Hong Kong Jockey Club

Main Arena of the 2008 Olympic Equestrian Event

Environmental Impact Assessment Report

Final

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Environmental Impact Assessment Report

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ABBREVIATION

AHU	Air Handling Unit
ANL	Acceptable Noise Level
APCO	Air Pollution Control Ordinance
AQO	Air Quality Objectives
Arup	Ove Arup and Partners Hong Kong Ltd
ASR	Air Sensitive Receiver
BMP	Best Management Practice
BOCOG	The Beijing Organising Committee for the Games of the 29th Olympiad
BNL	Basic Noise Level
BOD_5	5-day Biochemical Oxygen Demand
C&D	Construction and Demolition
CR	Contractor Representative
CNP	Construction Noise Permit
DO	Dissolved Oxygen
DP	Designated Project
EIA	Environmental Impact Assessment
EIAO	Environmental Impact Assessment Ordinance
EM	Environmental Manager
EMP	Environmental Management Plan
EMIS	Environmental Mitigation Implementation Schedule
EM&A	Environmental Monitoring and Audit
E&M	Electrical and mechanical
EP	Environmental Permit
EPD	Environmental Protection Department
ER	Engineer's Representative
ET	Environmental Team
ETWBTC	Environment, Transport and Works Bureau Technical Circular
FEI	Federation Equestre Internationale
HKGC	Hong Kong Golf Club
HKPSG	Hong Kong Planning Standards and Guidelines
HKSARG	Hong Kong Special Administration Region Government
HKSI	Hong Kong Sports Institute
HVAC	Heating, Ventilation and Air-Conditioning
IEC	Independent Environmental Checker
IOC	The International Olympic Committee
LCSD	Leisure and Cultural Services Department
MVAC	Mechanical Ventilation and Air-Conditioning
NCO	Noise Control Ordinance
NSRs	Noise Sensitive Receivers
M&E	Mechanical and Electrical
OZP	Outline Zoning Plan
PCW	Prescribed Construction Work
PlanD	Planning Department
PME	Powered Mechanical Equipment
ProPECC	Practice Note for Professional Persons
RE	Resident Engineer
SS	Suspended Solid
SWL	Sound Power Level
TCLP	Toxicity Characteristic Leaching Procedure
TMs	Technical Memoranda
TM-GW	Technical Memorandum on Noise from Construction Work other than Percussive Piling
TM-DA	Technical Memorandum on Noise from Construction Work in Designated Areas
TM-EIAO	Technical Memorandum on Environmental Impact Assessment Process
TM-Places	Technical Memorandum on Noise from Places other than Domestic Premises, Public Places or Construction Sites
TM-PP	Technical Memorandum on Noise from Percussive Piling
TM-Water	Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters

TPH	Total Petroleum Hydrocarbon
TSP	Total Suspended Particulates
USEPA	United State Environmental Protection Agency
VSR	Visually Sensitive Receivers
WBTC	Works Branch Technical Circular
WDO	Waste Disposal Ordinance
WMP	Waste Management Plan
WPCO	Water Pollution Control Ordinance
WQO	Water Quality Objective
WSR	Water Sensitive Receiver

1. INTRODUCTION

1.1 Project Background

The Beijing Organising Committee for the Games of the 29th Olympiad (BOCOG) made preliminary contacts with the Hong Kong Special Administrative Region Government (HKSARG) at the end of 2004 to explore the possibility of relocating the 2008 Olympic Equestrian Events to Hong Kong to take advantage of the established international equine import and export protocol as well as the supporting facilities already in place. After discussion and forming of an understanding with the HKSARG, BOCOG then proposed to Federation Equestre Internationale (FEI) and The International Olympic Committee (IOC) to relocate the equestrian events to Hong Kong. In July 2005, IOC has accepted BOCOG's proposal of staging the 2008 Olympic and Paralympic Equestrian Events in Hong Kong. Unlike the common practices of Olympic events in most other countries where an Executive Order will be served to eliminate the need to go through legislative procedures for the planning, construction and operation of the venue for the events, Hong Kong chose to remain committed in following the legislative process to engage public participation, in particular the EIA public consultation among other established public communication channels. This requires a super-fast design and submission programme to enable the required approval will be in place without affecting the implementation of the project.

The venue for staging the Olympic equestrian events shall include enough stables to accommodate imported horses, a main arena with a seating capacity for 20 000, different types of training grounds (sand, grass and indoor), a cross country course, broadcasting compounds and facilities for participants of the competition. In accordance with the Green Olympic Games theme commitment of the BOCOG and given the very tight schedule of the Project, it has been decided to temporarily convert Hong Kong Sports Institute (HKSI) into the core competition venues for dressage and show jumping and Hong Kong Golf Club (HKGC) for cross country ride. In addition, a part of the Penfold Park will be converted to provide supporting facilities including a bridle trail for training and a new stable for the horses.

Other than the HKSI site, both HKGC and Penfold Park sites are exempted Designated Project (DP). Within the HKSI site, the Main Arena has been identified as a DP for the EIA study in accordance with the Environmental Impact Assessment Ordinance (EIAO). The project profile for HKSI site (the Project) was submitted on 17 October 2005 and the corresponding study brief was issued on 7 November 2005.

1.2 Purpose and Scope of the EIA Study

The purpose of this EIA Study is to provide information on the nature and extent of potential environmental impacts arising from the construction, operation and decommissioning of the Main Arena for the 2008 Olympic Equestrian Event, and to contribute to decisions on the overall acceptability of the Project, after the implementation of environmental mitigation measures.

In accordance with the item O7, Part 1, Schedule 2 of EIAO, the Main Arena for 20,000 spectators is a DP under the category of "*an outdoor sporting facility with a capacity to accommodate more than 10,000 persons*". Other than the main arena, the rest of the facilities in the Project are not DPs. Table 1-1 gives an account of the DP and non-DP for the project.

Table 1-1: DP and non-DP of the project

DP	Non-DP
Main Arena for 20,000 spectators	Logistic Compound, Food & Merchandise, Spectator Entry & Broadcast Compound, Stable Complex (including a veterinary), Various Training Arenas

1.3 EIA Study Area

In accordance with Clause 3.4.1.2 of the Study Brief, the study area applied to air quality impact assessment is defined by a distance of 500m from the boundary of the Project, and it has extended to include major emission sources from concurrent projects, if any, that may have a bearing on the environmental acceptability of the Project.

In accordance with Clause 3.4.2.2(i) of the Study Brief, the study area applied to noise impact assessment has included all areas within 300m from the project boundary that may be potentially affected by the Project.

In accordance with Clause 3.4.3.2(iv) of the Study Brief, water systems and sensitive receivers due to changes induced by the Project have been studied and cumulative water quality impacts due to other projects, activities or pollution sources within a boundary of 300m from both sides along the identified water system(s) and sensitive receivers were included.

In accordance with Clause 3.4.5.2 and 3.4.5.3 of the Study Brief, the study area for visual impact assessment has encompassed the visual envelope of the Project while that for landscape impact assessment has included all areas within a 500m distance from the Project boundary.

1.4 The Approach

The EIA study has been prepared in accordance with the guidelines provided in Annex 11 of the TM-EIAO for the report contents and Annexes 12 to 19 for the impact assessments of various environmental issues. The general approaches and methodologies adopted for this Study are described below.

1.4.1 Description of the Environment

The characteristics of the existing environment were reviewed for identification and prediction of environmental impacts. Baseline surveys were conducted to determine the existing environmental conditions on the Project site and in any environs likely to be affected by the Project. The baseline conditions of the key issues as identified in the EIA Study Brief including air quality, noise, water quality and landscape & visual are described in the assessment.

1.4.2 Impact Prediction

The EIA Study was undertaken following the guidelines on assessment methodologies given in Annexes 12 to 19 of the TM-EIAO. Quantitative predicting tools were employed for the prediction of environmental impacts in respect of construction noise, operational noise and air quality. The predictions were conducted based on well-recognized methods such as the TM-GW for predicting construction noise.

The applied methodologies for the project had previously been adopted in other EIA studies. They have been generally accepted for use in predicting environmental impacts and for comparison of assessment results with the TM-EIAO requirements. Limitations are however envisaged of these methodologies. The accuracy of the prediction result will be affected by the degree of uncertainty in input data such as construction plant and air emission inventories.

Quantitative uncertainties in the prediction should be considered when drawing conclusions from the assessment results. In carrying out the prediction, realistic worst-case assumptions have been made in order to provide a conservative assessment of environmental impacts.

1.4.3 Impact Evaluation

The predicted changes and effects as a result of the Project were evaluated with respect to the criteria described in Annexes 4 to 10 of the TM-EIAO, and were in quantitative terms as much as practicable.

1.4.4 Impact Mitigation

Mitigation measures have been identified and evaluated to avoid, minimize or remedy the impacts. Priority was given to avoidance of impacts as a primary means of mitigation. The effectiveness of mitigation measures was assessed and the residual environmental impacts identified. Evaluation of impact was made with respect to the criteria described in Annexes 4 to 10 of the TM-EIAO, in quantitative terms as far as practicable.

1.5 Structure of EIA Report

The structure of this EIA report is outlined below for easy reference:

Chapter	Title	Aims
1	Introduction	To provide project background, purpose and scope of the EIA study and to define the EIA study area
2	Description of the Project	To describe the project requirements, consideration of alternatives and major activities in the project
3	Air Quality Impact	To assess the potential air quality impact of the project and suggest mitigation measures
4	Noise Impact	To assess the potential noise impact of the project and suggest mitigation measures
5	Water Quality Impact	To assess the potential water quality impact of the project and suggest mitigation measures
6	Waste Management Implications	To assess the potential waste management implications of the project and suggest mitigation measures
7	Landscape and Visual Impact Assessment	To assess the potential landscape and visual impacts of the project and suggest mitigation measures
8	Summary of Environmental Outcome	To summarise the key environmental outcomes arising from the EIA study.
9	Environmental Monitoring and Auditing Requirements	To define the scope of the EM&A requirements for the Project
10	Environmental Management Plan	To describe the environmental protection strategy under the Environmental Management Plan
11	Conclusion	To conclude the assessment results of the EIA study

2. DESCRIPTION OF THE PROJECT

2.1 General Description of the Project

The Project Proponent proposes to construct and operate a Main Arena with capacity to accommodate about 20,000 spectators and supporting back of house facilities for the Olympic Equestrian Events at HKSI.

The venues will be operational for one month during the main Olympic event, with the competition expected to last from between 10 to 14 days. 14 days after the Olympic Events, the Paralympic competition will be staged, which will last for a few days. The Paralympic Event is open to paid spectators estimated to be less than 10,000.

One year before the actual Olympic Events, the site will be occupied for the Test Event, which is used by all divisions of the Olympic Organising Committee to test their organisational capabilities for the Games and Event Management to trail the equine facilities and the footing (riding surface) of the Main Arena, Stables and Training Facilities. These mock up events are known as the 'Test Event Mode', and limited public access will be given.

The HKSI site is a government land leased to the HKSI for promoting sports education. The premises would be converted mainly to provide temporary facilities for the event. These would include restricted access supporting facilities of Dressage Training Arenas, Warm up Arena, Holding Arena, Stable Complex as well as a Main Arena. Only the Main Arena will be designed to accommodate more than 10,000 spectators. A summary of the temporary facilities is shown in Table 2-1. Drawing No.: ST/R/S/HK/021 shows the location and extent of the project site at HKSI with the Main Arena highlighted. The layout of the facilities on the site is presented in Drawing No.: ST/R/S/HK/022.

Table 2-1: Summary of temporary facilities.

Existing Facility	Future Facility	Addition / Modification / Alteration works	Remarks
Tennis Court	Logistic Compound, Food & Merchandise, Spectator Entry & Broadcast Compound	Modification	Temporary, non-sporting facilities
Stadium	Main Arena for 20,000 spectators	Modification	Temporary sporting facilities
Football Field	Stables (including veterinary)	Modification	Construction of an enclosed structures
Open Area	Warm up, dressage training and holding arenas	Modification	Temporary sporting facilities

2.2 Key Project Requirements

2.2.1 Description of Key Facilities and Access Arrangement

2.2.1.1 Main Arena (Designated Project)

The main arena is the venue for the Dressage and the Show Jumping competitions of the Olympic equestrian sport. The field will be of high quality, free draining sand footing and of size about 100m x 80m catering for both show jumping and dressage competition events. Temporary seating will be provided to accommodate 20,000 spectators. Broadcasting facilities will be located around the main arena to provide lighting, video capture, public address announcement, low level musical playback during competition.

The Main Arena is a Designated Project under the EIAO and will only be operational with the temporary seating for anticipated spectators during the Olympic and Paralympic Event periods. This assessment has been based on the assumptions that the Main Arena would only be used for equestrian events.

2.2.2 Other Facilities

2.2.2.1 Warm-up Arena

The warm-up arena is used for the competitors' final warm-up before entering the main arena for competition performance and will be designed to identical ground and light conditions as the main arena. The field will be of high quality, free draining sand footing and of size about 90m x 45m. The warm-up arena is not part of the DP.

2.2.2.2 Main Stable Complex

The main stable complex will contain approximately 216 units of about 3.6m x 3.6m air-conditioned stables in blocks of 54 boxes around a central courtyard. These blocks will include tack and feed storage rooms, laundries, toilets and day rooms with a 20m lunge ring located within each courtyard. Horse wash bays will be provided outside of each stable. Each horse wash bay will be equipped with facilities enabling the washing of 4 horses at the same time. Fodders and harness rooms will be provided in each stable with tools and clearing tools room for regular collecting and processing of horse fodder and manure. A purpose built equine clinic will be constructed at the venue to provide both diagnostic and minor ailment treatment services during the period. The Main Stable Complex is not part of the DP.

2.2.2.3 Sanitation Facilities

Portable toilets will be distributed throughout the Venue to meet the needs of over 20,000 spectators. Sewage will be connected to the public sewer network leading to the Shatin Sewage Treatment Plant.

2.2.2.4 Commercial and Catering Facilities

Other commercial and catering facilities include shops and storehouses, kiosks and stalls, catering facilities and temporary dining areas for spectators will be provided to meet the requirement of the spectators. All catering facility points will have close connection to processing areas for stock refilling and waste disposal.

2.2.3 Access Arrangement

During the Olympic and Paralympic Games, all categories of personnel other than ordinary spectators will arrive at dedicated coach stops or parking lots and will enter the different entrances with accreditation. Ordinary spectators will arrive at the venue by means of public transportation. Designated secure pathways will guide spectators from the transportation arrival and departure points to the ticketing and security checking points at the Main Arena.

2.3 Need for the Project

On the international level, although Hong Kong is a well-known world-class city for its energetic, vibrant and ever changing environment, it lacks a strong stimulant for raising the awareness of sports participation and advancement in the international arena. The opportunity for organising the entirety of Olympic Events in Hong Kong is distant and currently beyond the reach of the Hong Kong people due to the limitation on land resources, limited multi-event sporting

organising experience and associated opportunity costs to cope with the requirements for the Olympic facilities establishments. The offering of a chance to participate in the 2008 Olympic Event is therefore an exciting opportunity for the entire population of Hong Kong to support. In addition, this event creates opportunities for demonstrating the vibrant and living style of the Hong Kong people, the world-class equine facilities at the HKJC and the nurturing of sporting potential in the city as a result. The Olympic Events is worldwide participation sporting event that will enhance the international image of Hong Kong as a world-class city.

On the national level, as a major city of China, it is an honour of the Hong Kong people to support Beijing on staging the Olympic Equestrian Events. Joining the rest of the other provinces eg Tianjing, Qingdao in organising some of the events, Hong Kong's participation is a recognition of national pride and yet another opportunity for promotion sporting advancement in Hong Kong. The experience gained in organising the equestrian event will enhance Hong Kong's ability and credibility on staging other international multi-sporting events, for examples, the coming East Asian Games and eventually fulfil the city's ambition to hold the Asian Games and other world sporting events. This participation in organising the Olympic Equestrian events will also demonstrate the Hong Kong commitments and abilities to complete the project within such a limited time frame.

On a city level, Hong Kong's recent advancement on sporting achievements to compete on world stage has been stimulated by the success of popular sportspersons including Lee Lai Shan on Olympic gold medal for wind surfing and Li Ching and Ko Lai Chak on Olympic silver medal for table tennis. This has proven the abilities of the Hong Kong athletes to compete on the world arena and provide excellent examples for supporting the continued growth of these sports as well as stimulating the diversification into other sporting kinds. The organisation of the Olympic Equestrian will further stimulates the desire and ambition of the Hong Kong athletes to work towards their dreams, in turn, evolving yet another dimension of the vibrant city of Hong Kong.

The need for the project is evident and the successful organisation of the event will mark another key milestone on the development of sports in the history of Hong Kong and provides a stimulant for its continued growth in the future.

2.4 Consideration of Alternatives

2.4.1 Consideration of Alternative Locations

2.4.1.1 Site Selection Criteria

The IOC's Olympic Games Study Commission issued a set of guidelines to host cities in July 2003. The guidelines place particular emphasis on 'legacy value'. To quote a key stipulation, "IOC wants to ensure that the host cities and their residents are left with the most positive legacy of venues, infrastructure, expertise and experience."

Its principles of venue selection and construction are:

- Use existing venues with refurbishment if needed; build a new venue only if there is a legacy need, ensuring flexible use if possible; if there is no legacy need, seek a temporary solution.
- Develop venues in clusters. Several stand-alone venues are much more expensive than clusters.
- Maximise temporary installation over permanent construction, especially where legacy requirement is less than the Games requirement.

- Develop venue design standards to prevent over-building, over-servicing and over-spending.

FEI has specific requirements on the size, capacity and numbers of arenas, training fields, warm-up areas and competition spaces, as well as accommodation for athletes, spectators, press, the Olympic family and VIPs. Requirements for event management and other logistical support are also specified.

The Main Arena is required to provide 20,000 seats and the cross-country venue at least 3,000 temporary seats. The Main Arena must have a minimum size of 100 x 80 metres to accommodate the Dressage and Show Jumping events, as well as the Dressage and Show Jumping sections of the Three-Day Event.

There are also strict requirements for providing both sand and grass training arenas, in addition to waterproof training facilities for use in bad weather.

For the cross-country section of the Three-Day Event, a training track of at least 800 metres in length is required.

A minimum of 300 stables also has to be provided, each 3.6 x 3.6 metres and laid out in blocks. In addition, accommodation is required for 300 accompanying grooms, as well as facilities for event management, hospitality and security.

Following discussions with the Federation Equestre Internationale (FEI) and the IOC, BOCOG has specified that the main equestrian venue must have a total area of 40 hectares. Further, BOCOG has requested the venues exceed minimum requirements to facilitate FEI's acceptance of the relocation proposal.

Accordingly, the evaluation of the various site options has been conducted on the basis of adherence to these principles.

2.4.1.2 Site Examined

Five potential options for staging the 2008 Olympic Equestrian Events have been examined, four existing premises and a range of Greenfield sites. The alternative site evaluations are discussed below.

Greenfield Sites

A number of possible greenfield sites for contructing the equestrian venues, notably the former Kai Tak airport, were studied. A major problem with all these sites was the requirement to provide supporting equine facilities including an equine hospital and testing laboratory close to the main competition venue. This would mean either relocating the Hong Kong Jockey Club's existing equine facilities at high associated cost, or building new facilities from scratch which would not only be costly, but would also fail to provide the required legacy value.

A particular problem with the Kai Tak option was a number of insurmountable working constraints due to other works taking place on this site. This would make it extremely difficult to ensure that the project could be finished on time.

From the environmental perspective, modification works to these greenfield sites would result in disturbance to the existing natural environment and landscape. Habitats for wildlife fauna and flora species, if any, would also be disturbed. Constructing the equestrian facility on a virgin land is therefore environmentally undesirable.

Kau Sai Chau Golf Course

The main difficulty with this option was its relative remoteness, with access available only by sea. There would be insufficient transportation and logistical support for horses, participants and spectators. In addition, there would also be considerable geographic and topographic constraints in designing the competition and training venues. The cost of relocating the existing equine support facilities would also be very high.

Although staging the events on this site would give minimal odour, noise and visual impacts to sensitive receivers, the remoteness of the site would give rise to other environmental impacts such as pollution emissions due to transportation of construction materials and the problem with handling sewage and surface runoff.

Happy Valley Race Course plus Infield

Although the Hong Kong Jockey Club already has a number of on-site supporting facilities at this venue, there were two main constraints. The site is not large enough to meet the 40-hectare space requirement. There would be insufficient space to accommodate both the Dressage and Show Jumping events as well as training facilities.

Beas River Country Club

This site likewise has a number of existing equestrian facilities, including stabling, in place already. However, the total available space is only 22 hectares, well short of the 40-hectare requirement to accommodate the Dressage and Show Jumping events and associated training facilities.

Nevertheless, it is feasible for Beas River to be the venue for the cross-country section of the Three-Day Event if certain areas from the adjoining Hong Kong Golf Club could be incorporated into the site.

