Skylights are utilised to maximise natural lighting, particularly to the Central Atrium, through which a streamcourse flows, connecting to the wetlands beyond, but also in some of the gallery areas and the toilets. Timber louvres are extensively employed to provide shading, particularly to the glass curtain wall façade overlooking the main lakes, where they also act as sound and visual barriers to minimise disturbance to the large numbers of waterbirds that are already beginning to colonise the wetland water bodies.



Figures 3 and 4 (Visitor Centre from Entry Plaza), (Visitor Centre from Lake)



Figure 5 (Atrium Perspective)

Recycled bricks create a wall along the southerly aspect of the approach ramp, and extending through the Atrium, which mitigates the effects of solar gain on the building – this architectural device, along with many others, has already been successfully tested in the Phase 1 building. Within the Visitor Centre, circulation ramps are adopted throughout the galleries to cater for disabled visitors and also to minimise the need for mechanical lifts, whereas low-capacity 6 litre water closet are utilised to significantly reduce water consumption in all toilets.

### Exhibition Galleries

Specialist exhibition design consultants have been employed by ArchSD to develop an educational storyline relating to wetland conservation and environmental principles, not only in the exhibitry to be installed within the galleries but also to permeate throughout all aspects of the project, including the Visitor Centre architecture and the wetland habitats.

World class exhibitry will introduce visitors to the importance of wetlands, their distribution across the globe and their spectacular variety, and will include a full scale replica of a tropical peat swamp forest, complete with live crocodiles and other animals, a gallery showcasing the intimate relationship throughout history between human culture and wetlands, and the opportunity for visitors to



Figure 6 (Atrium Section)



become reporters for Wetland TV, investigating wetland environments under threat and learning what can be done to help.

Deriving from the exceptional potential of the Park, educational interpretive programmes are being developed for use both by school parties and other visitors with the following specific objectives:

- to raise awareness and increase understanding of the major benefits and values of wetlands
- to increase knowledge of nature's vitality and diversity
- to encourage action and lifestyle adjustments to a more sustainable approach
- to provide leisure and recreation facilities for all visitors



Figures 7, 8 and 9  
(Landscape and External Works)

## Landscape and External Works

The transition from internal gallery space to external Demonstrations in the recreated wetland landscape is Almost seamless, continuing the educational message of environmental concern and stewardship. As the visitor exits the building, he will find himself at the source of a rushing mountain stream, cascading over boulders down from the roof of the Visitor Centre, in the first of a series of recreated habitat displays. The stream can be followed downhill through all stages of its natural life cycle until it slowly winds through the delta and empties into a freshwater pond close to the Discovery Centre satellite building.



Figure 10 (Perspective from Satellite Building)

The satellite building functions as an outdoor classroom and is surrounded by interpretive zones where visitors can pond-dip to investigate the life forms commonly found in water bodies; learn how the Wetland Park is managed and the water levels manipulated by simple mechanical devices; and discover a wide range of wetland agricultural practices that have been an important way of life historically for the people of Hong Kong and China.