Penfold Park and HKSI

The Penfold Park site has the strong advantage of proximity to the Hong Kong Jockey Club's existing equine hospital and other supporting facilities. On its own, however, the site provides insufficient space to accommodate the Dressage and Show Jumping events as well as training facilities. These constraints could be overcome by incorporating the adjacent land currently administered by the Hong Kong Sports Institute (HKSI).

When compared with Happy Valley Racecourse, the Shatin Racecourse and HKSI are abutted by fewer residential developments, which means that the population size being potentially affected by the construction, operation and decommissioning of the project would be much smaller. The site could also be accessed easily by public transport such as Kowloon-Canton Railway, this would help to minimize the environmental impacts due to pollutant emissions from increased road traffic.

2.4.2 Selection of Preferred Scenario

After a comprehensive review and detailed inspection of a number of sites around Hong Kong the following preferred scenario on site selection has been made:

- The Core Venue for Dressage and Show Jumping: Shatin Racecourse incorporating the Hong Kong Sports Institute and Penfold Park
- The Cross Country Venue: Beas River Country Club and the Hong Kong Golf Club

The HKSI site was chosen because it has an excellent potential to be retrofitted and overlaid to become an Olympic Equestrian Venue with facilities. Conversion of the HKSI would represent a major cost saving exercise over a Greenfield Olympic Equestrian site and would demonstrate to the IOC, the FEI and all countries bidding for future Equestrian Event that it is possible to provide facilities at a reasonable cost, by adapting existing sporting venues. Less construction works are required to convert the existing HKSI to Core Venue than to build the facilities on a greenfield site. This would also lead to a minimization of pollution impact to the environment during construction phase.

The existing ambience and beauty of the HKSI site would be retained during the period of the Olympic and Paralympic Events. Upon completion of the Events, the existing facilities in HKSI would be reinstated.

2.4.3 Consideration of Alternative Project Layout

The constraints of the HKSI site land area means alternative project layout of the Main Arena is not feasible without affecting the arrangement of the supporting facilities and spectators access. A discussion of the reasoning of the project layout is given below.

2.4.3.1 Main Arena (Designated Project)

It is proposed to convert the existing athletic ground at HKSI to the Main Arena for the Olympic Equestrian Event. The existing athletic ground is considered the most suitable location for constructing the main arena as its size is comparable to the size requirement as specified by FEI. Another credit of constructing the Main Arena at the proposed location is that it would involve the least amount of existing vegetation that needs to be removed given the similarity in size and nature between the existing and the planned use.

2.4.3.2 Main Stable Complex

It is proposed to site the Main Stable Complex at the lower right-hand corner of the HKSI site. By siting stable complex at the proposed location, a longest horizontal distance between the stables and the nearest sensitive receivers (i.e. HKJC Staff Quarters) could be achieved hence minimizing any potential odour impact due to the new stables to these receivers. In addition, the existing facilities on the proposed land for the Stable Complex are football fields, therefore no excessive demolition works are required and hence reducing the amount of C&D material generated.

2.4.4 Consideration of Alternative Construction Methods and Sequences of Works

Conventional construction methods and plant will be used for the construction works within HKSI. As the construction involves standard site formation/earthworks, pipe laying and concreting, the proposed construction methods are well established and efficient for the nature of the work activities. With the implementation of appropriate mitigation measures and good site management practices, they will not cause any adverse environmental impacts. A detailed description of the construction methodologies for the works is given in Section 2.7.

2.5 Site location and Site History

Located to the southwest of the Shatin Racecourse, the proposed site is currently the home of the Hong Kong Sports Institute, which was built on a reclaimed land by the Hong Kong Jockey Club in 1980, to advance the sporting achievements of Hong Kong athletes. The group of facilities was originally called The Jubilee Sports Centre (JSC) and was previously managed by the Jubilee

Sports Centre Board. The JSCB became defunct following the renaming of the JSC as Hong Kong Sports Institute (HKSI) in April 1991. The HKSI was then managed by the Hong Kong Sports Development Board (HKSDB), which was established in April 1990. Subsequent to the dissolution of the HKSDB in October 2004, the Hong Kong Sports Institute Limited was established to take up the role of elite training and development in Hong Kong as well as to manage the HKSI facilities since then. The HKSI site contains a multitude of sporting facilities and infrastructure, including a large athletics field, indoor sporting halls, restaurants, accommodation, changing and meeting rooms etc, within an established park like environment. The site is currently zoned Government / Institution / Community and annotated on the latest approved Sha Tin OZP S/ST/20 gazetted on 8 August 2004.

2.6 Nature, scope and benefits of the Project

2.6.1 Nature of the Project

The nature of the Project is to provide an outdoor Main Arena with capacity to accommodate about 20,000 spectators and supporting facilities for the 2008 Olympic Equestrian Event.

2.6.2 Scope of the Project

The scope of the Project is to provide an outdoor Main Arena that can accommodate about 20,000 spectators for the Olympic Equestrian Events. In addition, associated facilities such as a stable complex providing accommodations for about 216 horses, a sand warm-up arena, training arenas, a broadcast compound, logistics compounds, food/merchandise area, spectator entry and spectator forecourt will also be set up at the existing HKSI site.

2.6.3 Benefits of the Project

It is the pride of Hong Kong to share the joy and glory of the 2008 Olympic and Paralympic Games, the first time the Games to be held in China. The relocation of the 2008 Olympic equestrian events will help arouse the community's interest in sports, enhancing Hong Kong's status as a hub for important sporting events, international equestrian centre and an Asian metropolitan. Hong Kong can also enjoy the economic benefits brought about by horse-lovers who come to Hong Kong for the equestrian events.

Besides, the equestrian sport for the disabled in Hong Kong is well-established and is occupying a leading position in Asia. After the 2008 Olympic equestrian events, the expertise and facilities will be improved. By then, the equestrian sport for the disabled will be boosted further.

The Shatin Racecourse is well equipped with core supporting facilities (such as an equine hospital, some isolation stables, horse training grounds, laboratories, a feed storage area and a team of professional staff), which can provide efficient and cost effective back-up services for the Olympic equestrian events. This is the most important consideration for site selection and the fundamental reason for staging the equestrian events in the vicinity of such facilities.

A substantial saving in the cost of staging the equestrian events can be achieved by pooling together the existing resources and facilities of the HKSI and the Sha Tin Racecourse and by carrying out suitable conversion works to cater for the events. The cost will be much lower than that of constructing a new venue.

2.7 Size, Scale, Shape and Design of the Project

The size of the Project is approximately 140,000 m^2. The shape of the Project site is presented in Drawing No.: ST/R/S/HK/021.

2.8 Construction & Reinstatement Method/Activities and Operational Activities

2.8.1 Construction Activities and Methodologies

2.8.1.1 General Site Formation

Minor cut and filling of the existing topography will be carried out to provide the land formation for the arenas, access roads and the new stables. Standard mechanical excavators and dump trucks will undertake this work. As the HKSI has been formed on areas of reclamation using granular type fill and boulders there should be no significant rock excavation if any. Individual boulders encountered during the site formation will be removed from site with any voids filling with suitable fill material.

Runoff from open soil surfaces will be intercepted and conveyed through silt traps to prevent silt-laden runoff being washed downstream to sensitive stream courses.

Where possible there will be a balance of cut and fill from the general excavation undertaken for the site formation of the HKSI if this can be achieved within the constraints of the required finished ground levels. Excess material will be disposed of to a licensed Government landfill site.

2.8.1.2 Drainage, Sewerage and Utilities

Drainage, sewerage, and utility services will be installed underground by laying pipes, cables and ducts in trenches formed through open excavation. Access chambers will be provided at appropriate intervals along the specific ancillary service in accordance with the specific requirements of the relevant authorities and service providers. Chambers will be formed using either mass or reinforced concrete.

All excavations will be undertaken by mechanical means. Similar to the general site formation, rock excavation will not be required except for the removal of isolated boulders. In the case of large boulders are encountered, pneumatic drills may be used. Pipes, cables and ducts will be laid using slings. Once laid the trenches will be backfilled with suitable material. The sides of all trench excavations and any excavations for access and pumping chambers will be shored using trench sheeting. The trench sheeting will be driven into the ground using the hydraulic arm of the mechanical excavator.

Excavations will be kept dry through temporary pumping from sumps in the bottom of the excavation. Pumped water from excavations will be conveyed through silt traps.

2.8.1.3 Main Arena and Other Sand Arena

The various sand equine arenas will be constructed by laying layers of granular material on top of the formed area. Excavators, compactors and tractors with rakes will be used to place the sand on arenas. On completion of the Olympics the sand on the training and main arenas will be removed from site and disposed of to a Government landfill site.

2.8.1.4 Grass Arenas

Grass arenas will be constructed by forming the turf footing above the formation surface. The turf will be laid on a sand layer above the formation surface.

2.8.1.5 Horse Walkways

To better facilitate horses movements between the stables and arenas, horse walkways will be formed. These will consist of gravel tracks formed by spreading over the formation surface.

2.8.1.6 Roads

Road will be formed by laying and compacting a road sub-base followed by the road formation in layers to the finished concrete road surface.

2.8.1.7 High Mast Lights

High mast lights are required to illuminate the main and warm up arenas. It will be necessary to provide piled foundations for the main arena light masts. The piles will either be constructed using pre-bored H piles or bored mini-piles. Slurry waste from forming the holes for the piles will be collected and contained in tanks and then removed from site and disposed to a licensed public fill. The high mast lights will be retained for future use but the number of lamps will be reduced to achieve an illuminance level comparable to that of the existing racecourse.

2.8.1.8 Temporary Stadium Seating

The Equestrian Event is expected to attract up to 20,000 spectators in peak days of the event. To accommodate the spectators temporary seating will be hired from a specialist seating contractor. The seating will be assembled on site around the main arena with the seating footings placed on the existing ground surface and the frame erected using manual labour and lifting equipment.

2.8.1.9 Temporary Toilets

Temporary toilets will be provided for the spectators. The toilets will be housed in Portakabins, which will be fabricated off site and placed on site where required using lifting equipment. The temporary toilets will be connected to the public sewer system. The sewer pipe connections will be constructed as described under the drainage, sewerage and utilities section.

2.8.1.10 New Stable Buildings

Four stable buildings will be built at the HKSI site. These stables are steel frame rest on reinforced concrete pad footing. Site formation work will be completed before the construction of these buildings. Reinforcement fixing and formwork cutting for the footings will be carried out on site. Concreting trucks will enter the site for concreting the footing. Most of the steel members will be pre-fabricated to minimise the welding works on site. As the buildings are only one or two storeys high, mobile crane will be adopt for transporting material within the site instead of using tower crane. After the construction of the structural frame, roofing, wall finishes, partitions and building services will be installed.

2.8.2 Operational Activities

There are three equestrian disciplines contested at the Olympics, with an individual and team event in each, making six events on the Olympic programme. The three disciplines are jumping, dressage, and Eventing. Jumping consists of negotiating a series of obstacles with the goal being not to disturb the fences. Dressage is a sort of ballet on horseback in which the rider guides the horse to perform certain intricate manoeuvres of stepping. Eventing combines the above two disciplines, and adds a third competition of riding a cross-country course on horseback.

Except the Cross-country event in Eventing, which will be held in a separate cross-country course, all individual and team competition events will be held at the Main Arena.

The 2008 Olympic Equestrian Event will be held in August 2008 and will last for about 2 weeks.

2.8.3 Reinstatement Activities and Methodologies

The areas for the Main Arena, logistics compound, spectator entry & broadcast compound and warm-up arena will be reinstated upon the completion of the Olympic and Paralympic Event. The sand footings for the arenas will be removed and sporting facilities will be reprovided on these areas. The temporary seats for the Main Arena would be dismantled.

2.9 Project Timetable and Phasing of the Project

The implementation of the Project is scheduled from July 2006 to January 2009. Table 2-2 gives the tentative project timetable and phasing. A detailed programme is presented in Appendix 2-1.

Table 2-2: Project timetable and phasing for the Project

Task	Start	Finish
Pre- Test Event Construction	July 2006	June 2007
Test Event	August 2007 (2 weeks)	
Post Test Event Construction	September 2007	June 2008
Olympic Event	August 2008 (2 weeks)	
Paralympic Event	September 2008	
Reinstatement of HKSI	October 2008	January 2009

2.10 Related Projects

The 2008 Olympic and Paralympic Equestrian Events would be staged on 3 sites in Hong Kong. Apart from HKSI, the existing Penfold Park and Hong Kong Golf Club would also be converted to the Event Venues. Stables and training facilities will be provided on the Penfold Park site whereas HKGC will be converted for the Cross-country Event.

The projects at Penfold Park and HKGC were confirmed to be exempted DPs and statutory submissions under EIAO would not be required if the proposed works on these two sites do not constitute a material change.

Since the Penfold Park site is located adjacent to the Project site, cumulative impacts arising from the activities on the Penfold Park site during both construction and operational phases were assessed.

3. AIR QUALITY IMPACT

3.1 Introduction

This chapter presents the assessment of potential air quality impacts, which may arise during the construction, operation and reinstatement of the Project. Control measures for construction / reinstatement activities have been recommended in accordance with the requirements specified in the Air Pollution Control (Construction Dust) Regulation. The adoption of full-enclosure design with odour removal system for the new Stables Complex will provide a higher standard of stable environmental control that also eliminate the potential of any odour impact during operational phase.

The air quality impact assessment has been conducted in accordance with the requirements of Annex 4 and Annex 12 of the TM-EIAO as well as the requirements set out under Clause 3.4.1 of the EIA Study Brief.

3.2 Environmental Legislation, Standards and Guidelines

3.2.1 Air Quality Objectives (AQO)

The principal legislation for controlling air pollutants is the Air Pollution Control Ordinance (APCO) (Cap 311) and its subsidiary regulations, which define statutory Air Quality Objective (AQOs) for 7 common air pollutants. The AQOs for these air pollutants are tabulated in Table 3-1 below.

Table 3-1: Hong Kong Air Quality Objectives

Pollutant	Concentration in micrograms per cubic metre [1] (Parts per million, ppm in brackets)				
	1 Hour [2]	8 Hour [3]	24 Hours [3]	3 Months [4]	1 Year [4]
Sulphur Dioxide	800 (0.3)		350 (0.13)		80 (0.03)
Total Suspended Particulates	500 [7]		260		80
Respirable Suspended Particulates [5]			180		55
Carbon Monoxide	30,000 (26.2)	10,000 (8.7)			
Nitrogen Dioxide	300 (0.16)		150 (0.08)		80 (0.04)
Photochemical Oxidants (as ozone) [6]	240				
Lead				1.5	

Notes:
[1] Measured at 298K(25 °C) and 101.325 kPa (one atmosphere).
[2] Not to be exceeded more than three times per year.
[3] Not to be exceeded more than once per year.
[4] Arithmetic means.
[5] Respirable suspended particulates mean suspended particles in air with nominal aerodynamic diameter of 10 micrometres or smaller.
[6] Photochemical oxidants are determined by measurement of ozone only.
[7] Not an AQO. TM-EIAO suggested short term averaging level for 1 hour is 500 μg/m^3. There is no exceedance allowance for 1-hour TSP guideline level.

3.2.2 Air Pollution Control (Construction Dust) Regulation

The Air Pollution Control (Construction Dust) Regulation specifies processes that require special control. Contractors and site agents are required to inform EPD and adopt dust reduction measures while carrying out "Notifiable Works" or "Regulatory Works" as defined under the regulation. Works relevant to this Project include site formation activities of a small scale.

3.2.3 Odour Criteria

In accordance with Annex 4 of TM-EIAO, the limit of 5 odour units based on an averaging time of 5 seconds should not be exceeded at any receiver.

3.3 Description of the Environment

3.3.1 Surrounding Land Uses

The Study Area is located in Fo Tan, Shatin within an area of high-rise residential developments. The Project site of HKSI adjoins Shatin Racecourse and is situated to the northwest of Shing Mun River Channel. Fo Tan industrial area is located at a horizontal distance of about 380m to the northwest and Shatin Sewage Treatment Works at approximately 1260m to the northeast of the site. Tai Po Road – Sha Tin section, is along the northwest of the site at a distance of about 180m. Major local influence on the background air quality of the adjacent landuses are the industrial emissions from the Fo Tan industrial area and vehicular emissions from Tai Po Road – Sha Tin section.

The Project site is located within the "Sha Tin Fuel Restriction Area" under the Air Pollution Control (Fuel Restriction) Regulations. Subregulation 4(1) states that no conventional liquid fuel or conventional solid fuel should be used in any furnace, oven or industrial plant in the Sha Tin fuel restriction area. In other words, only gaseous fuel is permitted in this area. However, the above subregulation does not apply to any furnace, oven or industrial plant that is used or operated only on a construction site, therefore the fuel type of the construction plant for the Project is not governed by this regulation.

3.3.2 Background Air Quality

The nearest EPD's Air Quality Monitoring Station to the project site is the Sha Tin Monitoring Station at Sha Tin Government Secondary School along Man Lai Road at 2.5km away. According to EPD's report on "Air Quality in Hong Kong", the Area Type of Shatin is under the New Town: Residential category.

Air quality data at the Sha Tin Monitoring Station between 2000 and 2005 has been extracted. Table 3-2 below shows the average background concentration of major air pollutants at the monitoring station.

Table 3-2: Concentrations of major air pollutants at EPD's Shatin monitoring station

Pollutant	Average Concentration (μg/m³)
TSP [1]	66.3
RSP [2]	50.6
SO_2 [2]	16.3
NO_x [2]	92.2
NO_2 [2]	47.7
O_3 [2]	38.4

[1] Average annual TSP from "Air Quality in Hong Kong" published by EPD between 2000 and 2003 as the average annual TSP concentrations for 2004 and 2005 have not yet been published.

[2] Average hourly concentration from Air Quality Monitoring Data between 2000 and 2005

3.4 Air Sensitive Receivers

Air sensitive receivers (ASRs) were identified in accordance with the guidelines in Annex 12 of the TM-EIAO. Existing ASRs were confirmed through site visits and review of the survey maps. There were no planned ASRs on the latest Outline Zone Plan. The key representative ASRs for air impact assessment are given in Table 3-3 and their respective locations are shown in Drawing No.: ST/R/S/HK/031

Table 3-3: Summary of representative air sensitive receivers

ASR ID.	ASR Description	Use	Shortest Horizontal Distance to Project Boundary, m	Shortest Horizontal Distance to Boundary of Stable Area, m
A1	Hong Kong Wong Association Wong Ming Him Memorial School	Educational	468	828
A2	Wo Che Estate	Residential	460	828
A3	Hong Kong Institute of Vocational Education (Shatin)	Educational	283	690
A4	Shatin Fire Station	Office	108	510
A5	Jockey Club Ti-I College	Educational	237	564
A6	KCRC House	Office	263	500
A7	HKJC Staff Quarters	Residential	66	300
A8	Racecourse Villa	Residential	177	260
A9	International Christian School – Elementary	Educational	289	390
A10	Jubilee Court Shopping Centre	Commercial	300	390
A11	Jubilee Garden	Residential	316	372
A12	Royal Ascot Shopping Centre	Commercial	360	408
A13	Royal Ascot	Residential	420	438
A14	City One Shatin	Residential	312	618
A15	Ravana Garden	Residential	240	288
A16	Leung Kui Kau Primary School	Educational	240	282
A17	Garden Vista	Residential	250	264
A18	Pictorial Garden Phase I	Residential	230	258
A19	Pictorial Garden Phase II	Residential	234	288
A20	Pictorial Garden Phase III	Residential	310	348

3.5 Assessment Methodology

3.5.1 Determination of Assessment Area

The study area for the air impact assessment includes all ASRs within 500m from the boundary of the Project. Drawing No.: ST/R/S/HK/032 shows the scope of the study area.

3.5.2 Construction Phase

Given the small scale of construction activities involved in this Project, no significant construction dust emissions are anticipated. A qualitative approach for the assessment of construction dust impact is therefore proposed. The assessment has been conducted in accordance with the procedures below:

- Identify the construction activities that could potentially be the sources of construction dust emission;
- Adopt good site practice and appropriate control measures to minimize the potential dust impact;
- Assess the significance of construction dust emissions from these activities after adopting good site practice and appropriate control measures;
- Assess the significance of cumulative dust impact due to other concurrent projects.

3.5.3 Operational Phase

Odour assessment has been conducted in accordance with the following procedures:

- Identify and locate the existing and future odour emission sources within the study area;
- Identify and locate representative ASRs that may be affected by the odour sources;
- Determine by odour patrol the shortest distance from the existing stables at Sha Tin Racecourse beyond which the odour is insignificant;
- Assess the significance of the scale and temperature influence on the source emissions of the new stable complex in comparison with the existing Sha Tin stables.
- Assess the significance of odour impact at the ASRs by making reference to the distance of insignificant odour determined by odour patrol from the existing Sha Tin stables.

3.6 Identification of Environmental Impacts

3.6.1 Construction / Reinstatement Phase

As the design has taken consideration of the landform of the HKSI site, only minor site formation activities will be required on the Project. Extensive excavation works is not expected. Chapter 2.8 presents a detailed description of the key construction works required which include the following major activities:

- General site formation;
- Drainage and sewerage works;
- Utilities services, roadworks and horse walkways construction works;
- Construction of temporary stadium, new stable and training arena; and
- Cumulative air quality impacts arising from concurrent construction activities at Penfold Park.