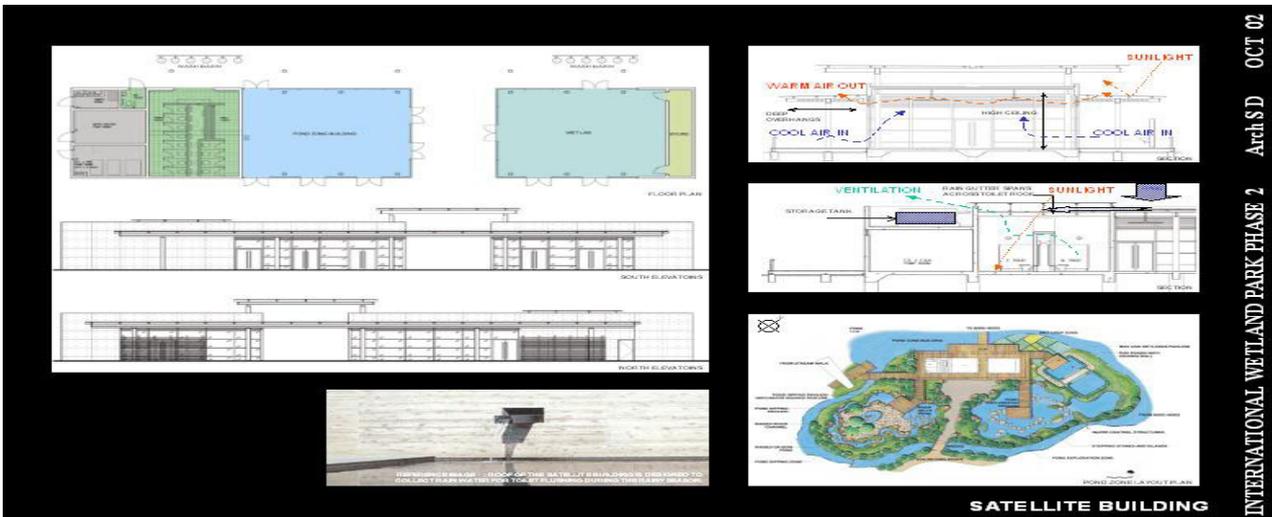


Figure 11

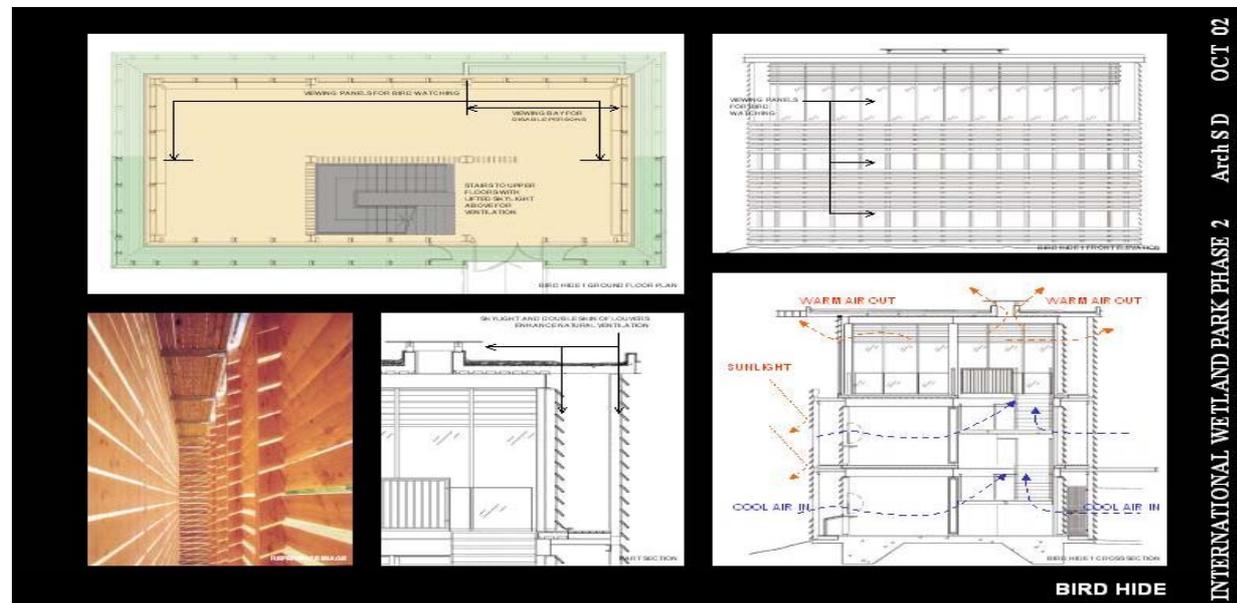


Figure 12

The satellite building has been designed to collect rainwater for flushing purposes, and relies entirely on natural ventilation, with heat gain minimised by the careful use of louvres. The outlying bird hides are similarly designed with skylights and double-skin louvers to maximise natural ventilation and user comfort. Beyond the satellite building, timber boardwalks lead out across the lakes into the ‘outer zone’ of increasingly natural landscape and lower key development, characterised by timber bird hides, boardwalks and nature trails.

Throughout the landscape, predominantly native plants are used to replicate the natural habitats as closely as possible but also to minimise maintenance requirements and water consumption. Water features are designed to utilise water drawn from the freshwater lakes of the EMA, thus recycling it back into the system and reducing water consumption. Simple irrigation systems are provided to aid soft landscape establishment and maintenance but are proposed to be used only at night to reduce evaporation and consumption, as well as avoid conflict with Park visitors. External lighting is confined to the entry plaza and building approach ramp, with no lighting provided to the majority of the Park area thereby minimising



disturbance to wildlife and also reducing power consumption.