All the above activities are not expected to generate a significant amount of construction dust. With the implementation of the control measures as stipulated in the Air Pollution Control

(Construction Dust) Regulation, construction dust impact to the surrounding air sensitive receivers would be minimal.

3.6.2 Cumulative Dust impacts from Concurrent Projects

The construction activities of the Project will coincide with the modification works in Penfold Park for the Olympic Event. Modification works inside Penfold Park involve the formation of the sand and grass footings for the Bridle Track and the Training Arenas, and the construction of a stable block in the middle of the park and a short underpass of less than 200m between Penfold Park and HKSI.

The construction activities in Penfold Park, including site clearance, laying of sand and grass footings for Bridle Track, and the Training Arena, and construction of stables would not generate significant amount of construction dust. The construction methodology of the underpass is similar to that of a subway for pedestrian and would only cause minor fugitive dust emission. Control measures stipulated in the Air Pollution Control (Construction Dust) Regulation of Air Pollution Control Ordinance (APCO) will be strictly followed. Cumulative dust impact from Penfold Park is therefore considered insignificant.

3.6.3 Operational Phase

3.6.3.1 Vehicular Emissions

At present, people visiting the Sha Tin Racecourse usually arrive by means of public transport (e.g. bus and railway). The same mode of transportation would be provided during period of the Olympic Event. When compared to the crowd size of 50,000 on a typical horseracing day at Sha Tin Racecourse, the predicted number of 20,000 spectators would not cause additional load to the surrounding traffic given the fact that no horseracing event would be held at Sha Tin Racecourse on the days of Olympic Event. Additional vehicular emission is therefore not anticipated.

3.6.3.2 Odour Impact from Stable

The existing horse stables at the Sha Tin Racecourse are located next to the Shatin STW and can accommodate 1,192 horses. An existing stable area is located adjoining the HKSI site, which can accommodate another 70 horses. During the Olympic Equestrian Event period these stables will be used as normal stables to accommodate horses for the equestrian event. The major differences between these stables and the stables at Sha Tin Racecourse are the inclusion of an insect screen at the entrance and the adoption of enclosed solid waste containers at the stables near HKSI.

Waste generated from stables at Sha Tin Racecourse mainly consists of bedding paper scraps, horse feed and horse excretion. Waste from stables are cleared twice a day and stockpiled in a partially confined concrete container outside the stable building. The waste is subsequently collected by licensed waste collector engaged by HKJC twice daily. During the process of transferring waste from the concrete container to refuse collection vehicles, water is continuously sprayed on the stockpiled waste so as to suppress any dust arising from the operation. Approximately 126 tonnes of stable waste are generated from the existing stables at Sha Tin Racecourse every day. This figure is however subject to variations of horse population and workload. The bedding materials for stables will be replaced more frequently in high humidity weather due to hygiene concerns and therefore a greater amount of stable waste is likely to be generated during these seasons. The collected waste is delivered to the landfill sites in Hong Kong by refuse collection vehicles for final disposal. Table 3-4 shows the typical daily operation schedule for stables at Sha Tin Racecourse.

Table 3-4: Existing stable operation timetable

Time	Activities / Operations
04:00	Cleansing of stable, removing beddings with manure out of the stables, wash box and replace a new bedding
08:00	Horses having morning exercises
10:00	Waste collector to collect stable wastes
12:00 to 14:00	Cleansing of stables, changing beddings
17:00	Waste collector to collect stable wastes
18:00 to 0400 of next day	Resting time for horses, no activities

The stable cleansing practices usually include the removal of waste bedding that contains horse manure, washing of stable box and replacement of new bedding. Dust control measures currently in place include covering of waste by tarpaulin and spraying of water on the waste mass to avoid the emission of fugitive dust and odour. HKJC advised that there would be no activity or operation in the stable from 1800 to 0400 of the following day. The frequency for washing the horses varies from stable to stable and usually depends on the practices of the horse trainers. In general, horse are brushed and washed respectively at least once every day.

Tracks and areas outside stables are also cleaned regularly to ensure that they are free from waste or dust. Horse excretion found on these areas is frequently removed.

The operation schedule currently adopted by the general stables at Sha Tin Racecourse will be extended to cover the new stables.In addition, the existing measures for dust and odour control include:

- Temperature and humidity are maintained at about 22°C and 70% inside the stable boxes throughout the seasons. Thus, significant variation of the odour source emission strength due to variation of ambient temperature in different seasons is not anticipated;
- Paper scraps are used as bedding material for the majority of the stables boxes to reduce dust particle level;
- During seasons of high humidity levels, the frequency of changing stable bedding will be increased accordingly; and
- Sheet cover and water spraying system are installed at the waste storage area to control dust and odour emissions.

3.7 Prediction and Evaluation of Environmental Impacts

3.7.1 Operational Phase

Odour patrols along different routes around the existing stables at Sha Tin Racecourse were conducted on 29 November 2005 to determine the shortest distance beyond which odour is insignificant. The odour panelists from Polytechnic University have identified four types of olfactory stimulants, namely horse manure, feed, grass and sewage during the patrol. These olfactory stimulants are originated from the horse stables and the Shatin STW. The findings of odour patrol suggest a distance of insignificant odour at around 100m from the boundary of stable area. The full odour patrol report is given in Appendix 3-1.

Given the facts that the new Stable Complex will be located at more than 250m away from the nearest sensitive receiver (ASR18) and that they will only accommodate about 216 horses (20% of the existing total horse population), it would be conservative to conclude, based on the patrol

observations, that the new stables at HKSI will unlikely cause adverse odour impact to the nearby ASRs on the following justifications:

- Since the environmental control within all stables will be maintained at about 22°C temperature and 70% humidity, significant variation of the odour source emission strength due to variation of ambient temperature in different seasons is not anticipated. The findings of the odour patrol on the distance of insignificant odour therefore represents a worst case source emission scenario;
- The new Stable Complex will house about 216 horses, which is only 20% of the population in the existing stables. The scale is much smaller than the existing stable area at Sha Tin Racecourse. This represents a significant reduction on the quantity of potential odour emission sources. The location of the Stable complex is also at a much further distance of 250m from the nearest ASR in comparison with the distance (100m) of insignificant odour from the existing stables;
- The new Stable Complex will be designed to a higher standard of full enclosure construction and equipped with activated carbon filter of minimum 90% odour removal efficiency at the exhaust. In addition, properly enclosed containers similar to those for the existing Stables near HKSI will be provided for the stockpiling of stable waste.

It is therefore concluded that odour impact from the new Stable Complex will be insignificant.

3.7.2 Cumulative Odour impacts

An existing stable area that can accommodate 70 horses is located to the northwest of the Project site. The stable management practices for these stables (including waste management procedures) are very similar to that for the stable areas at Sha Tin Racecourse, except for the adoption of enclosed container for the stockpiling of stable waste. Given the much smaller scale of these stables relative to the existing stables at Sha Tin Racecourse, a more stringent indoor environment control, and the insignificant odour sensed during the odour patrol, it is concluded that the cumulative odour impact within the study area is insignificant.

3.8 Mitigation Measures

3.8.1 Construction / Reinstatement Phase

The Contractor is obliged to follow the procedures and requirements given in the Air Pollution Control (Construction Dust) Regulation. The following dust suppression measures will also be incorporated in the contract document to control the dust nuisance throughout the construction phase:

- Any excavated dusty material should be covered entirely by impervious sheeting or sprayed with water to maintain the entire surface wet and then removed or backfilled or reinstated where practicable within 24 hours of the excavation or unloading;
- Any dusty materials remaining after a stockpile is removed should be wetted with water and cleared from the surface of roads or streets;
- The load of dusty materials on a vehicle leaving a construction site should be covered entirely by impervious sheeting to ensure that the dusty materials do not leak from the vehicle;

- Where practicable, vehicle washing facilities with high pressure water jet should be provided at every discernible or designated vehicle exit point. The area where vehicle washing takes place and the road section between the washing facilities and the exit point should be paved with concrete, bituminous materials or hardcores;
- When there are open excavation and reinstatement works, hoarding of not less than 2.4m high should be provided as far as practicable along the site boundary with provision for public crossing. Good site practice shall also be adopted by the Contractor to ensure the conditions of the hoardings are properly maintained throughout the construction period;
- The portion of any road leading only to construction site that is within 30m of a vehicle entrance or exit should be kept clear of dusty materials;
- Any area that involves demolition activities should be sprayed with water or a dust suppression chemical immediately prior to, during and immediately after the activities so as to maintain the entire surface wet;
- Where a scaffolding is erected around the perimeter of a building under construction, effective dust screens, sheeting or netting should be provided to enclose the scaffolding from the ground floor level of the building, or a canopy should be provided from the first floor level up to the highest level of the scaffolding; and
- Any skip hoist for material transport should be totally enclosed by impervious sheeting.

3.8.2 Operational Phase

The full-enclosure design of the proposed stable and the installation of odour removal system, such as carbon filter at the exhaust of ventilation system of stables will provide additional control on any potential of odour impact. Notwithstanding this, the current housekeeping rules will apply to ensure a consistent good practice. They include:

- A sanitary environment will always be maintained in the stable area. The current waste management practices as mentioned in Section 3.6.3.2 will be extended to cover the new stable area at HKSI. Detailed design of stable will cater for the health, safety and environmental protection considerations in accordance with the HKJC policy and practice; and
- Regular maintenance of the odour removal system, such as carbon filter system will be carried out to maintain the odour removal efficiency.
- Enclosed containers, similar to those at the existing stables near HKSI, will be provided for the stockpiling of waste.

3.9 Residual Environmental Impacts

With the implementation of appropriate dust mitigation measures during the construction / reinstatement phase, no residual dust impact is anticipated.

With the proper stable management practice in place as described in Sections 3.8.2, no residual air quality impact is anticipated during the operation of the Project.

3.10 Conclusion

Representative ASRs comprising residential uses and schools have been identified. Construction dust impact was assessed to be minor and could be effectively controlled by implementing the

procedures and requirements specified in the Air Pollution Control (Construction Dust) Regulation. An EM&A programme will be devised to monitor the dust impact during construction. Concurrent projects that would potentially cause cumulative dust impacts have been identified. The potential cumulative impacts from these projects are considered to be minor and insignificant. With the implementation of effective dust suppression control and good site practice, adverse cumulative construction dust impact is not anticipated.

Operational air quality impact due to increased vehicular emissions as a result of increased traffic volume is not expected given that spectators will arrive the venue by public transport similar to a horse-racing day and in much reduced number, and that no horseracing event would be held at Sha Tin Racecourse during the Olympic events.

The results of the odour patrol survey conducted by specialists from Polytechnic University concluded that odour was insignificant at a distance of approximately 100m from the existing stable boundary. Given the smaller scale of the new Stable Complex and the greater separation distance to the nearest ASR (more than 250m), it is concluded that the potential odour impact from the new Stable Complex is insignificant. In addition, the improved odour control measures at the new Stable Complex will further eliminate any potential of odour impact.

4. NOISE IMPACT

4.1 Introduction

This chapter presents the assessment of potential noise impacts which may arise during the construction, operation and reinstatement of the Project. This assessment has been based on the assumptions that the Main Arena would only be used for equestrian events and the equestrian competition will not start earlier than 0700hr and will not be extended beyond 2300hr. Phased construction schedule would be implemented and quiet construction plant would be used where necessary to mitigate the potential noise impacts during construction / reinstatement phase. Proper volume control over the public address system by means of a limiter device would help to alleviate the potential noise impact in operational phase.

The noise impact assessment has been conducted in accordance with the requirements of Annex 5 and Annex 13 of the TM-EIAO as well as the requirements set out under Clause 3.4.2 of the EIA Study Brief.

4.2 Environmental Legislation, Standards and Guidelines

4.2.1 Construction / Reinstatement Noise

Control over construction noise is governed by the Noise Control Ordinance (NCO) (Cap 400) and the EIAO and their subsidiary requirements. Various Technical Memoranda (TMs) have been issued under the NCO and the EIAO to stipulate control approaches and criteria. These TMs prescribe the maximum permitted noise levels for the use of Powered Mechanical Equipment (PME) and certain construction activities and processes, according to the type of equipment or activity, the perceived noise climate of the area, and the working hours of equipment operation and usage. TMs applicable to the control of noise from construction activities in the current Project works are:

- TM on Noise from Construction Work other than Percussive Piling (TM-GW);
- TM on Noise from Construction Work in Designated Areas (TM-DA);
- TM on Noise from Percussive Piling (TM-PP);
- TM on Environmental Impact Assessment Process (TM-EIAO)

4.2.1.1 Noise Standards for Daytime

Noise arising from general construction works during daytime is governed by the TM-EIAO. Table 4-1 presents the stipulated noise standards.

Table 4-1 : Noise standards for daytime (0700 to 1900 hours) construction activities

Uses	Acceptable Noise Standards $L_{eq\ (30mins)}$, dB(A)
All domestic premises including temporary housing accommodation	75
Hotels and hostels	75
Educational institutions including kindergartens, nurseries and all others where unaided voice communication is required	70 65 (during school examinations)

In accordance with the TM-EIAO, the noise criteria as laid down in Table 4-1 for the construction of DPs shall be met as far as practicable. All practicable mitigation measures shall be exhausted to avoid residual impacts to the maximum possible extent.

4.2.1.2 Noise Standards for Restricted Hours

The NCO provides statutory controls on general construction works during the restricted hours (i.e. 1900 to 0700 hours from Monday to Saturday and at any time on Sundays or public holidays). The use of PME for construction works during the restricted hours would require a CNP. The TM-GW details the procedures adopted by EPD for assessing such application. The granting of a CNP is subject to conditions stated in the permit and it may be revoked at any time for failure to comply with the permit conditions.

Since the Study Area does not fall within any designated area under the NCO. Hence, noise criteria set out in the TM-DA would not be applicable to this Project.

Maximum noise levels from construction activities during restricted hours at the affected NSRs are controlled under the TMs and shall not exceed the specified Acceptable Noise Levels (ANLs). These ANLs are stipulated in accordance with the Area Sensitivity Ratings established for the NSRs. The ANLs for construction works in designated areas are more stringent than those given in the TM-GW, as reflected from the corresponding Basic Noise Levels (BNLs) stated in Table 4-2.

Table 4-2 : BNLs for construction noise other than percussive piling

Time Period	Basic Noise Levels for Area Sensitivity Ratings, dB(A)		
	A	B	C
All weekdays during the evening (1900 to 2300 hours), and general holidays (including Sundays) during the day and evening (0700 to 2300 hours)	60	65	70
All days during the night-time (2300 to 0700 hours)	45	50	55

4.2.1.3 Construction Noise Permits

Despite any description or assessment made in this EIA Report on construction noise aspects, there is no guarantee that a CNP will be issued for the project construction. The Noise Control Authority will consider a well-justified CNP application, once filed, for construction works within restricted hours as guided by the relevant TMs issued under the NCO.

The Noise Control Authority will take into account contemporary conditions / situations of adjoining land uses and any previous complaints against construction activities at the site before making a decision in granting a CNP. Nothing in the EIA report shall bind the Noise Control Authority in making a decision. If a CNP is to be issued, the Noise Control Authority shall include in it any conditions demand. Failure to comply with any such conditions will lead to cancellation of the CNP and prosecution action under the NCO.

Percussive piling would not be adopted for the Project. Therefore, criteria as set out in the TM-PP would also not be applicable to this Project.

4.2.1.4 Best Practices

The following practice notes on construction activities shall also be observed by the Contractor:

- Noise from Construction Activities – Statutory (ProPECC PN 1/93)
- Noise from Construction Activities – Non-statutory Controls (ProPecc Note 2/93)

4.2.2 Operation Noise

The TM applicable to fixed noise sources is Technical Memorandum for the Assessment of Noise from Places Other than Domestic Premises, Public Places or Construction Sites (TM-Places).

According to Table 1A in Annex 5 of TM-EIAO, for planning purpose, noise levels from fixed noise source should be 5dB(A) below the appropriate ANLs stipulated in Table 3 of the TM-Places, or the prevailing background noise levels, whichever is lower. The ANLs for different Area Sensitivity Ratings are summarised in Table 4-3 below. The criteria apply to cumulative operations of all fixed plants, PA system and crowd noise.

Table 4-3: ANLs for different Area Sensitivity Ratings in TM-Places

Area Sensitivity Rating	Time Period [1]	Acceptable Noise Levels (ANL), $L_{Aeq, 30 mins}$, dB(A)
A	Day & evening	60
	Night	50
B	Day & evening	65
	Night	55
C	Day & evening	70
	Night	60

Note:
[1] Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours

A noise survey was undertaken in November 2005 to determine the prevailing noise levels. Results indicated that the measured average daytime & evening time noise levels were in the range of 55-59 dB(A); and the measured average night-time noise levels were in the range of 54-56 dB(A) at varying monitoring locations. As the background noise level for day & evening time is lower than the relevant ANL, the background noise levels would be adopted as the daytime & evening time assessment criterion. On the other hand, as the background noise level at night-time is higher than the relevant ANL, planning criteria of 50 dB(A) would be adopted as the night-time assessment criterion. A summary of the noise criteria for operation noise is given in the following Table 4-4.

Table 4-4: Summary of noise criteria for operation noise

Area	Time Period [1]	Prevailing Noise Level, dB(A) (1)	Area Sensitivity Rating	ANL-5 dB(A) (2)	Criteria dB(A) Min. of (1) & (2)
HKJC Staff Quarters	Day & evening	59	B	60	59
	Night	56	B	50	50
Racecourse Villa	Day & evening	55	B	60	55
	Night	54	B	50	50
Garden Vista	Day & evening	57	B	60	57
	Night	54	B	50	50

Note:
[1] Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours

4.3 Description of the Environment

4.3.1 Surrounding Land Uses

The Study Area is located in Fo Tan, Shatin within a residential area of high-rise residential developments. The Project site of HKSI adjoins Shatin Racecourse and is situated to the northwest of Shing Mun River Channel. Fo Tan industrial area is located at a horizontal distance of about 380m to the northwest and Shatin Sewage Treatment Works at approximately 1260m to the northeast of the site. Tai Po Road – Sha Tin section, which is along the northwest of the site

at a distance of about 180m, dominates the noise climate. Table 4-5 gives an account of the nearby residential developments.

Table 4-5: Residential developments around the Project site

Residential Development	Shortest Horizontal Distance to Project Boundary, m
HKJC Staff Quarters	66
Racecourse Villa	177
Ravana Garden	240
Garden Vista	250
Pictorial Garden Phase I	230
Pictorial Garden Phase II	234

4.3.2 Existing Background Noise levels

Baseline noise survey was carried out in November 2005. All the noise measurements were conducted in accordance with TM-Places. The measured noise levels at the selected locations range from 54 to 59 Leq (30-min) dB(A). A summary of the measured noise levels is given in Table 4-6.

Table 4-6: Prevailing noise levels

Area	Time Period [1]	Prevailing Noise Levels, dB(A) $L_{Aeq, 30\ min, dB(A)}$
Hong Kong Jockey Club Staff Quarters	Day & evening	59
	Night	56
Racecourse Villa	Day & evening	55
	Night	54
Garden Vista	Day & evening	57
	Night	54

Note:
[1] Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours

4.4 Noise Sensitive Receivers

Noise sensitive receivers (NSRs) were identified in accordance with Annex 13 of the TM-EIAO. Both existing and planned uses during the construction and operation period of the Project are included as appropriate. The existing NSRs were identified through desktop review and site survey. There were no planned NSRs on the latest Outline Zone Plan.

The land uses in the vicinity of the Project site include schools and residential developments. The key representative NSRs for noise assessment are given in Table 4-7 and their respective locations are shown in Drawing No.: ST/R/S/HK/041.

Table 4-7: Representative noise sensitive receivers (NSRs)

NSR ID.	NSR Description	Use	Shortest Horizontal Distance to Project Boundary, m
N1	Hong Kong Institute of Vocational Education (Shatin)	Educational	283
N2	Jockey Club Ti-I College	Educational	237
N3	HKJC Staff Quarters	Residential	66
N4	Racecourse Villa	Residential	177
N5	International Christian School – Elementary	Educational	289
N6	Ravana Garden	Residential	240
N7	Leung Kui Kau Primary School	Educational	240
N8	Garden Vista	Residential	250

NSR ID.	NSR Description	Use	Shortest Horizontal Distance to Project Boundary, m
N9	Pictorial Garden Phase I	Residential	230
N10	Pictorial Garden Phase II	Residential	234

4.5 Assessment Methodology

4.5.1 Determination of Assessment Area

The study area for the noise impact assessment includes all NSRs within 300m from the boundary of the project and its worksites.

4.5.2 Construction / Reinstatement Phase

Construction noise assessment will be conducted in accordance with the following procedures:

- Identify and locate representative NSRs that may be affected by the works;
- Organise the work sequence of the site activities during the period;
- Compile the plant items for each work sequence;
- Establish the sound power levels of the plant items from the TM-GW or other recognised sources of reference;
- Determine the separation distance at the NSRs from the notional noise source positions;
- Apply corrections for façade, distance, barrier attenuation and acoustic reflection where applicable;
- Predict construction noise levels at the NSRs;
- Quantify the level of impact at the NSRs in accordance with TM-GW; and
- Predict the cumulative noise impacts from any concurrent construction activities in the vicinity of the Project site.

4.5.3 Operational Phase

4.5.3.1 Fixed Noise Sources

Fixed noise sources assessment will be conducted in accordance with the following procedures:

- Identify and locate the fixed noise sources;
- Identify and locate representative NSRs that may be affected by the fixed noise sources;
- Determine the separation distances and orientation of the fixed noise sources from the NSRs;
- Predict the cumulative noise impacts of other noise sources on the NSRs;
- Apply corrections for tonality, impulsiveness and intermittency in accordance with TM-Places, as appropriate; and
- Establish the maximum allowable Sound Power Level (SWL) as the compliance criteria for each fixed noise sources.

4.5.3.2 Crowd Noise and Public Address (PA) system

Crowd and PA noise assessment will be conducted in accordance with the following procedures:

- Establish the crowd and PA noise level from on-site noise survey at the grandstand and adjacent areas during the horseracing day on 13 November 2005. The expected crowd and PA noise level of an equestrian event would be much lower than that of a horseracing event due to the quiet nature of the competition. A correction factor of 5-10dB(A) is considered reasonable. For conservative assessment, the adopted crowd and PA noise level of the equestrian event is assumed to be 5dB(A) below the measured horseracing event level.
- Determine in accordance with standard acoustic principle and practices the representative unit area sound power level of the crowd noise taking into account the surface area of the grandstand. The respective sound power level for each individual spectator area is determined. For simplicity, both crowd and PA noise are assumed to be radiated from the surface area of the grandstand.
- Determine the separation distance at the NSRs from the noise source;
- Apply corrections for façade, distance, barrier attenuation and acoustic reflection where applicable;
- Predict crowd and PA noise levels at the NSRs;
- Quantify the level of impact at the NSRs in accordance with TM-Places; and
- Predict the cumulative noise impacts of other noise sources on the NSRs.

In addition, the PA system design will include a limiter device to allow setting of maximum output sound level to within the noise criteria at the NSRs in accumulation with other fixed noise sources.

4.6 Identification of Environmental Impacts

4.6.1 Construction / Reinstatement Phase

Section 2.8 presents a detailed description of the key construction works required for each of the worksites. The major construction works would include the following activities:

- General site formation;
- Drainage and sewerage works;
- Utilities services, roadworks and horse walkways construction works;
- Construction of temporary stadium, new stable and warm-up arena; and
- Cumulative construction noise impacts arising from concurrent construction activities at Penfold Park including the construction works for the underpass.

The above construction activities will involve the use of Powered Mechanical Equipment (PME) including breakers, excavators, lorries, mobile cranes, concrete truck mixers, pokers, rollers, etc. The Sound Power Levels (SWLs) for each PME without mitigation measures are given in Appendix 4-1.

The plant inventory provided in Appendix 2-1 indicates the total number of PME for each construction activity. Prediction is made with respect to the distance of NSRs from the notional

source locations. Appendix 4-2 shows the locations of the NSRs and their respective distances from the notional sources.

Practically, the PMEs on a worksite are not always in full operation throughout the construction period. They are usually used at a certain utilization rate. Similar utilisation rates as adopted in other approved EIA report (EIA Application No. EIA-098/2004) have been assumed in this Study. The assumed utilization rates for different PME are summarized in Table 4-8 below:

Table 4-8: Utilisation rates of PME

PME	Utilisation Rate
Roller	50%
Hand-held breaker, Pneumatic breaker	80%
Mini-piling (earth auger), Lorries, excavators and crane lorries	65%
Mobile crane	30%

4.6.2 Operational Phase

Potential operational noise impact will include:

- Fixed Noise Source of MVAC system at 4 Stables, AHU and Chiller Plant noise at the Veterinary; and
- Crowd noise and PA broadcast.

It is anticipated that noise emanating from MVAC, AHU and Chiller Plant can be adequately controlled by the installation of acoustic silencers. Significant crowd noise and PA broadcast from the competition in the Main Arena is not anticipated due to the generally quiet nature of the equestrian events.

Locations of these potential operational noise sources are shown in Drawing No.: ST/R/S/HK/042.

4.7 Prediction and Evaluation of Environmental Impacts

4.7.1 Construction / Reinstatement Phase

Assessment results indicate that, under "unmitigated" scenario, the construction noise levels at some of the NSRs would exceed the criteria. The maximum unmitigated construction noise levels and the exceedance over the criteria at the NSRs are shown in Table 4-9. Detailed results of construction noise assessment are given in Appendix 4-3.

Table 4-9 : Predicted maximum construction noise levels at the NSRs – "unmitigated" scenario

NSR No.	NSR Description	Unmitigated Scenario	
		Max Predicted Noise Level, dB(A) [2]	Exceedance, dB(A)[1]
N1	Hong Kong Institute of Vocational Education (Shatin)	68	0
N2	Jockey Club Ti-I College	70	0
N3	HKJC Staff Quarters	**77**	2
N4	Racecourse Villa	**76**	1
N5	International Christian School – Elementary[1]	**72**	2
N6	Ravana Garden	74	0
N7	Leung Kui Kau Primary School [1]	**74**	4
N8	Garden Vista	74	0
N9	Pictorial Garden Phase I	74	0

NSR No.	NSR Description	Unmitigated Scenario	
		Max Predicted Noise Level, dB(A) [2]	Exceedance, dB(A)[1]
N10	Pictorial Garden Phase II	73	0

Note:
[1] The noise criterion of 70dB(A) was adopted for educational institutions.
[2] Bold figures represent exceedance of the noise criteria inTM-EIAO.

4.7.2 Operational Phase

4.7.2.1 Fixed Noise Sources

Analysis has been conducted to quantify the preliminary near-field SWL criteria (Appendix 4-4). A summary of the SWL criteria which will be incorporated into the contract specification, is given in Table 4-10.

Table 4-10 : Summary of SWLs criteria for major fixed noise sources

Locations of Noise Sources	Plant Item	Distance to nearest NSRs, m	Maximum allowable Sound Power Level, dB(A)
			Night-time
Stable 1	MVAC Plant	306	93
Stable 2	MVAC Plant	284	92
Stable 3	MVAC Plant	351	93
Stable 4	MVAC Plant	340	94
Veterinary	AHU	298	92
	Chillers	298	92
Central Plant Chiller		275	94

The above SWL criteria should be implemented and refined during the design development by the Contractor. Any new NSRs should also be identified and incorporated into the design as necessary. The Contractor shall install sound attenuators, noise barriers and acoustic enclosures as appropriate to ensure that the specified maximum SWLs in the above Table 4-10 be achieved. The predicted noise levels at NSRs due to fixed plant operations is presented in Table 4-11.

Table 4-11: Summary of predicted daytime operational noise level

NSR No.	NSR Description	Predicted Noise Levels at NSRs, Leq (30min)
		Fixed Plant
N1	Hong Kong Institute of Vocational Education (Shatin)	41
N2	Jockey Club Ti-I College	43
N3	HKJC Staff Quarters	48
N4	Racecourse Villa	49
N5	International Christian School – Elementary	46
N6	Ravana Garden	46
N7	Leung Kui Kau Primary School	48
N8	Garden Vista	49
N9	Pictorial Garden Phase I	49
N10	Pictorial Garden Phase II	48

4.7.2.2 Crowd Noise and Public Address (PA) system

Crowd noise data for an equestrian event is not available from previous Olympic Equestrian events in other countries. The typical crowd and PA broadcast noise level of a horseracing day was measured to be 73 dB(A) at 1.2 m above floor level and applied as the basis for prediction

with an assumed –5 dB(A) correction factor due to the quiet nature of the equestrian event. The adopted crowd and PA noise for the assessment is therefore 68 dB(A) and details of noise survey is given in Appendix 4-5.

The predicted crowd noise and PA noise levels at the representative NSRs during the Olympic Equestrian Event are given in Table 4-12. The results indicate that all predicted noise levels are within noise criteria. Detailed results of crowd and PA noise assessment are given in Appendix 4-5 with notes to provide reference for the noise assessment methodologies adopted.

Table 4-12: Summary of predicted daytime operational noise level

NSR No.	NSR Description	Predicted Noise Levels at NSRs, Leq (30min)
		Crowd + PA
N1	Hong Kong Institute of Vocational Education (Shatin)	47
N2	Jockey Club Ti-I College	49
N3	HKJC Staff Quarters	54
N4	Racecourse Villa	52
N5	International Christian School – Elementary	50
N6	Ravana Garden	52
N7	Leung Kui Kau Primary School	51
N8	Garden Vista	50
N9	Pictorial Garden Phase I	49
N10	Pictorial Garden Phase II	48

4.7.2.3 Combined Noise Level during Operation

Table 4-13 below shows the combined noise levels at NSR due to the operation of the Project.

Table 4-13: Summary of predicted daytime operational noise level

NSR No.	NSR Description	Predicted Daytime Noise Level, Leq (30min)[1]		
		Crowd + PA (A)	Fixed Plant (B)	Total (A+B)
N1	Hong Kong Institute of Vocational Education (Shatin)	47	41	48
N2	Jockey Club Ti-I College	49	43	50
N3	HKJC Staff Quarters	54	48	55
N4	Racecourse Villa	52	49	54
N5	International Christian School – Elementary	50	46	51
N6	Ravana Garden	52	46	53
N7	Leung Kui Kau Primary School	51	48	53
N8	Garden Vista	50	49	53
N9	Pictorial Garden Phase I	49	49	52
N10	Pictorial Garden Phase II	48	48	51

Notes: [1] – The nighttime operational noise level is only contributed by noise emanating from the fixed plant.

4.8 Mitigation Measures

4.8.1 Construction / Reinstatement Phase

The predicted noise levels show that unmitigated construction activities could exceed the daytime noise criteria at some of the NSRs. Noise mitigation measures are therefore required to alleviate the noise impacts. Noise emissions from construction sites could be minimised by the following means:

- Good site practices to limit noise emissions at the source;

- Use of quiet plant and working methods;
- Use of site hoarding as noise barrier to screen noise at ground level of NSRs;
- Use of temporary noise barriers to screen noise from relatively static PMEs;
- Scheduling of construction works outside school examination periods in critical area; and
- Alternative use of plant items within one worksite, wherever practicable.

The above mitigation measures would need to be implemented in all work sites as good practices. Detailed descriptions of these mitigation measures are given in the following sections.

4.8.1.1 Good Site Practices and Noise Management Techniques

Good site practice and noise management techniques could considerably reduce the noise impact from construction site activities on nearby NSRs. The following measures should be followed during each phase of construction:

- only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction programme;
- machines and plant (such as trucks, cranes) that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum;
- plant known to emit noise strongly in one direction, where possible, be orientated so that the noise is directed away from nearby NSRs;
- silencers or mufflers on construction equipment should be properly fitted and maintained during the construction works;
- mobile plant should be sited as far away from NSRs as possible and practicable; and
- material stockpiles, site office and other structures should be effectively utilised, where practicable, to screen noise from on-site construction activities.

The identified noise mitigation requirements for construction equipment will be incorporated into the contract specification. The benefits of these techniques can vary according to specific site conditions and operations. The environmental noise climate would certainly be improved through these control practices, although the improvement can only be quantified during implementation when specific site parameters are known.

4.8.1.2 Use of Site Hoarding

Purpose built temporary noise barriers of 2.4m high located on the site boundaries between noisy construction activities and NSRs could generally reduce noise levels at low-level zone of NSRs through partial screening. In general this would provide minimum 5 dB(A) attenuation for the low level receivers. It would be possible for the Contractor to provide these in the form of site hoardings to achieve this attenuation effect, provided that the barriers have no openings or gaps and have a superficial surface density of at least 14kg/m^2. Good site practice shall also be adopted by the Contractor to ensure the conditions of the hoardings are properly maintained throughout the construction period. For conservative assessments, however, the site hoarding has not been taken into consideration in the construction noise assessments.

4.8.1.3 Use of Movable Noise Barrier for Relatively Static Plants

Movable temporary noise barriers located close to noisy plant and be moved iteratively with the plant along a worksite can be very effective for screening noise from NSRs. A typical design

which has been used locally is a wooden framed barrier with a small cantilevered upper portion of superficial density no less than 14kg/m^2 on a skid footing with 25mm thick internal sound absorptive lining. This measure is particularly effective for low level zone of NSRs. A cantilevered top cover would be required to achieve screening benefits at upper floors of NSRs.

Movable barriers can be used for some PME (e.g. breakers) to minimize noise impact. It is anticipated that suitably designed barriers could achieve at least 5 - 10dB(A) reduction. For a conservative assessment, only a reduction of 5dB(A) is assumed.

A summary of the movable noise barrier for PMEs, and the associated noise reduction is given in Appendix 4-6.

4.8.1.4 Scheduling of Construction Works Outside School Examination Period

During school examination periods, the daytime construction noise criterion is 65dB(A) which is lower than the normal daytime school criterion of 70dB(A). Scheduling of construction works outside school examination period to less intrusive periods would definitely reduce the overall noise impacts at the NSRs and thus for ensuring compliance with the construction noise criterion.

The Contractor shall liaise with the school representative(s) including, but not limited to Hong Kong Institute of Vocational Education (Shatin), Jockey Club Ti-I College, International Christian school – Elementary and Leung Kui Kau Primary School to obtain the examination schedule and avoid noisy construction activities during school examination period.

4.8.1.5 Use of "Quiet" Plant and Working Methods

The use of quiet plant is a feasible solution to tackle adverse noise impacts associated with the construction works. It is generally known (supported by field measurement) that particular models of construction equipment are quieter than standard types given in the TM-GW. Whilst it is generally considered too restrictive to specify that the Contractor has to use specific models or items of plant, it is reasonable and practicable to set plant noise performance specifications for specific PME so that some flexibility in selection of plant is allowed. A pragmatic approach would be to request that the Contractor independently verifies the noise level of the plant proposed to be used and demonstrates through furnishing of these results, that the plant proposed to be used on the site meets the requirements.

The use of quiet plant associated with the construction works is prescribed in British Standard "Noise Control on Construction and Open Sites, BS5228: Part 1: 1997" which contains the SWLs for specific quiet PME. The SWLs for quiet PMEs adopted for the assessment are detailed in Appendix 4-7. It should be noted that while various types of silenced equipment could be found in Hong Kong, EPD when processing a CNP application for evening or night time works may choose to apply the noise data stipulated in the TM-GW as appropriate. CNP applications which contain sufficient details of any particularly quiet items of PME or any special noise control measures which the CNP applicant proposes to employ on the site may be given special consideration by the Noise Control Authority.

4.8.1.6 Sequencing Operation of Construction Plant Equipment

In practice, some plant items will operate sequentially within the same worksite, and certain reduction of the predicted noise impacts could be achieved. However, any additional control on the sequencing of plant will impose a restrictive constraint to the Contractor on the operation and planning of plant items, and the implementation of the requirement would be difficult to be monitored. Hence, sequencing operation of PME has not been taken into consideration in the

construction noise assessments, except those specified in Chapter 4.6.1 for which the realistic operating time has been incorporated.

4.8.2 Assessment Results for "Mitigated" Scenario During Daytime - "Good Practice" Mitigation Measures

Noise reduction from the use of mitigation measures including quiet plant and noise barrier for construction plants as described in Chapter 4.8.1 has been applied in the assessment. However, no screening correction for site hoarding has been assumed in the model for conservative analysis. Detailed results of construction noise assessment for "mitigated" scenario are given in Appendix 4-8. The predicted noise levels and the exceedance over daytime construction noise criteria are summarised in the following Table 4-14.

Table 4-14: Predicted maximum construction noise levels at the affected NSRs – "mitigated" scenario – with good practices

NSR No.	NSR Description	Mitigated Scenario	
		Max Predicted Noise Level, dB(A)	Exceedance, dB(A)
N1	Hong Kong Institute of Vocational Education (Shatin)[1]	68	0
N2	Jockey Club Ti-I College[1]	70	0
N3	HKJC Staff Quarters	71	0
N4	Racecourse Villa	70	0
N5	International Christian School – Elementary[1]	66	0
N6	Ravana Garden	74	0
N7	Leung Kui Kau Primary School [1]	68	0
N8	Garden Vista	74	0
N9	Pictorial Garden Phase I	74	0
N10	Pictorial Garden Phase II	73	0

Note:
[1] The noise criterion of 70dB(A) was adopted for educational institutions.

With the use of recommended noise mitigation measures described in **Chapter 4.8.1**, construction noise impacts at the NSRs will be reduced to within the noise criteria.

4.8.3 Cumulative Construction Noise Impacts from Concurrent Projects During Daytime

The construction activities of the Project will coincide with the modification works in Penfold Park for the Olympic Event. Modification works inside Penfold Park involve the formation of the sand and grass footings for the Bridle Track and the Training Arenas, and the construction of a stable block in the middle of the park and a short underpass of less than 200m between Penfold Park and HKSI.

The construction activities for Bridle Track, Training Arena and Stables include site clearance, laying of sand and grass for Bridle Track, laying of sand for Training Arena and superstructure work for the stables. These construction activities would involve the use of PME such as handheld breaker, excavator, dump truck and mobile crane.

A notional sound power level of 110dB(A) at the Penfold Park site was assumed for the assessment of cumulative construction noise impact for the Project. The cumulative noise level at NSRs are summarised in Table 4-15 below. Results show that the predicted cumulative noise levels are within the noise criteria and residual impact is not anticipated.

Table 4-15: Cumulative construction noise impacts from Penfold Park

NSR No.	NSR Description	Notional Distance to Penfold Park	Predicted Noise Level, dB(A)			Noise Criteria	Exceedance
			The Project	Penfold Park	Cumulative		
N1	Hong Kong Institute of Vocational Education (Shatin)	1109m	68	44	68	70	0
N2	Jockey Club Ti-I College	926m	70	45	70	70	0
N3	HKJC Staff Quarters	669m	71	48	71	75	0
N4	Racecourse Villa	530m	70	50	70	75	0
N5	International Christian School – Elementary	601m	66	49	66	70	0
N6	Ravana Garden	737m	74	47	74	75	0
N7	Leung Kui Kau Primary School	609m	68	49	68	70	0
N8	Garden Vista	514m	74	51	74	75	0
N9	Pictorial Garden Phase I	465m	74	51	74	75	0
N10	Pictorial Garden Phase II	428m	73	52	73	75	0

4.8.4 Operational Phase

4.8.4.1 Fixed Noise Sources

The detailed design should incorporate the following good practice in order to minimise the nuisance on the neighbouring NSRs:

- Louvers should be orientated away from adjacent NSRs, preferably onto Sha Tin Racecourse which are less sensitive.
- Direct noise mitigation measures including silencers, acoustic louvers and acoustic enclosures should be allowed for in the design.

4.8.4.2 Crowd Noise and Public Address (PA) system

Significant crowd noise from the competition at the Main Arena is not anticipated. The detailed design of PA system should incorporate the following practice in order to minimize any impact on the neighboring NSRs:

- To use a cluster of small power loudspeakers instead of a few large power loudspeakers;
- To use directional loudspeakers and orientate them to point towards the audience and away from the nearby noise sensitive receivers; and
- To include a "Limiter" device in the PA system to set the upper bound of the output sound level.

4.9 Residual Environmental Impact

Construction / reinstatement noise and operational noise arises from the Project can be properly mitigated by implementing the proposed mitigation measures. Residual noise impacts are not anticipated. In order to ensure compliance of the operational noise level with the stipulated noise standards in TM, noise commissioning tests for all major fixed noise sources should be included in the Contract Document.

4.10 Conclusion

Potential noise sources and representative NSRs for the construction and operational phases have been identified. Noise prediction has been conducted based on established methodologies.

4.10.1 Construction / Reinstatement Phase

The assessment has been conducted based on daytime noise criteria specified in the TM-EIAO. It is predicted that the unmitigated construction noise impacts associated with the modification works for the Project would exceed the criteria.

Noise mitigation measures have been identified which could reduce the noise levels to within the noise criteria at all NSRs. Measures including the use of good site practices, use of quiet plant and working method, use of site hoarding as noise barrier, use of temporary noise barrier, scheduling of construction work and alternative use of plant item should be incorporated into the Contract Specifications and Implementation Schedules.

With the recommended mitigation measures, construction noise impacts could be controlled to within the required noise limits.

4.10.2 Operational Phase

Crowd and PA noise is not expected to be significant and will be within the noise criteria in accordance with the prediction results. Operational noise impacts from mechanical and electrical (M&E) plant can be effectively mitigated by implementing noise control treatment at source during the design stage and residual operational noise impacts are not anticipated. The need for noise commissioning on fixed noise sources should be included in the Contract Document.

5. WATER QUALITY IMPACT

5.1 Introduction

This chapter presents the assessment of potential water quality impacts, which may arise during the construction, operation and reinstatement of the Project. Control measures such as silt traps and sand bags will be implemented on site to control the potential site runoff during construction / reinstatement phase. Low flow intercepting system will be implemented to prevent potential contamination of surface runoff by horse manure during heavy rainstorm.