### **Sustainability and Recycled Materials**

Careful selection of materials is an essential element in ArchSD' sustainable design approach to the project. Only softwoods from identified renewable sources are utilised in preference to hardwoods. Pulverised Fuel Ash (PFA) is used as a partial cement replacement, and recycled crushed concrete provides hardcore and sub-base materials. Recycled bricks from the demolition of traditional Chinese buildings form the wall to the approach ramp and atrium.

In the soft landscape, in addition to the use of native materials, the existing trees and shrubs from the Phase 1 garden area are either to be retained in-situ or re-used elsewhere in the Park when the existing Phase 1 building is converted into the ticket office for the Park. Many of the building materials from the Phase 1 landscape areas are also to be reused, including the granite paving originally salvaged from the Police HQ wall at Arsenal Street, the origami animal sculptures and the discarded Lau Fau Shan oyster shells used in the gabion screen walls.

### **Building Services Installations**

Environmental principles also feature strongly in the building services installation design for the project, resulting in extremely high energy efficiency and minimal maintenance cycle costs. In particular, the Wetland Park will be the first major project in Hong Kong to utilise a highly energy efficient geothermal cooling system in its air-conditioning installation. This system utilises the relatively constant and stable ground temperatures occurring just a few metres below the surface, together with the substantial area of land available for heat dissipation within the site boundary, and consists of 468 sets of polyethylene pipes, laid in 50 metre deep boreholes and embedded

in cement for greater conductivity. Boreholes are placed 4 metres apart to maximise heat dissipation capacity and sufficiently deep underground to avoid any adverse impact on the soft landscape. A variable speed pumping system divides the total flow into 4 pump sets, so that pumping energy can be varied according to the required AC loading and valves can be shut off to stop the flow when not required. The pipework design minimises the amount of trenching required but also provides sufficient back-up capacity so that, if any part of the system needs to be shut down for rectification works, this will only affect a maximum of 8.4% of the total AC loading.

Not only does the geothermal system avoid the discharge of waste heat into the atmosphere with consequent adverse impacts on global warming or into the surrounding habitats with potentially negative effects ecologically, it also saves substantial amounts of energy for cooling the building by utilising a much lower ground condensing temperature, which can be as low as 28C in summer, compared to 35C for a conventional AC system. The geothermal installation is estimated to result in a 25% energy saving overall, compared to a conventional cooling tower approach.

The system also has visual and architectural benefits as all heat dissipation equipment is buried underground, thereby leaving a clean building façade and grass roof unencumbered by ducting, fans, condensers and the like. This is particularly important visually in the appearance of the green roof from the entry plaza and also the building façade viewed from the satellite building area or across the main lake.

Other environmental features of the building services installations include carbon dioxide sensors to regulate fresh air in accordance with visitor occupancy, and computer controlled lighting systems with sensors to control illumination levels and timers to close down lighting selectively as and when it is not required.



## **Construction Methods**

Piling work has already been completed and the main building contract commenced in April 2003. This will be followed by the exhibit installation work before overall completion scheduled for late 2005. Great care will be taken throughout the construction process to minimise any potentially adverse ecological impacts. As far as possible, all excavated materials are to be reused on site, whereas the use of hoardings, formwork and other temporary works will be carefully controlled. Natural clay materials are to be used to waterproof lakes and ponds.

To avoid any contamination to the existing lakes and water bodies during construction, at ArchSD's request, TDD have installed a double sheet pile barrier to segregate the Visitor Centre from the water, which will be removed at the end of the contract. In addition, a clay bund has been installed to protect the satellite building area particularly during the excavation of its footings, whereas ArchSD are currently working with their main contractor on a method statement to develop a portable coffer dam system to allow construction of the boardwalks to proceed with the minimum environmental disruption, avoiding the need to drain any of the lakes whilst avoiding any incidence of pollution.

## **Conclusion**

On completion in late 2005, the Wetland Park will represent the ultimate in sustainability and environmental consciousness in architectural and landscape design and will provide a unique facility to be enjoyed by over 500,000 visitors per year. It will satisfy all its potentially conflicting objectives in order to provide a world class tourist attraction and also a major conservation, educational and recreational resource, fully justifying the total expenditure of approximately \$520 million.

## **Architectural Services Department**

## **Reference**

1. Hong Kong Tourist Association, "Hong Kong International Wetland Park and Visitor Centre Feasibility Study – Final Report", May 1999