The water quality impact assessment was conducted in accordance with the criteria and guidelines for evaluating and assessing water pollution as stated in Annexes 6 and 14 of the TM-EIAO respectively and the specific requirements as stipulated in Clause 3.4.3 of the EIA Study Brief.

5.2 Environmental Legislation, Standards and Guidelines

The following relevant legislation and associated guidelines are applicable to the evaluation of water quality impacts associated with the construction and operation of the Project:

- Environmental Impact Assessment Ordinance (Cap. 499, S.16), Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO), Annex 6 and 14;
- Water Pollution Control Ordinance (WPCO);
- Technical Memorandum on Standards for Effluent Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (WPCO, Cap. 358, S.21);
- Hong Kong Planning Standards and Guidelines (HKPSG); and
- Practice Note for Professional Persons (ProPECC), Construction Site Drainage (PN1/94)

The Water Pollution Control Ordinance (WPCO, Cap 358) provides the major statutory framework for the protection and control of water quality in Hong Kong. According to the Ordinance and its subsidiary legislation, the entire Hong Kong waters are divided into ten Water Control Zones (WCZs) and four supplementary WCZs. The proposed HKSI site at Shatin lies within the Tolo Harbour and Channel WCZ and the water quality sensitive receivers which may be affected by the Project works are located within the same WCZ. The Tolo Harbour and Channel WCZ is further divided into several subzones based on their geographical locations. The relevant water quality subzones under this project include the Shing Mun River Subzones C, D and I (SM(C), SM(D) and SM(I)). The WQOs for these subzones in Tolo Harbour and Channel WCZ form the basis for the assessment of water quality impacts in this EIA Study. Extracts of the corresponding WQOs for the Water Control Subzones SM(C), SM(D) and SM(I) are listed in Table 5-1.

Table 5-1: Water Quality Objectives for Tolo Harbour and Channel WCZ (SM(C), SM(D) and SM(I) subzones)

Parameter	Water Quality Objectives for Watercourses
Aesthetic Appearance	Not to cause waters of the subzone to contain substances that- (a) settle to form objectionable deposits; (b) float as debris, scum, oil or other matter to form nuisances, (c) produce objectionable colour, odour, taste or turbidity; (d) injure or are toxic or produce adverse physiological responses in humans, animals or plants; or (e) are conducive to undesirable aquatic life or a nuisance to aquatic life.
E. Coli	< 1000 per 100 ml
Colour	< 50Hazen units
pH	In the range of 6.0 – 9.0 for SM(D) and SM(I); In the range of 6.5 – 8.5 for SM(C)
Temperature	Change of natural daily temperature range < 2°C
SS	Annual median < 25 mg/L for SM(D) and SM(I) Annual median < 20 mg/L for SM(C)
DO	> 4 mg/L or > 40% saturation (at 15°C)
BOD_5	< 5 mg/L
COD	< 30 mg/L
NH_3-N	< 0.5 mg/L
Toxicants	Not to cause the toxicants to attain such a level as to produce significant toxic effects in humans, fish or any other aquatic organism, with due regard to biologically cumulative effects in food chains and to toxicant interactions with each other.

5.3 Baseline Conditions

5.3.1 Ground Condition

5.3.1.1 Geology

The geology of the site has inferred based on the findings of previous ground investigation works. The study is also carried out using the information described in the geological survey memoir for the area (Memoir no. 1), and the Geotechnical Area Studies Programme (GASP) report II for the Central New Territories, together with the geology maps Sheet 7 (1:20000 scale, Solid and Superficial Deposits) published by the Geotechnical Engineering Office (GEO).

Based on GASP report II, reclamation fill can be found within the site area and is underlain by marine deposits. Marine deposits, as detailed in the geological map sheet 7 published in 1986, consists of dark grey silty sand or clay with traces of shell fragments of Holocene formation. Marine deposits are in turn underlain by a layer of alluvial deposits which consist of brownish-grey silty sand with subangular gravel and occasionally contains cobbles and boulder horizons.

As revealed from the relevant ground investigation information, the site is generally covered by a layer of Fill with 6m to 10m in thickness resulted from the reclamation carried out in early 1970s. The Fill layer is underlain by a layer of Marine Deposits (MD) and Alluvium subsequently. The thickness of MD varies from 5m to 12m while the thickness of Alluvium varies from 5m to 7m. The MD is generally clayey in nature with shell fragments and the Alluvium is mainly sandy with much cobble and gravel.

The top layer of existing comprises concrete foundation with well connected drainage systems or topsoil planted with turf grass. The landform has been in existence for years and thus significant erosion of the top layer is not anticipated as a result of the modification works.

5.3.1.2 Groundwater Condition

Groundwater level was measured in two boreholes with piezometers/standpipes in the Golf Driving Range of Hong Kong Sports Institute between the period of 21 January 1999 and 4 February 1999. The highest recorded groundwater level is at +2.84mPD while the lowest is at +1.93mPD, which is 4.5m below ground level.

5.3.2 Water Quality Monitoring Data

The HKSI site is located to the northwest of the intersection of Shing Mun River Channel and Fo Tan Nullah. These watercourses might be affected by the construction works of the Project. Both of them are trained open channels where Fo Tan Nullah is a tributary of the Shing Mun River Channel that directs surface runoff from inland Fo Tan to Shing Mun River Channel.

At present, the routine monitoring programme conducted by EPD provides the most comprehensive spatial and temporal river water quality data, and these data may be used to represent the baseline water quality conditions of the concerned water systems.

The baseline river quality conditions were determined from the intergrated data collected by EPD between 1998 and 2005 from the monitoring stations at Fo Tan Nullah (TR17L) and Shing Mun River Channel (TR19I), respectively.

The river water qualities in Shing Mun River Channel and Fo Tan Nullah are presented in Tables 5-2 and 5-3, respectively.

Table 5-2: Water quality monitoring data at Shing Mun River Main Channel (TR19I)

	Annual Average Concentration					
Year	DO (mg/L)	*E coli* * (cfu/100mL)	BOD5 (mg/L)	TSS (mg/L)	COD (mg/L)	pH
1998	6.8	6088	4.3	5.1	93.6	7.7
1999	7.3	2075	4.5	6.4	54.0	7.9
2000	8.5	2509	5.6	8.3	50.3	8.0
2001	7.6	4179	5.0	5.2	14.9	7.9
2002	7.1	1895	5.5	6.0	15.4	7.9
2003	9.0	439	6.2	10.0	19.8	8.3
2004[1]	7.7	1861	-	-	-	-
2005[1]	7.2	2208	-	-	-	-

* - Geometric mean value

[1] Monitoring data for 2004 to 2005 was available only at Shing Mun River Main Channel (TR19I) on two major parameters (*E.coli* and DO).

Table 5-3: Water quality monitoring data at Fo Tan Nullah (Lower course) (TR17L)

	Annual Average Concentration					
Year	DO (mg/L)	*E coli* * (cfu/100mL)	BOD5 (mg/L)	TSS (mg/L)	COD (mg/L)	pH
1998	6.4	14087	5.8	5.8	68.0	7.4
1999	6.2	6015	3.7	5.3	34.5	7.6
2000	8.0	6115	5.9	11.1	48.3	7.8
2001	6.7	6807	5.4	5.4	14.7	7.6
2002	6.8	3691	4.0	5.8	11.8	7.6
2003	7.5	3028	5.0	5.8	14.6	7.9

* - Geometric mean value

It could be observed from the above tables that the river water qualities in both Shing Mun River Channel and Fo Tan Nullah were improving with a decreasing trend in *E. coli* concentration.

With reference to EPD's Annual River Water Quality Report in 2003, the Water Quality Index (WQI) of Shing Mun River was "Good" showing a notable reduction in the *E. coli* level. In 2003, the WQI of the Fo Tan Nullah was also "Good" with improving trends in *E. coli*.

5.3.3 Existing Drainage System

The existing drainage at HKSI typically consists of a series of pipes and channel system that discharge stormwater to the Shing Mun River via the public drains along the existing footpath at the eastern and southern side of the site. Drainage at the existing access road within the HKSI compound consists of road gullies and channel system that discharge stormwater to Shing Mun River Channel via the 825mm storm drain at the southern side of the site. Drainage at the existing soccer pitches consist of sub-soil drains and surface U-channels that discharge stormwater to a series of pipe system and outfalls to the Shing Mun River Channel. The locations of the existing stormwater outfalls along Shing Mun River near the Project site are presented in **Drawings No.ST/C/S/GN/D/31 to ST/C/S/GN/D/33**.

Considering the extent and size of the drainage system, there has been no history of flooding due to inadequacies in the existing drainage systems.

5.3.4 Existing Sewerage System

The existing sewerage at HKSI consists of a 300mm sewer collecting flows from the HKSI sports complex and training pool. This existing 300mm sewer is connected to the existing 450mm gravity trunk sewer at the southern corner of the site, which is in turn connected to the Sha Tin Pumping Station at Yuen Wu Road from where sewage is pumped to the Sha Tin STW via the twin 1400mm sewage rising main along the promenade by the Shing Mun River Channel. The existing sewage layout at HKSI is shown in **Drawings No.ST/C/S/GN/D/31 to ST/C/S/GN/D/33**.

5.4 Water Sensitive Receivers

Shing Mun River Channel is the identified water sensitive receiver for the Project. The channel is a popular waterway for boating activities. The beneficial use of the channel was sensitive to water pollution.

5.5 Identification and Evaluation of Environmental Impacts

5.5.1 Construction / Reinstatement Phase

5.5.1.1 Pollution Sources from Construction Activities

Potential water pollution sources during construction phase will include sources mainly from land-based activities, including:

- Construction site runoff;
- Sewage effluent due to workforce on site; and
- Drainage diversion

Construction Site Runoff

Construction site runoff comprises:

- Runoff and erosion from site surfaces, drainage channels, earth working areas and stockpiles;
- Wash water from dust suppression sprays and wheel washing facilities; and
- Fuel, oil, solvents and lubricants from maintenance of construction machinery and equipment.

Construction runoff may cause physical, biological and chemical effects. The physical effects include potential blockage of drainage channels and increase of Suspended Solid (SS) levels in the Tolo Harbour and Channel WCZ. Runoff containing significant amounts of concrete and cement-derived material may cause primary chemical effects such as increasing turbidity and discoloration, elevation in pH, and accretion of solids. A number of secondary effects may also result in toxic effects to water biota due to elevated pH values, and reduced decay rates of faecal micro-organisms and photosynthetic rate due to the decreased light penetration. Mitigation measures will be in place to control runoff.

Sewage Effluent

Sewage effluents will arise from the sanitary facilities provided for the on-site construction workforce. The characteristics of sewage would include high levels of BOD_5, Ammonia and *E. coli* counts. Since portable chemical toilets and sewage holding tank will be provided, no adverse water quality impact is anticipated.

5.5.2 Operational Phase

5.5.2.1 Stormwater Impact

The construction of the Venue at HKSI will not cause additional catchment to the existing drainage system and there will be no significant change to the site's impermeable areas. The site is directly adjacent to the Shing Mun River Channel, therefore, surface runoff can easily be discharged to the river channel. The existing outfalls at the promenade will be used to convey stormwater runoff from the Project site. The existing drainage system for HKSI has been constructed in 1980 and the capacities were not up to the current standard. Hence, upgrading of the downstream drainage will be implemented to prevent overflow.

Surface runoff at the new stables complex at HKSI may be contaminated with horse manure due to a large number of horses frequenting a relatively small area. The design strategy is to collect surface runoff from the areas immediately adjacent to the stables in a low flow interceptor drainage system to intercept the first foul flush and convey it to a storage tank from where it is pumped to the foul drainage system. The catchment area of the low flow interceptor drainage system covers the area of Main Stable Complex but not the temporary facilities of competition arena, holding arena, warm-up arena, etc. as they would be reinstated. A drawing showing the coverage of catchment area is given in Drawing No.: ST/R/S/HK/051. Sand traps will also be provided at the stable to prevent sand from being conveyed into the pipe system. The low flow system will be provided with an overflow chamber that will allow storm water to bypass during peak flow periods. Adverse water quality impact is not anticipated.

5.5.2.2 Sewage Impact

Sewage from Visitors

It is expected that there will be some 20,000 spectators visiting the Venue at HKSI. These spectators will require temporary toilet facilities. Based on the Hong Kong Building Regulations

requirement for toilet facility for place of entertainment, a considerable number of toilet blocks are required and these blocks will occupy a significant area. As the Olympic Event will only be held for several days, the number of toilets required has been based on the temporary toilet provision made at other similar short-term international events. The proposed sewerage for the temporary toilet blocks will be connected to the existing 300mm sewer at the southern side of the site and then to the new sewers proposed for the new Stable Complex.

Sewage Flows from New Stable Complex at HKSI

The Stable Complex at HKSI includes 4 stable blocks each with 54 stables. Each block will include tack and feed storage rooms, duty/change rooms, wash bays, sand rolls, toilets and day rooms with a 20m lunge ring located within each courtyard. The new Complex will also include a purpose-built Equine Clinic with observation and doping control stables, farrier's workshop and a temporary Stables Café.

The quantity of sewage generated is estimated based on the expected total site population and unit flow factors provided in DSD's Sewerage Manual. The estimated sewage flow from the Stable Complex during and after Olympic Event is 206 m^3/day.

Sewage Flows from Temporary Toilets at HKSI

The quantity of sewage generated from the temporary toilets is estimated based on the expected total spectators and unit flow factors provided in DSD's Sewerage Manual. The total number of spectators expected at the Main Arena is 20,000. With the assumption that this population will be evenly distributed among the toilet blocks proposed, the estimated sewage flow is 500 m^3/day.

The major increase in sewage flow will be from the new stables in HKSI and the sewage generated from the expected 20,000 spectators at the Core Event Venue in HKSI.

The wastewater from the Stables Complex will be conveyed by a new gravity/pressure sewer to be laid along the pathway of the Shing Mun River and connected to the existing 450 mm public sewer located on the south eastern corner of HKSI.

During the Olympic Event the sewage generated would utilize some 12% of the sewers' capacity currently serving Sha Tin Racecourse and the HKSI. As the Olympic events will only occur over a period of 2 weeks when there is no racing at Sha Tin Racecourse and the HKSI facility is only being used for the Olympics the existing sewerage should have sufficient capacity.

The existing 450 mm gravity sewer is used to discharge sewage to the main inlet pumping station of STSTW. STSTW has a treatment capacity of 191,000 m^3/day, comparing this to the additional sewage generated by the venue during the Olympic Events of 706 m^3/day, it is clear that there would be no practical impact on STSTW's treatment capacity.

5.5.2.3 Turf Management

The total turf area in HKSI would be slightly reduced during the operational phase due to the conversion of the existing football pitches to the Stable Complex. As no new turf area would be introduced to the site, the Turf Management Plan currently adopted by the HKSI will remain unchanged. No new chemicals will be introduced and thus adverse water quality impact is not anticipated. The current Turf Management Plan adopted by the HKSI is described as follows:

Fertilizer

The rate of fertilizer application is shown in Table 5-4 below.

Table 5-4: Fertilization application

Fertilizer	Rate
Nitrogen in mineral and urea forms	300kg/hectare/year
Phosphorous: P_2O_5	300kg/hectare/year
Potash: K_2SO_4	300kg/hectare/year

The application rate of fertilizer may vary due to status of turf growth and amount of rainfall. Fertility programme is based on observations on the turf conditions and the seasonal lifecycle of the grass to ascertain if optional fertilizers are applied. The microorganisms associated with turf are responsible for metabolizing fertilizers and using nutrients to support their growth. Nitrogen used by microorganisms is turned into complex organic compounds within the microorganisms. These microorganisms are relatively short-lived, and when they die the nitrogen is released as complex forms of N. Microbial population turns this quick-release N (Fertilizer) into slow-release N. The rapidly utilized N results in very little mobile form of N (Free NO_3). Complex forms of N do not move downward to any extent in soils. Phosphorus will also be applied to turf to support healthy plant and root growth. Phosphorus generally does not move in soil because it binds with clay, aluminum and calcium. It is also applied less frequently and generally at much lower application rate than nitrogen fertilizers.

It is expected that there would be a slight reduction in the total turf area in the HKSI site after it has been converted to the Event Venue for the 2008 Olympic Games (the football pitches would be converted to the Stable Complex). Therefore, the amount of fertilizers to be applied on the site is not anticipated to increase. Adverse water quality impact is not envisaged.

Pesticides

All pesticides used are registered under the Pesticide Ordinance. The use of chemicals is only part of the integrated pest management programme. Pesticides are used with reference to lifecycle of particular pest. Other pest management strategies, including cultural and biological are utilized for the best of the turf conditions in accordance with the current Turf Management Plan.

Considerations are given to minimize exposure to public and to avoid environmental contamination in the form of spray drift and chemical leaching by:

- No pesticide application on windy and rainy days policy;
- Proper disposal of pesticide containers;
- Observing safety regulation pertaining to the use of pesticide; and
- Warning sign to public.

Product with lower toxicity and environmental persistence will be used, given the same efficacy against the same target pest. In addition, pesticide application is carried out by skilled and trained staff to meet the above criteria. The application rate of different chemicals will follow the recommended rate provided by the manufacturer.

Application scheduling is designated to target particular pest / pathogen / weed prevailing at that time. The Application schedule is presented in Table 5-5 below.

Table 5-5: Application schedule of chemicals for HKSI

	Herbicide	Insecticide	Fugicide
Jan			
Feb	Devrinol		Dacotech
Mar	Devrinol		Dacotech
Apr		Diazinon	
May	MSMA + Gramoxone		
Jun	MSMA + Gramoxone		
Jul		Carbofuran	
Aug			
Sept			
Oct			
Nov			
Dec			

The existing Turf Management Plan has been proven to be effective in controlling the growth of pests and weeds without causing adverse water quality impact to the drainage system. It is therefore considered that no additional mitigation measures with respect to the turf management plan for the site is required.

5.6 Mitigation Measures

5.6.1 Construction/reinstatement Phase

Construction Runoff

In accordance with the Practice Note for Professional Persons on Construction Site Drainage, Environmental Protection Department, 1994 (ProPECC PN 1/94), construction phase mitigation measures, where appropriate, will include the following:

- At the start of site establishment, perimeter cut-off drains to direct off-site water around the site will be constructed with internal drainage works and erosion and sedimentation control facilities implemented. Channels (both temporary and permanent drainage pipes and culverts), earth bunds or sand bag barriers will be provided on site to direct stormwater to silt removal facilities. The design of the temporary on-site drainage system will be undertaken by the contractor prior to the commencement of construction.
- The dikes or embankments for flood protection will be implemented around the boundaries of earthwork areas. Temporary ditches will be provided to facilitate the runoff discharge into an appropriate watercourse, through a silt/sediment trap. The silt/sediment traps will be incorporated in the permanent drainage channels to enhance deposition rates.
- The design of efficient silt removal facilities will be based on the guidelines in Appendix A1 of ProPECC PN 1/94, which states that the retention time for silt/sand traps should be 5 minutes under maximum flow conditions. Sizes may vary depending upon the flow rate, but for a flow rate of 0.1 m^3/s a sedimentation basin of 30m^3 would be provided and for a flow rate of 0.5 m^3/s the basin would be 150 m^3. The detailed design of the sand/silt traps will be undertaken by the contractor prior to the commencement of construction.
- Construction works will be programmed to minimize surface excavation works during the rainy seasons (April to September). All exposed earth areas will be completed and vegetated as soon as possible after earthworks have been completed. If excavation of soil cannot be

avoided during the rainy season, or at any time of year when rainstorms are likely, exposed slope surfaces will be covered by tarpaulin or other means.

- The overall slope of the site will be kept to a minimum to reduce the erosive potential of surface water flows, and all trafficked areas and access roads protected by coarse stone ballast.
- All drainage facilities and erosion and sediment control structures will be regularly inspected and maintained to ensure proper and efficient operation at all times and particularly following rainstorms. Deposited silt and grit will be removed regularly and disposed of by spreading evenly over stable, vegetated areas.
- Measures will be taken to minimise the ingress of site drainage into excavations. If the excavation of trenches in wet periods is necessary, they will be dug and backfilled in short sections wherever practicable. Water pumped out from trenches or foundation excavations will be discharged into storm drains via silt removal facilities.
- Open stockpiles of construction materials (for example, aggregates, sand and fill material) of more than $50m^3$ will be covered with tarpaulin or similar fabric during rainstorms. Measures will be taken to prevent the washing away of construction materials, soil, silt or debris into any drainage system.
- Manholes (including newly constructed ones) will always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris being washed into the drainage system and storm runoff being directed into foul sewers.
- Precautions be taken at any time of year when rainstorms are likely, actions to be taken when a rainstorm is imminent or forecasted, and actions to be taken during or after rainstorms are summarised in Appendix A2 of ProPECC PN 1/94. Particular attention will be paid to the control of silty surface runoff during storm events, especially for areas located near steep slopes.
- All vehicles and plant will be cleaned before leaving a construction site to ensure no earth, mud, debris and the like is deposited by them on roads. An adequately designed and sited wheel washing facilities will be provided at every construction site exit where practicable. Wash-water should have sand and silt settled out and removed at least on a weekly basis to ensure the continued efficiency of the process. The section of access road leading to, and exiting from, the wheel-wash bay to the public road will be paved with sufficient backfall toward the wheel-wash bay to prevent vehicle tracking of soil and silty water to public roads and drains.
- Oil interceptors will be provided in the drainage system downstream of any oil/fuel pollution sources. The oil interceptors will be emptied and cleaned regularly to prevent the release of oil and grease into the storm water drainage system after accidental spillage. A bypass will be provided for the oil interceptors to prevent flushing during heavy rain.
- Construction solid waste, debris and rubbish on site will be collected, handled and disposed of properly to avoid water quality impacts.
- All fuel tanks and storage areas will be provided with locks and sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank to prevent spilled fuel oils from reaching water sensitive receivers nearby.

- By adopting the above mitigation measures with Best Management Practices (BMPs) it is anticipated that the impacts of construction site runoff from the construction site will be reduced to satisfactory levels before discharges.

Sewage from Workforce

Portable chemical toilets and sewage holding tanks will be provided for handling the construction sewage generated by the workforce. A licensed contractor will be employed to provide appropriate and adequate portable toilets and be responsible for appropriate disposal and maintenance.

Notices will be posted at conspicuous locations to remind the workers not to discharge any sewage or wastewater into the nearby environment during the construction phase of the Project. Regular environmental audit on the construction site can provide an effective control of any malpractices and can achieve continual improvement of environmental performance on site. It is anticipated that sewage generation during the construction phase of the Project would not cause water quality impact after undertaking all required measures.

Accidental Spillage of Chemicals

Any service shop and maintenance facilities will be located within a bunded area, and sumps and oil interceptors will be provided. Maintenance of equipment involving activities with potential for leakage and spillage will only be undertaken within the areas appropriately equipped to control these discharges.

5.6.2 Operational Phase

5.6.2.1 Stormwater Impact

The existing sub-soil drains, perimeter channels and carrier drains will be retained for the proposed jump training and main competition arenas. The overlay works consist of laying the sand footing on the existing ground level. New sub-soil drains will be laid below the footing, which will convey runoff into the existing perimeter channel. For the proposed access roads, the general drainage design strategy is to collect surface runoff from the road by gullies and carrier drains and convey to the existing public drains at the public footpath or directly discharge it to the Shing Mun River Channel via existing pipe outfalls. Silt/sand traps will be incorporated.

As surface runoff from the stables could be contaminated with horse manure, a low flow interceptor drainage system is proposed to intercept the first foul flush and convey it to a storage tank from where it is pumped to the foul drainage system. Sand traps will also be provided at the stable to prevent sand from being conveyed into the pipe system. The low flow system will be provided with an overflow chamber that will allow storm water to bypass during peak flow periods. The capacity of the proposed interceptor system will be designed similar to the system currently being implemented at the existing racecourse stables. The interceptor system at the existing stables has been designed to capture a 1 in 2 year 10 minute event.

5.6.2.2 Sewage Impact

A new gravity/pressure sewer would be constructed along the pathway of the Shing Mun River and be connected to the existing 450mm public sewer at the southeastern corner of HKSI to collect the sewage from the new Stable Complex and the low flow interceptor system. The capacities of the existing sewers have been checked and the evaluation result shows that these sewers would not be overloaded by the installation of new facilities. Additional measures to mitigate water quality impact are considered not necessary.

5.7 Cumulative Impact

Construction activities would be carried out concurrently at Penfold Park for the 2008 Olympic Equestrian Event. Site control measures to be in place on the Penfold Park site to control site runoff and sewage from workforce would be virtually the same as those to be adopted for the HKSI site.

In addition, the turf management plan currently adopted by Penfold Park would remain unchanged during the period. No new chemicals such as fertilizers and pesticides would be introduced on the site. Therefore, no cumulative water quality impact is anticipated as a result of the concurrent projects.

5.8 Residual Environmental Impacts

With full and strict implementation of the recommended mitigation measures for drainage and sewerage system, no unacceptable residual impacts on the water quality are anticipated.

5.9 Conclusion

The existing water qualities of the water systems near the HKSI site have been reviewed. The only identified water sensitive receiver for the Project is the Shing Mun River Channel, which is a popular waterway for boating activities. Potential water quality impacts of the Project during construction / reinstatement phase have been assessed. With the implementation of the necessary and proper site controlling measures, no adverse water quality impact is anticipated.

There would be no increase in runoff due to the increase in permeability as there would be no change in catchment area and the total impermeable area. The existing drainage downstream of the proposed connection will be upgraded to the current design standard to ensure a sufficient capacity to cater for the surface runoff from the site. A low flow interceptor system is provided to intercept the first foul flush of the surface runoff from the proposed stables, thus improving the water quality of the effluent to Shing Mun River Channel. Sand traps would also be provided to prevent the siltation of the drainage system.

Temporary toilets would be provided during the operation period of the Olympic Event. Sewage from these temporary toilets will be conveyed to existing sewerage system by existing sewers on the HKSI site. A new sewer running along the access path of Shing Mun River Channel is proposed to convey sewage from the new stables to the existing public sewers.

The application of chemicals, such as pesticides and fertilizers, on the turf area will be in accordance with the current Turf Management Plan. Hence, it would not cause adverse water quality impact to the surrounding water systems, in particular the Shing Mun River Channel.

With the implementation of the recommended measures, no adverse water quality impact is anticipated for both construction and operational phase of the Project.

6. WASTE MANAGEMENT IMPLICATIONS

6.1 Introduction

This chapter examines the quality and quantity of waste generated during construction, operational and reinstatement phases of the Project. The disposal options for each type of waste have been identified and their impacts have been assessed. Mitigation measures to minimize waste impacts have also made reference to the environmental guidelines issued by BOCOG.

The assessment is conducted in accordance with the EIAO Ordinance, Annexes 7 and 15 of the TM-EIAO and the EIA Study Brief for the Project.

6.2 Environmental Legislation, Standards and Guidelines

The relevant legislation and associated guidance applicable to the study for the assessment of waste management implications include:

- Waste Disposal Ordinance (Cap 354)
- Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap 354N)
- Waste Disposal (Chemical Waste) (General) Regulation (Cap 354C)
- Land (Miscellaneous Provisions) Ordinance (Cap 28)
- Public Health and Municipal Services Ordinance (Cap. 132) – Public Cleansing and Prevention of Nuisances Regulation
- Dumping At Sea Ordinance (Cap. 466)
- Guideline of Environmental Protection for Temporary Olympic Projects (issued by BOCOG)
- Environmental Protection Guideline of Olympic Rebuilding and Extending Projects (issued by BOCOG)
- Management of Construction and Demolition Materials Including Rock (WBTC No. 33/2002)
- Waste Management on Construction Sites (WBTC No. 15/2003)

6.2.1 Waste Disposal Ordinance (WDO)

The *Waste Disposal Ordinance* (WDO) prohibits the unauthorised disposal of wastes. Under WDO, animal waste means the manure of any animal; or any dead animal or any part of any dead animal not fit for, or not intended for, human consumption; or any bedding, straw, or other waste contaminated by manure or urine of any animal. The disposal of waste generated from stables in this Project is governed by this Ordinance.

6.2.2 Waste Disposal (Charges for Disposal of Construction Waste) Regulation

Under the Waste Disposal (Charges for Disposal of Construction Waste) Regulation to be implemented in December 2005, construction waste means any substance, matter or thing that is generated from construction work and abandoned, whether or not it has been processed or stockpiled before being abandoned, but does not include any sludge, screenings or matter removed in or generated from any desludging, desilting or dredging works. According to

Schedule 6 of the Regulation, construction waste delivered to a landfill for disposal must not contain more than 50% by weight of inert material. Construction waste delivered to a sorting facility for disposal must contain more than 50% by weight of inert material, and construction waste delivered to a public fill reception facility for disposal must consist entirely of inert material.

6.2.3 Waste Disposal (Chemical Waste) (General) Regulation

Chemical waste includes any scrap materials, or unwanted substances specified under Schedule 1 of this Regulation, if such a substance or chemical occurs in such a form, quantity or concentration that causes pollution or constitutes a danger to health or risk of pollution to the environment.

A person shall not produce, or cause to be produced, chemical wastes unless he is registered with EPD. Any person who contravenes this requirement commits an offence and is liable to a fine and/or imprisonment. Chemical wastes must be treated, utilising on-site plant licensed by EPD or have a licensed collector to transport the wastes to a licensed facility. For each consignment of wastes, the waste producer, collector and disposer of the wastes must sign all relevant parts of a computerised trip ticket. The system is designed to trace wastes from production to disposal.

This regulation also prescribes the storage facilities to be provided on site including labelling and warning sign. To minimise the risks of pollution and danger to human health or life, the waste producer is required to prepare and make available written emergency procedures for spillage, leakage or accidents arising from storage of chemical wastes. The waste producer must also provide employees with training for such procedures.

Under the regulation of WDO, the Chemical Waste (General) Regulation 1992 provides regulations for chemical waste control, and administers the possession, storage, collection, transport and disposal of chemical wastes. The EPD has also issued a 'guideline' document, the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes (1992),* which details how the Contractor should comply with the regulations on chemical wastes.

6.2.4 Land (Miscellaneous Provisions) Ordinance

The inert portion of Construction and Demolition (C&D) materials may be taken to public filling facilities including public filling area, public filling barging points and stockpiling areas. These facilities usually form part of land reclamation schemes and are operated by CEDD. The ordinance requires Dumping Licenses (to be issued by CEDD) to be obtained by individuals or companies, who deliver inert C&D materials to the public filling facilities.

Individual licenses and windscreen stickers are issued for each vehicle involved. Public filling areas will accept only inert building debris, soil, rock and broken concrete. There is no size limitation on the rock and broken concrete, and a small amount of timber mixed with inert material is permissible. The material should, however, be free from marine mud, household refuse, plastic, metal, individual and chemical wastes, animal and vegetable matters and any other materials considered unsuitable by the Filling Supervisor.

6.2.5 Public Cleansing and Prevention of Nuisances by-Laws

These by-laws provide further control on illegal tipping of wastes on unauthorised (unlicensed) sites. Illegal dumping of wastes can lead to a fine and imprisonment.

6.2.6 BOCOG's Guidelines

The two guidelines issued by BOCOG which specify the requirements on waste management strategies for temporary Olympic Project and rebuilding and extending Olympic Projects will be observed. A copy of the original Chinese version documents and their English translation are given in Appendix 6-1 for reference.

6.2.7 Other Relevant Guidelines

The following documents and guidelines also relate to waste management and disposal:

Table 6-1: Other relevant documents and information

Bureau / Department	Documents / Guidelines / Technical Circulars
Planning, Environmental and Lands Branch	• Waste Disposal Plan for Hong Kong (December 1989) • Waste Reduction Framework Plan, 1998 to 2007
Environment, Transport and Works Bureau	• Works Branch Technical Circular (WBTC) No. 32/92, The Use of Tropical Hard Wood on Construction Site • WBTC No. 2/93, Public Dumps • Works Bureau TC No 2/93B, Public Filling Facilities • WBTC No. 16/96, Wet Soil in Public Dumps • Works Bureau TC Nos. 4/98 and 4/98A, Use of Public Fill in Reclamation and Earth Filling Project • Works Bureau TC Nos. 25/99, 25/99A and 25/99C, Incorporation of Information on Construction and Demolition Material Management in Public Works Sub-committee Papers • Works Bureau TC No. 12/2000, Fill Management • Works Bureau TC No. 19/2001, Metallic Site Hoardings and Signboards • Works Bureau TC No. 06/2002, Enhanced Specification for Site Cleanliness and Tidiness • Works Bureau TC No. 12/2002, Specification Facilitating the Use of Recycled Aggregates • Works Bureau TC No. 21/2002, Trip-ticket System for Disposal of Construction and Demolition Material • Environment, Transport and Works Bureau Technical Circular (ETWBTC) (Works) No. 33/2002, Management of Construction and Demolition Material Including Rock • ETWBTC (Works) No. 34/2002, Management of Dredged / Excavated Sediment • ETWBTC (Works) No. 15/2003, Waste Management on Construction Sites
EPD / CEDD	• New Disposal Arrangements for Construction Waste (1992)
EPD	• Code of Practice on the Packaging, Labeling and Storage of Chemical Wastes (1992)
PlanD	• Environmental Guidelines for Planning In Hong Kong (1990), Hong Kong Planning and Standards Guidelines

According to ETWBTC No. 33/2002, for Designated Projects, a C&D Material Management Plan has to be submitted to the Public Fill Committee in case of C&D materials exceed 50,000m^3.

ETWBTC No. 15/2003, which supersedes "WBTC No. 5/98, On-site Sorting of Construction Waste on Demolition Sites" and "WBTC No. 29/2000, Waste Management Plan", sets out the policy, procedures and requirements for contractors to prepare and implement an enhanced Waste Management Plan to encourage on-site sorting of C&D materials and to reduce C&D waste generation during construction.

6.3 Assessment Methodology

6.3.1 Construction / Reinstatement Phase

6.3.1.1 General

The assessment of environmental impacts from handling, storage, collection, transportation and disposal of waste material (liquid and solids) generated by the Project has been undertaken in accordance with Annex 7 and 15 of the TM-EIAO and the EIA Study Brief.

The methodology for assessing potential waste management impacts during the construction phase of the Project includes the following tasks:

- estimation of the types and quantities of wastes to be generated as a result of construction activities;
- assessment of potential impacts from the management of solid wastes with respect to potential hazards, air and odour emissions, noise and wastewater discharges;
- evaluation of the opportunities for reducing waste generation;
- identification of disposal options for each type of waste; and
- assessment of impacts on the capacity of waste collection, transfer and disposal facilities.

It should be noted that at this preliminary design stage, only preliminary information of the proposed construction activities is available. Hence, the types of wastes likely to be generated during the construction stage of the Project should be examined in greater detail in the Waste Management Plan to be prepared by the Contractor.

6.4 Identification and Evaluation of Environmental Impact

6.4.1 Construction/Reinstatement Phase

6.4.1.1 Construction and Demolition Material

Construction and demolition (C&D) material arising from construction activities such as site clearance and excavation works. C&D material consists of the following two portions:

- Inert portion of (public fill) – e.g. excavated soil, rock, rubbles, concrete, etc.
- Non-inert portion (C&D waste) – e.g. timber, bamboo scaffoldings, etc.

The contractor of the Project (the Contractor) will be responsible for sorting C&D material into inert and non-inert portions. Inert portion of C&D material should be reused on site as far as practicable. Surplus inert C&D material shall be transported to public filling areas depending on the percentage of inert content. Non-inert portion of C&D material shall be reused whenever possible and be disposed of at landfills as a last resort.

Minor site formation to the required levels will be accomplished by cut and fill method. The total volume of excavated soil is estimated to be 21,000 m^3. Amongst which, approximately 500m^3 of the soil would be reused for back filling. The possibility of reusing the surplus excavated soil on other associated sites such as Penfold Park would be explored. The unused excavated soil would be delivered to the public fill bank at Tseung Kwan O Area 137 or other appropriate facilities as assigned by CEDD.

It is expected that only very small amount of C&D material will be generated during the reinstatement phase of the Project. The major portion of waste arising from this stage would be C&D waste from the demolition of temporary facilities. The reomved facilities will be reused or recycled elsewhere as far as practicable.

Non-inert C&D waste would mainly be generated during site clearance. The estimated volume of C&D waste for a contract of this size is approximately 8,500m^3 as advised by the Engineer. The C&D waste consisting of removed vegetation and topsoil would be delivered to SENT landfill or other final disposal facilities as appropriate. The amount of C&D waste generated during reinstatement phase is predicted to be less than 10,000m^3.

6.4.1.2 Chemical Waste

The maintenance and servicing of construction plant and equipment may possibly generate some chemical wastes, for instance, cleaning fluids, solvents, lubrication oil and fuel.

Chemical waste arising during the construction phase may pose the following potential environmental, health and safety hazards if not stored and disposed of appropriately as stipulated in the Waste Disposal (Chemical Waste) (General) Regulations:

- Toxic effects to workers;
- Adverse impacts on water quality from spills and associated adverse impacts on fresh water biota); and
- Fire hazards.

Materials classified as chemical wastes will require special handling and storage arrangements before removal for appropriate treatments at the Chemical Waste Treatment Facility at Tsing Yi. Wherever possible, opportunities for the reuse and recycling of materials will be taken. Mitigation and control requirements for chemical wastes are detailed in Section 6.5.4.

In view of the size of the Project and the corresponding construction activities, it is anticipated that the quantity of chemical waste, such as lubricating oil and solvent produced from plant maintenance will be small and in the order of less than a hundred litres per month. Provided that the handling, storage and disposal of chemical wastes are in accordance with these requirements, adverse environmental impacts are not expected.

6.4.2 Operational Phase

6.4.2.1 Municipal Waste

A certain amount of municipal waste will be generated during the event period. By adopting the average waste generation rate of 1.1 kg/visitor/day for retail, dining and entertainment from an International Theme Park Project under the approved EIA Report (EIA - 041/2000), the estimated daily municipal waste generation rate for 20,000 visitors is approximately 22 tonnes. Recyclable materials such as plastic bottles, alluminium cans and paper will be collected by separate recycle bins and delivered to recyclers for recycling. The non-recyclable portion of waste generated will be collected and delivered to the designated refuse transfer station or landfill site for disposal by waste collector to be engaged by the venue operator. Given the short duration of the event, it is anticipated that the waste management implications due to the Project will be insignificant.

6.4.2.2 Waste from Stables

Waste generated from stables at Sha Tin Racecourse mainly consists of bedding paper scraps, horse feed and horse excretion. Waste from stables are cleared and collected by licensed waste collector engaged by HKJC twice everyday. Approximately 126 tonnes of stable waste are generated from the existing stables at Sha Tin Racecourse every day. It should be noted that this figure is subject to variations depending on the seasonal factors, horse population and workload. The bedding materials for stables will be replaced more frequently in high humidity weather due to hygiene concerns and therefore a greater amount of stable waste is likely to be generated during these seasons. The collected waste is delivered to the landfill sites in Hong Kong by refuse collection vehicles for final disposal. Table 6-2 shows the typical daily operation schedule for stables at Sha Tin Racecourse.

Table 6-2: Operation schedule for stables at Sha Tin Racecourse

Time	Activities / Operations
4:00am	Cleansing of stable, removing beddings containing horse manure out of the stables
8:00am	Horses having morning exercises
10:00am	Waste collector to collect stable wastes
12:45am - 2:30pm	Cleansing of stables, changing beddings
5:00pm	Waste collector to collect stable wastes
6:00pm – 4:00am	Resting time for horses, no activities in stables

There is a potential introduction of new species of plants with horse feed as plant seeds can be passed out in the horse faeces and can still germinate. This can be addressed by waste control. All plant material and horse faeces will be collected and disposed of in accordance with the current HKJC practice.

It is expected that same waste type and similar amount of waste per stable would be generated by the new stables at the HKSI site during the operational phase of the Project. Based on the existing waste generation rate for one stable, the predicted daily waste amount produced from the 216 new stables at the Main Stable Complex is approximately 23 tonnes. The operation schedule currently adopted by the stables at Sha Tin Racecourse will be extended to cover the new stables.

Tracks and areas outside stables are also cleaned regularly to ensure that they are free from waste or dust. Horse excretion found on these areas are frequently removed.

6.5 Mitigation Measures

6.5.1 Construction/Reinstatement Phase

6.5.1.1 Good Site Practice

It is anticipated that the construction of the Project will only involve minor site formation works and construction of simple temporary structures, therefore significant amount of C&D material generation is not expected. However, the following good site practices are still recommended throughout the construction activities:

- nomination of an approved personnel, such as a site manager, to be responsible for the implementation of good site practices, arrangements for collection and effective disposal to an appropriate facility, of all wastes generated at the site;

- training of site personnel in site cleanliness, appropriate waste management procedures and concepts of waste reduction, reuse and recycling;
- provision of sufficient waste disposal points and regular collection for disposal;
- appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers;
- regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors;
- a waste management plan (WMP) should be prepared by the contractor in accordance with ETWB TCW No. 15/2003 and submitted to the Engineer for approval.

6.5.1.2 C&D Material

The Project Proponent shall notify CEDD of the estimated spoil volumes to be generated, and liaise and agree with the Public Fill Committee for the disposal of surplus inert C&D materials including good quality rock during detailed design of the project. Wherever practicable, C&D materials should be segregated from other wastes to avoid contamination and ensure acceptability at public filling areas or reclamation sites. The following mitigation measures should be implemented in handling the waste:

- Maintain temporary stockpiles and reuse excavated fill material for backfilling and reinstatement;
- Carry out on-site sorting;
- Surplus artificial hard materials should be delivered to Tuen Mun Area 38 recycling plant or its successor for recycling into subsequent useful products;
- Make provisions in the Contract documents to allow and promote the use of recycled aggregates where appropriate;
- Implement a trip-ticket system for each works contract to ensure that the disposal of C&D materials are properly documented and verified; and
- Implement an enhanced Waste Management Plan similar to ETWB TC(W) No. 15/2003 – "Waste Management on Construction Sites" to encourage on-site sorting of C&D materials and to minimize their generation during the course of construction.

6.5.1.3 C&D Waste

Standard formwork should be used as far as practicable in order to minimise the arising of C&D waste. The use of more durable formwork or plastic facing for the construction works should be considered. Use of wooden hoardings should be avoided. Metal hoarding should be used to enhance the possibility of recycling. The purchasing of construction materials will be carefully planned in order to avoid over ordering and wastage.

The Contractor should recycle as much of the C&D materials as possible on-site. Public fill and C&D waste should be segregated and stored in different containers or skips to enhance reuse or recycling of materials and their proper disposal. Where practicable, concrete and masonry can be crushed and used as fill. Steel reinforcing bar can be used by scrap steel mills. Different areas of the sites should be considered for such segregation and storage.

A charging policy for the disposal of waste to landfill will be implemented in December 2005. This will provide additional incentive to reduce the volume of waste generation and to ensure proper segregation of inert material for disposal to public filling areas.

6.5.1.4 Chemical Waste

Chemical waste producers should be registered with EPD. The Contractor shall identify alternatives to eliminate the use of chemical, to reduce its generation quantities or to select a chemical type of less impact on environment, health and safety as far as practical.

Chemical waste should be handled in accordance with the Code of Practice on the Packaging, Handling and Storage of Chemical Wastes as follows. Containers used for storage of chemical wastes should:

- Be suitable for the substance they are holding, resistant to corrosion, maintained in a good condition, and securely closed;
- Have a capacity of less than 450 L unless the specification have been approved by EPD; and
- Display a label in English and Chinese in accordance with instructions prescribed in Schedule 2 of the Regulations.

The storage area for chemical wastes should:

- Be clearly labelled and used solely for the storage of chemical wastes;
- Be enclosed on at least 3 sides;
- Have an impermeable floor and bunding, of capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in the area, whichever is greatest;
- Have adequate ventilation;
- Be covered to prevent rainfall entering (water collected within the bund must be tested and disposed of as chemical waste, if necessary); and
- Be arranged so that incompatible materials are adequately separated.

Disposal of chemical waste should:

- Be via a licensed waste collector; and
- Be to a facility licensed to receive chemical waste, such as the CWTC which also offers a chemical waste collection service and can supply the necessary storage containers; or
- Be to a re-user of the waste, under approval from EPD.

6.5.1.5 General Refuse

General refuse generated on-site should be stored in enclosed bins or compaction units separately from construction and chemical wastes. A reputable waste collector should be employed by the Contractor to remove general refuse from the site, separately from construction and chemical wastes, on a daily basis to minimize odour, pest and litter impacts. Burning of refuse on construction sites is prohibited by law.

Aluminium cans are often recovered from the waste stream by individual collectors if they are segregated and made easily accessible. Separately labelled bins for their deposit should be provided if possible.

Office wastes can be reduced through the recycling of paper if volumes are large enough to warrant collection. Participation in a local collection scheme should be considered by the Contractor. In addition, waste separation facilities for paper, aluminium cans, plastic bottles etc., should be provided.

6.5.1.6 Sewage

Adequate numbers of portable toilets should be provided for the workers. The portable toilets should be maintained in a state, which will not deter the workers from utilizing these portable toilets. Night soil should be collected by licensed collectors regularly.

6.5.2 Operational Phase

6.5.2.1 Municipal Waste

The following measures would be implemented to enhance material recovery and recycling:

- Recycling bins will be provided at shops and food service locations to collect cardboard containers. Personnel in office will be provided with bins to recycle office paper.
- Aluminium can recycling bins will be placed at prominent locations for collection.
- Recycling bins for plastic bottle recovery should be set up at prominent places to facilitate visitors' participation in material recovery activities.
- The landscaping works will generate a certain amount of grass clippings, leaves, brush and tree trimmings. However, the handling capacity of the existing Sha Ling composting facility is limited and is currently composting livestock wastes. The facility is unlikely to be able to handle the green waste generated from the Project site. Should there be a market or facility which could process the green waste arising from the Project site, the establishment of a recycling programme for green waste should be considered.
- The venue operator should make arrangements with the laser printer toner cartridge suppliers to collect and recycle used toner cartridges for laser printers to avoid disposal of the cartridge at landfills as far as practicable.

6.5.2.2 Waste from Stables

Waste from horse stables (mainly the horse manure) would be collected on a regular basis following HKJC's sanitary practices including the following:

- Stable waste will be stockpiled in properly enclosed containers;
- Stable waste will be collected by licensed waste collector daily on a regular basis; and
- Briefings would be given to stable staff on the sanitary practices.

The current management control measures adopted by stables at Sha Tin Racecourse have been proven to be effective and sufficient in reducing nuisance and protecting the environment. These measures would be extended to cover the new stable area at the HKSI site.

6.6 Residual Environmental Impacts

With the implementation of recommended mitigation measures, adverse residual impacts are not anticipated for both the construction and operational phases.

6.7 Conclusion

6.7.1 Construction/Reinstatement Phase

The quantity and timing for the generation of waste during the construction phase have been estimated. Assessment result shows that the Project would only generate a limited amount of C&D waste. The waste management implications arising from the Project is therefore considered not significant. Measures, including the opportunity for on-site sorting and reusing excavated fill materials (stored in stockpiles) are recommended to minimise the surplus disposal off-site.

Recommendations have been made for the Contractor's implementation during the construction period to minimise the waste generation and any off-site disposal.

6.7.2 Operational Phase

The types and quantities of waste that would be generated during the operational phase have been assessed. Assessment result shows that only a limited amount of waste would be generated from the new stables and by the visitors during the event. With the implementation of proper waste management procedures, the waste management implications of the Project would only be of short term and insignificant.

7. LANDSCAPE AND VISUAL IMPACT ASSESSMENT

7.1 Introduction

7.1.1 Study Aim

This Landscape and Visual Impact Assessment (LVIA) is part of the Environmental Impact Assessment (EIA) for the Main Arena of the 2008 Olympic Equestrian Event. The LVIA assesses the potential landscape and visual impacts that might occur as a result of this Olympic competition development that is classified as a category "O.7 (Part I)" project of Schedule 2 - Designated Projects (DPs) Requiring Environmental Permits – of the Environmental Impact Assessment Ordinance (EIAO).

The LVIA is necessitated due to the expected landscape and visual impacts that could result from the venue construction, venue operation and post-event reinstatement works. Therefore, the impact assessment considers construction, operation and reinstatement phases. Since there are sensitive receivers that will be affected, this report also describes mitigation measures that would lessen the magnitude of impacts.

The aim of this LVIA is to identify and describe the expected landscape and visual impacts that might occur as a result of the construction and operation of the DP and reinstatement of the existing facilities after the event and to define the significance and magnitude of these impacts before and after mitigation.

7.1.2 Study Area

Drawing No. ST/L/S/HK/101 illustrates the location of the existing Hong Kong Sports Institute (HKSI), which is the venue of the Core Equestrian Event. The Main Arena will be located in the approximate centre of the HKSI site.

Landscape Impact Assessment (LIA): In accordance with EIAO Guidance Note No. 8/2002 the landscape impact assessment includes all areas that are within 500m from the limit of the works area of the venue. This extent is illustrated on Drawing No. ST/L/S/HK/210 (see LIA Study Boundary).

Visual Impact Assessment (VIA): The Study Area of the Visual Impact Assessment (VIA) includes all terrestrial and aquatic areas within the visual envelope of the Project. The visual envelope is defined as the visual zone of influence according to the EIAO Guidance Note No. 8/2002. This extent is illustrated on Drawing No. ST/L/S/HK/230.

7.1.3 Purpose of this LVIA

The purpose of this LVIA is to define the existing landscape and visual quality in the LVIA Study Area; to evaluate the landscape and visual impacts associated with the Main Arena; to propose mitigation measures and to assess the effectiveness of mitigation measures.

To achieve this purpose, the following goals are set out for this LVIA:

- To carry out landscape and visual baseline studies and to describe the existing and future conditions;
- To identify and describe the landscape and visual impacts of the development for the construction, operation and reinstatement phases;

- To define the significance and magnitude of these impacts;
- To propose mitigation measures by taking local conditions and experience in consideration and to describe the maintenance and management of these mitigation measures; and
- To indicate the residual impacts after mitigation.

7.2 Relevant Legislation and Guidelines

The methodology for undertaking the landscape and visual impact assessment is in accordance with Annexes 10 and 18 of the Technical Memorandum on Environmental Impact Assessment Process, the EIAO Guidance Note No. 8/2002 and the EIA Study Brief No. ESB-136/2000. The list of legislation, standards and guidelines applicable to this assessment is as follows:

- Environmental Impact Assessment Ordinance (Cap. 499, Section 16);
- Technical Memorandum on Environmental Impact Assessment Process;
- EIAO Guidance Note No. 8/2002 – Preparation of Landscape and Visual Impact Assessment;
- Hong Kong Planning Standards and Guidelines;
- Outline Zoning Plan No. S/ST/20
- WBTC No. 25/93 – Control of Visual Impact of Slopes;
- WBTC No. 17/2000 – Improvement of Appearance of Slopes;
- GEO Publication No. 1/2000 – Technical Guidelines on Landscape Treatment and Bio-engineering for manmade Slopes and Retaining Walls
- WBTC 14/2002 – Management and Maintenance of Natural Vegetation and Landscape Works, and Tree Preservation; and
- ETWB TCW No. 2/2004 – Maintenance of Vegetation and Hard Landscape Features.

7.3 LVIA Assessment Methodology

7.3.1 LVIA Approach

The approach to this study has been facets:

- To be in accordance with the standards and legislation as described in the EIAO and other legislation;
- To follow a sound research ethic; and
- To base the assessment methodology on the objectives as set in Section 7.1.3 above.

7.3.2 The Research Ethic

This LVIA is a professional study conducted by a team consisting of landscape architects assisted by field surveyors and production technicians. The landscape architects conducted the assessment in an independent and comprehensive manner, where the findings are authentic to their properties and not according to preferred definitions. In doing this, the landscape architects relied on experience and professional judgements, the evaluation of the study by Government bodies and

the other related impact assessments of this EIA Report. In addition, the findings of this LVIA Study are presented in a structured and systematic manner to improve the public comprehension.

7.3.3 Project Description

The project details are described in Section 2 of the EIA Report. Since it is necessary to describe how the development fits into the scope of the landscape and visual environments and describe works that might cause landscape or visual impacts, Section 7.4 of the LVIA describes venue features relevant to the LVIA.

The description is in text and drawing formats and presents the following details: plans to indicate location of the development, existing sports facilities, extents of the development works, and the boundary of works areas.

7.3.4 Review of Planning and Development Control Framework

A review of the existing planning studies and documents was undertaken as part of the assessment to gain an insight into the planned role of the site, its context and to help determine whether the development fits into the wider existing and future landscape context.

This review considered the planning intentions described on OZPs and other documents. It identifies any issue of conflict with the neighbouring planned land uses. It in particular identifies future visually sensitive receivers (VSRs). It also describes the future landscape setting and visual context of the study area.

7.3.5 Landscape Impact Assessment

The assessment of the potential impacts comprises two distinct sections:

- Baseline survey; and
- Identification and definition of landscape impacts.

Baseline Survey:

To conduct the landscape baseline study that describes the physical properties of the landscape, two surveys were carried out: The first was a desktop survey and the second a site survey. These two surveys collected data with respect to the landscape character areas (LCAs) and landscape resources (LRs). Landscape elements surveyed include:

- Vegetation;
- Rock features
- Patterns of settlement;
- Land use; and
- Prominent watercourses and water bodies.

Landscape Resources: These are the individual landscape elements. These resources are described and illustrated herein. Part of the vegetation survey includes a specific survey on trees. Photographs of Landscape Resources are shown in Drawings No.: ST/L/S/HK/211 and ST/L/S/HK/211. The tree survey methodology is outlined in Section 7.3.6 below.

Landscape Character Areas: Landscape areas with broadly homogeneous units of similar character were identified. These are areas where the topography and land use in particular defines

landscape units and are further characterised by landscape element compositions. These LCAs are described and illustrated. Drawing ST/L/S/HK/220 presents the Landscape Character Plan.

Sensitivity to change: The individual LCAs and LRs are rated using low, medium or high depending on the following factors that influence sensitivity:

- Quality – the overall performance of a LCA or LR in the study area;
- Importance or rarity;
- Ability to accommodate change;
- Significance of potential change in the local context;
- Significance of potential change in the regional context;
- Maturity of landscape elements comprising; and
- Overall size within the study area.

The determined degree of sensitivity has the following meanings:

- High: A LR or LCA that is rare, protected or of particular value in its local context or in Hong Kong;
- Medium: A LR or LCA that is valuable to its local context and have a moderate ability to absorb change;
- Low: A LR or LCA that is common, in poor condition (such as the eroded slopes on the site) and have the ability to absorb change.

Identification and definition of landscape impacts:

Identification: This is a systematic process during which any anticipated changes to the landscape are recorded. These changes will occur during the construction, operation and reinstatement phases of the venue. Such changes are described, measured and illustrated in this report.

Magnitude of change: The change to LCAs and LRs are rated as negligible, small, intermediate or large. Factors affecting the magnitude of change are:

- Compatibility of the equestrian features with the surrounding landscape;
- Duration of impacts under construction, operation and reinstatement phases;
- Scale of the venue facilities;
- Reversibility of change; and
- The relative size of the change in comparison to the size of the existing LCAs or LRs.

The measured magnitude of change has the following meanings:

- Large: the quantitative and qualitative loss is high and will lead to permanent alteration of the properties of the LR or LCA;
- Intermediate: The quantitative and qualitative loss is moderate and some portions of the LR or LCA will be permanently changed;
- Small: The quantitative and qualitative loss can be observed, but most portions of the LR or LCA will stay in tact;

- Negligible: The effect of the impact on the LR or LCA is barely noticeable or non-existent.

Definition: The impact is a product of the sensitivity of a LCA or LR and the magnitude of change to such a LCA or LR. The significance threshold for impacts to landscape character and resources is a definition of the impact and is rated as significant, moderate/significant, moderate, slight/moderate or negligible. Any such impacts are further defined as beneficial or adverse. The significance threshold is derived from the Significance Threshold Matrix as described in Table 7-1 below:

Table 7-1: The significance threshold matrix

Magnitude of Change caused by proposal	**Large**	Moderate Impact	Moderate / Significant Impact	Significant Impact
	Intermediate	Slight / Moderate Impact	Moderate Impact	Moderate / Significant Impact
	Small	Slight Impact	Slight / Moderate Impact	Moderate Impact
	Negligible	Negligible Impact	Negligible Impact	Negligible Impact
		Low	**Medium**	**High**
	Sensitivity to Change			

Table 7-2 describes the meanings of the above significance threshold definitions. Since impacts can be either beneficial or adverse, the definitions are also classified in such terms.

Table 7-2: Impact definitions

Adverse / Beneficial Impacts			
Significant: An impact where the proposal would cause significant deterioration or improvement in the existing environmental quality.	Moderate: An impact that would cause noticeable deterioration or improvement in the existing environmental quality.	Slight: An impact that would barely cause a perceptible deterioration or improvement in the existing environmental quality.	Negligible: An impact where the change might be noticeable.
Note: Moderate / Significant impacts can in part be classified as Moderate and in part as Significant. Slight / Moderate impacts can in part be classified as Slight and in part as Moderate.			

7.3.6 Tree Survey Methodology

Trees are landscape resources. The impact identification and definition process are therefore similar to the above statements in Section 7.3.5. The tree survey carried out complies to the requirements of Section 3.4.5 for the Study Brief.

The individual tree survey for this LVIA was conducted by means of a field survey. Trees were identified and surveyed. Recorded data are: location of tree, species, size and condition. This report also describes the impact on trees in terms of felling and transplantation. A separate Tree Felling and Transplantation Application is being processed for all trees.

7.3.7 Visual Impact Assessment

Potential visual impacts are assessed under the following two topics:

- Baseline survey; and
- Identification and definition of visual impacts.

Baseline Survey:

The baseline survey was carried out by means of both desktop and field surveys. Data was collected to describe the visual properties of existing and future visually sensitive receiver (VSR) groups.

VSR groups: Existing and future VSRs that are located within the visual envelope were identified. The visual envelope includes all areas from which the Main Arena can be seen and is defined as the view shed formed by natural and manmade features such as existing ridgelines, built developments and for example areas of woodland/or large trees.

Sensitivity to change: The individual VSR groups are rated using low, medium or high depending on the following factors that influence sensitivity:

- Value of existing views;
- Quality of existing views;
- Availability of alternative views;
- Amenity of alternative views;
- Type of VSRs in the group;
- Number of VSRs in the group;
- Duration of views to the Project;
- Frequency of views to the Project; and
- Degree of visibility.

The determined degree of sensitivity has the following meanings:

- High: A VSR group with a large number of viewers that enjoy a unique or valuable view, which will be dramatically altered with the slightest change to it;
- Medium: A VSR group with a medium number of viewers who enjoy good views with some disturbances in the present sightlines. Change to their views will be noticeable, but will not alter the essential qualities thereof;
- Low: A VSR group with only a few viewers, whose view will not be noticeably changed by the proposal.

Identification and definition of visual impacts:

Identification: This is a systematic process during which any anticipated changes to views are recorded. These changes will occur during the construction, operation and reinstatement phases of the Project. Such changes are described illustrated in this report.

Magnitude of change: The change of views from VSR groups is rated as negligible, small, intermediate or large. Factors affecting the magnitude of change are:

- Compatibility with the landscape and character of the surroundings;
- Duration of impacts;
- Scale of the Project;
- Reversibility of the change;
- Viewing distance; and
- Potential blockage of views.

The measured magnitude of change has the following meanings:

- Large: The qualitative change is dramatic and permanent;
- Intermediate: The qualitative change is noticeable, but viewers still have other views of good quality;
- Small: The qualitative change is noticeable, but viewers have a large number of high quality alternative views for enjoyment;
- Negligible: The effect of the impact on the VSR group is barely noticeable or non-existent.

Definition: Similar to the case of LCAs and LRs, the VSR groups impact is a product of the sensitivity of VSR group and the magnitude of change of its views. The significance threshold for impacts is a definition of the impact and is rated as significant, moderate/significant, moderate, slight/moderate or negligible. Any such impacts are further defined as beneficial or adverse. The significance threshold is derived from the Significance Threshold Matrix as described in Table 7-1 above and the meanings of such impacts are clarified in Table 7-2.

7.3.8 Landscape & Visual Impact Mitigation Measures

The identification of the landscape and visual impacts will highlight those sources of conflict requiring design solutions or modifications to reduce the impacts, and, if possible, blend the development and associated activities in with the surrounding landscape.

Mitigation measures have considered factors including:

- Avoiding landscape and visual impacts as far as possible;
- Preserving sensitive landscape and visual elements as far as possible;
- Preservation of existing vegetation as far as possible;
- Introduction of woodland, tree and shrub planting of new or disturbed slopes, amenity strips and areas, areas adjacent to any new structures to aid stabilization with careful consideration of significant landscape elements;
- Consideration of the contouring of new slopes in order to visually integrate them into the existing topography;
- Use of vegetated earth mounding or structural solutions for screening; and
- Feasibility of mitigation measures in respect of funding, implementation phasing and maintenance.

These objectives will result in the formation of landscape and visual mitigation proposals, which will alleviate the previously identified landscape and visual impacts as far as possible, both during its construction, operation and reinstatement phases, and to ensure that the residual impacts are acceptable.

7.3.9 Defining the Residual Impacts

The residual impacts are those, which remain after the proposed mitigation measures have been successfully implemented. This is assessed for the construction, operation and reinstatement phases.

As described above, the level of impact is a product of the sensitivity to change and the magnitude of change, which the proposals will cause to landscape character, landscape resource or visually sensitive receiver. It is a comparison of the future landscape modified by the proposals

with the landscape, which would have existed during this period if the Project had not been constructed. This assessment also considers the ability of the landscape character, landscape resource or visual amenity to tolerate change, i.e. its quality and sensitivity taking into account the beneficial effects of the proposed mitigation. The significance threshold is as per the description in Table 7.3.5.a.

In accordance with Annex 10 of the TM-EIAO an overall assessment is also made of the residual landscape and visual impacts attributable to the proposed scheme. The degree of residual impact is considered in accordance with The Significant Threshold Matrix in Table 7.3.5.a above.

7.4 Project Description

7.4.1 Overview

Works for this DP are for the Main Arena of the core equestrian venue for the 2008 Olympic Equestrian Event. The description below is a brief summary of the Project works, with particular attention to those works that will impact the landscape and visual environments.

7.4.2 Design Phase

The detailed design phase of this Project and DP commenced in mid of 2005. Several stakeholders, including the BOCOG, and interest groups were consulted during the process in order to identify potential impacts at an early stage, to avoid impacts as far as possible and to ensure the Olympic competition and administrative requirements can be achieved. As a result, the design was revised several times in order to minimize the need for tree felling, enhance local landscape areas, avoid glare impacts and to minimize grading works.

Broad Landscape Strategy: The landscape has been designed to support the functions and activities associated with the two equestrian events and future sports events after reinstatements works, enhance the existing landscape and to mitigate landscape and visual impacts. Drawing No. ST/L/S/HK/110 illustrates the master plan for the operation phase (unmitigated): The Olympic Mode. Drawing No. -/114 illustrates the master plan for the reinstatement phase (unmitigated): The Post Olympic Mode. The mitigated master plans are illustrated on Drawing Nos. -/410 and -/411.

The Main Arena: It will comprise of a sand footing area of 100x80m, which will be constructed on the existing grass Athletics Field. Temporary spectator seating will be provided around the arena, mostly on the existing tartan running lanes. Temporary seating of a suitable colour scheme will be selected to complement the overall design of the competition arena. A temporary decorative landscape strip will be located around the arena in front of the spectator seating. It will comprise of flower plants in removable pots. New floodlights to achieve 2000 lux level on the field will also be provided on 40m high light posts. The plan of the Main Arena is presented in Drawing No.: ST/L/S/HK/112.

Logistic, food and merchandise, spectator entry and broadcast compounds: These will be located on existing tennis courts, which will be reinstated after the Paralympic Event.

Stable Complex: New stables will be located in the southeast of the site on existing grass football fields. The Stable Complex will have horse stables, access roads, parking bays, training areas with sand footings and a veterinary clinic. It will be permanent.

Arenas: The Holding Arena, which will have a sand footing, will be located directly East of the Main Arena on an existing multi-use hard sports court that will be reinstated after the Paralympic

Event. The Warm-up Arena will be located next to Holding Arena. It will be constructed partially on the multi-use hard sports court, existing landscape areas and a parking area. It will have a sand footing.

New underpass to the Shatin Racecourse: It will be constructed to link the Stable Complex with Penfold Park. It will be underground with portals to ground levels on both sides and be permanent.

7.4.3 Construction Phase

A large portion of the works will be implemented between July 2006 and August 2007, including site formation, road, landscape, drainage, competition arena, remaining arenas, indoor arena, stables, underpass and some temporary works. Other temporary structures, including the judging tower, tents and toilets will be constructed between March and June 2008. Floodlights will also be implemented in this period.

The temporary spectator seating for the Main Arena will be constructed between February 2008 and June 2008. Other building works will be carried out between December 2007 and June 2008. Building works will comprise renovations to the existing HKSI building, in particular interior modifications.

7.4.4 Operational Phase

Operation of the venue will comprise of three events, namely the Test Event, Olympic Equestrian Event and the Paralympic Equestrian Event.

The Test Event will take place in August 2007 over a period of two weeks and commence with a security lock down in June 2007. Event overlay facilities will be constructed in July 2007. These will include temporary toilets, merchandise stores, etc. and the implementation of broadcast equipment. During the same time a limited number of horses will be brought to the venue.

Post Test Event construction works will be carried out between the Test and Olympic Equestrian events.

The Olympic Equestrian Event will take place in August 2008. It will commence with the security lock down in June 2008. Set-up works, including the installation of broadcast equipment will be carried out in July 2008. All horse of the competition will be brought to the event during the same time. The event will have a two-week duration.

The timeframe for the Paralympic Equestrain Event will be similar to the Olympic Equestrian Event, with the exception of the security lock down period, which is not required, since the Paralympic Event will follow within approximately three week after the Olympic Event. During this three weeks the event set-up works, which will include the installation of overlay facilities and broadcast equipment as well as horse stabling will take place.

The operational phase will be completed after the Paralympic Event.

7.4.5 Reinstatement Phase

Reinstatement works will commence after the Paralympic Event in October 2008 and be completed in January 2009. Landscape related works will include the reconstruction of tennis courts, Athletics Field and multi-purpose hard sports court. Areas around the Stable Complex will be enhanced with landscape works.

7.5 Review of Planning and Development Control Framework

7.5.1 Introduction

A review of the existing and future development framework that encompasses or will be influenced by the Project has been undertaken and the results of this review are described below. The aims of this review are:

- To gain insight into the planned functions of the study area and its context;
- To identify any issue of conflict with the neighbouring planned land uses;
- To describe how the Project fits in the planning and development context; and
- To determine future sensitive receivers (SRs).

The Outline Zoning Plan (OZP) that defines planning intentions for HKSI is the Shatin Outline Zoning Plan No. S/ST/20. The site is designated for Government / Institution / Community (G/IC) use. This type of use is intended for the provision of Government, institution or community facilities serving the needs of the local residents and / or a wider district, region or the territory. The present use is for sports training and competition. The Project operation use will also be for sports events. The present use will largely be reinstated after the Paralympic Event. The Project will therefore fit in the planning and development context of the present location.

HKSI is located adjacent to the Shatin Racecourse, which is zoned for Other Specified Uses (Racecourse). Using the HKSI site as the venue for the 2008 Olympic Equestrian Event will not cause major conflicts with the racecourse use. The Project therefore fits into the context of its nearest neighbouring land use.

Future planning intentions for Penfold Park are in the formulation process at the preparation time of this Report. Intermediate proposals in support of this Project are to implement horse stables, a bridle track and a cross country training track. Proposals for a long-term equestrian park are under consideration. This park will be open for public use. The use of HKSI for the Olympic Equestrian Event will benefit the long-term use of Penfold Park as it could potentially include legacy features in remembrance of the 2008 Olympic Equestrian Event.

To the South, HKSI is bordered by a cycle track adjacent to the Shing Mun River Channel. The track's use will be temporarily discontinued during the events and reinstated afterwards. To the North and West it is enclosed by the Tai Po Road - Sha Tin Section and the Shatin Road. Traffic impacts to these two roads will be minimal and the road use will continue. The KCR Fo Tan and KCR Racecourse stations will be used during the event. Special arrangements will be made to continue the rail service throughout the duration of the Olympic competition.

Areas to the South of the Shing Mun River Channel are primarily zoned for Residential (Group B) (R(B)), Village Type Development (V), Open Space (O) and Green Belt (G) uses. Visually sensitive receivers (VSRs) in the R(B) zone include residents in estates like Pictorial Garden, Garden Vista and Ravana Garden. To the North of HKSI is a prominent Other Specified Uses (Railway Depot Comprehensive Development Area) zone with estates like Royal Ascot and Jubilee Garden. The KCR House is also in this zone. Minor visual impacts to users of these zones are expected during the construction phase, however the distance will be great and land use conflicts are not expected. Operation phase visual impacts are also expected in the form of glare from floodlights. This will not require any of the present uses to discontinue.

7.6 Existing Landscape Baseline Conditions

7.6.1 Introduction

This section describes the landscape baseline conditions of all areas that are within a 500m distance from the works boundaries of the Project. Descriptions are on the properties of the landscape resources and character areas. Expansive lawns and pockets of trees are the most prominent landscape resources. These resources and hard sports fields define the landscape character. More details are described below.

7.6.2 Landscape Resources

7.6.2.1 LR 1 – Turf Lawns

The dominant grass species at the HKSI site are *Axonopus compressus* and *Zoysia matrella*. These are common exotic grass species that are frequently used on sports fields in Hong Kong. A lawn area of 0.7 ha is presently located in the centre of the Main Arena. The sensitivity to future change is defined in Table 7-3 below. Photo Nos. 1, 4, 5, 6 and 7 on Drawing No. -/211 illustrates pockets of lawns in garden areas and Photo Nos. 4, 7, 8 and 9 on Drawing No. -/ 212 illustrates lawn areas used for the practice and play of sports.

Table 7-3: LR 1: Sensitivity to potential change

Sensitivity of LR at Baseline Conditions	
Sensitivity Parameter	*Rating*
Quality of landscape resource	High
Importance and rarity	Low
Ability to accommodate change	Medium
Local significance of potential change	Medium
Regional significance of potential change	Low
Maturity	Medium
Area (in LIA boundary)	15.5 ha
Sensitivity Rating	Medium

7.6.2.2 LR 2 – Trees

There are approximately 714 live trees and 6 dead trees on the site. The majority of these are ornamentals introduced for aesthetic purposes. Three trees, all *Ficus microcarpa*, have diameters at breast height of over 1m. Drawing Nos. ST/L/S/HK/213 to ST/L/S/HK/216 indicates the location and development impact on trees of each individual tree. Drawing No. -/ 217 illustrates examples of the existing trees and the development affect on such trees. Bird nests were observed in some trees within the site. These will be inspected and removed from trees that are required to be felled or transplanted with reference to the Wild Animal Protection Ordinance (Cap 170). More details on individual trees are enclosed in Appendix 7-1. The sensitivity to change is described in Table 7-4 below.

Table 7-4: LR 2: Sensitivity to potential change

Sensitivity of LR at Baseline Conditions	
Sensitivity Parameter	*Rating*
Quality of landscape resource	Medium - high
Importance and rarity	Medium
Ability to accommodate change	Medium
Local significance of potential change	Medium
Regional significance of potential change	Low
Maturity	High
Total number at HKSI	714
Sensitivity Rating	**Medium**

7.6.2.3 LR 3 – Synthetic Sports Fields

Drawing No. ST/L/S/HK/101 illustrates the location of synthetic sports fields. The Main Arena will be located at the Athletics Field in the approximate centre of the HKSI site. It comprises of a tartan running lane (approximately 6,000m^2) and an infield lawn area (approximately 7,000m^2). A multi purpose hard sports court (approximately 5,500m^2)is located directly adjacent to it, while tennis courts and badminton courts (total approximately 13,000m^2)are located in the southwest. All these outdoor synthetic sports fields will be reinstated after the Paralympic Equestrian Event. A cycle track (approximately 5,000m^2) is located in the northwest and will not be affected by the works. The sensitivity to change is described in Table 7-5 below. Drawing No. -/ 212 includes photos illustrating the existing synthetic sports fields.

Table 7-5: LR 3: Sensitivity to potential change

Sensitivity of LR at Baseline Conditions	
Sensitivity Parameter	*Rating*
Quality of landscape resource	Medium
Importance and rarity	Medium
Ability to accommodate change	High
Local significance of potential change	High
Regional significance of potential change	High
Area	3.6 ha
Sensitivity Rating	Medium

7.6.2.4 LR 4 – Garden Areas

Several ornamental and naturalistic garden areas are located within the HKSI site. These comprise of common garden plants including trees, palms, shrubs, climbers, groundcovers and small patches of lawn between planter beds. The Main Arena site comprises of approximately 2000m^2 of garden areas and this will be covered by spectator seating. The sensitivity to change is described in Table 7-6 below. Garden areas are illustrated on Drawing No. -/211, which indicate typical examples of garden areas in good condition and garden areas that require enhancement. See Photo 1 for a garden area in relatively good condition and Photo 7 for a garden that requires enhancement.

Table 7-6: LR 4: Sensitivity to potential change

Sensitivity of LR at Baseline Conditions	
Sensitivity Parameter	*Rating*
Quality of landscape resource	Low to medium
Importance and rarity	Low
Ability to accommodate change	High
Local significance of potential change	Medium
Regional significance of potential change	Low
Area (in LIA boundary)	14.5 ha
Sensitivity Rating	Low

7.6.2.5 LR 5 – River Channel and Pond

The Shing Mun River Channel and two smaller nullah that flow into it are located southeast of HKSI. Concrete banks bound these water bodies that flow towards the ocean. Very little natural vegetation is present along the banks (see Photo 11 on Drawing No. -/211). One of the man-made lakes in Penfold Park is located in the LIA Study Boundaries. It has a concrete bank and bed with a vegetated island.

Table 7-7: LR 5: Sensitivity to potential change

Sensitivity of LR at Baseline Conditions	
Sensitivity Parameter	*Rating*
Quality of landscape resource	Medium
Importance and rarity	Low
Ability to accommodate change	High
Local significance of potential change	Medium
Regional significance of potential change	Low
Area (in LIA boundary)	30.25 ha
Sensitivity Rating	Medium

7.6.3 Landscape Character Areas

7.6.3.1 LCA 1 – Sports Complex

The HKSI site as a whole can be considered as a sports complex character area, being defined by its sports associated buildings and outdoor sports fields. The location of this LCA is illustrated on Drawing No. -/220. Drawing No. -/221 illustrates the sports fields at HKSI, which define its character. The rating of this LCA's sensitivity to change and ratings of sensitivity parameters are recorded in Table 7-8 below.

Table 7-8: LCA 1: Sensitivity to potential change

Sensitivity of LCA at Baseline Conditions	
Sensitivity Parameter	*Rating*
Quality of landscape character	High
Quality of landscape resources	Medium
Importance and rarity	High
Ability to accommodate change	Medium
Local significance of potential change	High
Regional significance of potential change	High
Maturity of Landscape	Medium
Area	15.5 ha
Sensitivity Rating	Medium

7.6.3.2 LCA 2 – Racecourse

The Shatin Racecourse is located northeast of the Project site and is characterised by is turf racing tracks, grand stand, buildings, parking areas and other equestrian facilities. It is one of two such facilities in Hong Kong. Drawing No. -/221 includes photos the racecourse. The rating of this LCA's sensitivity to change and ratings of sensitivity parameters are recorded in Table 7-9 below.

Table 7-9: LCA 2: Sensitivity to potential change

Sensitivity of LCA at Baseline Conditions	
Sensitivity Parameter	*Rating*
Quality of landscape character	High
Quality of landscape resources	High
Importance and rarity	High
Ability to accommodate change	Medium
Local significance of potential change	High
Regional significance of potential change	High
Maturity of Landscape	Medium
Area of racecourse (within this LIA Study area)	17.5 ha
Sensitivity Rating	High

7.6.3.3 LCA 3 – Penfold Park

Penfold Park has an infield location with respect to the turf racing tracks of the Shatin Racecourse. It is characterised by rolling lawns, large ponds, trees and several built structures including a kiosk, aviary and maintenance building. Photos illustrating the landscape character of Penfold Park are on Drawing No. -/221. The rating of this LCA's sensitivity to change and ratings of sensitivity parameters are recorded in Table 7-10 below.

Table 7-10: LCA 3: Sensitivity to potential change

Sensitivity of LCA at Baseline Conditions	
Sensitivity Parameter	*Rating*
Quality of landscape character	Medium
Quality of landscape resources	High
Importance and rarity	High
Ability to accommodate change	Medium
Local significance of potential change	Medium
Regional significance of potential change	Medium
Maturity of Landscape	Medium
Area within this LIA Study area	8.7 ha
Sensitivity Rating	Medium

7.6.3.4 LCA 4 – Built-up Areas

The Project area is surrounded by several built-up developments, including amongst others the Royal Ascot, Jubilee Gardens, the HK Jockey Club Staff Quarters and the Institute of Vocational Training (Shatin). Most of these buildings are between ten and twenty storeys high and more than ten years old. The character of the built-up areas is illustrated on Drawing No. -/222. The rating of this LCA's sensitivity to change and ratings of sensitivity parameters are recorded in Table 7-11 below.

Table 7-11: LCA 4: Sensitivity to potential change

Sensitivity of LCA at Baseline Conditions	
Sensitivity Parameter	*Rating*
Quality of landscape character	Medium
Quality of landscape resources	Medium to low
Importance and rarity	Low
Ability to accommodate change	High
Local significance of potential change	Low
Regional significance of potential change	Low
Maturity of Landscape	Medium
Area within this LIA Study area	47.5 ha
Sensitivity Rating	Low

7.6.3.5 LCA 5 – Transportation Facilities

Major roads within the LIA study boundaries are the Shatin Road, Fo Tan Raod, Tai Po Road – Shatin Section and Lok King Street. The character of these roads is typically harsh with little soft landscape works. Extensive parking areas are located North of the Shatin Racecourse and North of the HKSI. The KCR Fo Tan and Racecourse stations are also located in the LVIA Study Area. Drawing No. -/222 illustrates the character of transportation facilities. The rating of this LCA's sensitivity to change and ratings of sensitivity parameters are recorded in Table 7-12 below.

Table 7-12: LCA 5: Sensitivity to potential change

Sensitivity of LCA at Baseline Conditions	
Sensitivity Parameter	*Rating*
Quality of landscape character	Low
Quality of landscape resources	Low
Importance and rarity	Low
Ability to accommodate change (from landscape point of view)	High
Local significance of potential change (from landscape point of view)	Low
Regional significance of potential change (from landscape point of view)	Low
Maturity of Landscape	Medium
Area	N/A
Sensitivity Rating	Low

7.6.3.6 LCA 6 – Natural Hillside

A small portion of the hillside near Fo Tan Village is located within the LIA Study Boundaries. It comprises of natural vegetation and rocky outcrops. Parts of it have been scarred with man-made slopes.

Table 7-13: LCA 6: Sensitivity to potential change

Sensitivity of LCA at Baseline Conditions	
Sensitivity Parameter	*Rating*
Quality of landscape character	Medium
Quality of landscape resources	Medium to high
Importance and rarity	Medium
Ability to accommodate change (from landscape point of view)	Low
Local significance of potential change (from landscape point of view)	Medium
Regional significance of potential change (from landscape point of view)	Low
Maturity of Landscape	Medium to high
Area within LIA Study Boundaries	4ha
Sensitivity Rating	Medium

7.6.3.7 LCA 7 – River Channel

The Shing Mun River Channel and its two smaller nullah is located southeast of HKSI. It is a landscape resource of significant size and uniformity to be classified as a character area. It comprises of a large water body with concrete banks and cycle tracks on both sides. Drawing No. -/222 illustrates the river channel.

Table 7-14: LCA 7: Sensitivity to potential change

Sensitivity of LCA at Baseline Conditions	
Sensitivity Parameter	*Rating*
Quality of landscape character	Medium
Quality of landscape resources	Medium
Importance and rarity	Medium
Ability to accommodate change (from landscape point of view)	High
Local significance of potential change (from landscape point of view)	Medium
Regional significance of potential change (from landscape point of view)	Medium
Maturity of Landscape	Low
Area within LIA Study Boundary	30.25 ha
Sensitivity Rating	Medium

7.7 Landscape Impact Assessment

7.7.1 Impacts on Landscape Resources

The largest impact on landscape resources will occur during the construction phase, when large areas of land will be cleared for site formation works. These impacts are described in Table 7-15 below:

Table 7-15: Impacts on landscape resources before mitigation

LR Ref.	LR Notation	Sensitivity to Change	Impact Description	Source of Impact	Magnitude of Change	Significance Threshold
LR1	Turf Lawns	Medium	Construction: Loss of grass cover: 2.8 ha, of which 0.7ha is at Main Arena. Baseline cover is 15.5 ha.	Construction: Site formation and building works; and Clearance of vegetation.	Construction: Large	Construction: Moderate / Significant Adverse
			Operation: Loss of grass cover: 2.8ha.	Operation: New Project and Main Arena features replacing existing grass.	Operation: Large	Operation: Moderate / Significant Adverse
			Reinstatement: Reinstatement of 0.7 ha grass cover at Main Arena (Compared with the 2.8ha loss during early construction phases the, the loss of grass cover after reinstating turf at the Athletics Field will be 2.1ha.)	Reinstatement: Planting works (beneficial).	Reinstatement: Intermediate	Reinstatement: Moderate Adverse

LR Ref.	LR Notation	Sensitivity to Change	Impact Description	Source of Impact	Magnitude of Change	Significance Threshold
LR 2	Trees	Medium	Construction: Felling of existing trees: 33. Of these, 12 will be felled at the Main Arena; Transplantation of existing trees: 53. Of these, 13 are presently located at the site for the Main Arena; In total 628 trees will be retained. Of these, 33 are located at the site for the Main Arena; The three trees with diameters over 1m at breast height will be retained and protected; Trees to be felled are common species; and Baseline total is 714 trees. An additional 6 dead trees were recorded, which will be removed. Note the above numbers are based on the Project proposals and may change upon finalization of the detailed design.	Construction: Site formation works and building works; and Clearance of vegetation.	Construction: Intermediate	Construction: Moderate Adverse
			Operation: Felling of existing trees during construction; and The three trees with diameters over 1m at breast height of over 1m will be retained and protected	Operation: New Project features replacing existing trees.	Operation: Intermediate	Operation: Moderate Adverse
			Reinstatement: Planting of 12 new trees at the Main Arena; and The three trees with diameters at breast height of over 1m will be retained and protected	Reinstatement: Planting works (beneficial).	Reinstatement: Small	Reinstatement: Slight / Moderate Adverse
LR 3	Synthetic Sports Fields	Medium	Construction: Loss sport surfaces: 3.6ha of which 0.6 ha is at the Athletics Field. Baseline cover of sports fields is 3.6ha.	Construction: Site formation works and building works; and Clearance of vegetation.	Construction: Large	Construction: Moderate / Significant Adverse

LR Ref.	LR Notation	Sensitivity to Change	Impact Description	Source of Impact	Magnitude of Change	Significance Threshold
			Operation: Loss is same as for construction phase (3.6ha), except for the Main Arena that will be used for the equestrian competition instead of athletics training and competitions.	Operation: New Project features replacing existing sports fields.	Operation: Large	Operation: Moderate / Significant Adverse
			Reinstatement: Reconstruction of all synthetic sports fields (beneficial).	Reinstatement: Construction works.	Reinstatement: Large	Reinstatement: Moderate / Significant Beneficial
LR 4	Garden Areas	Low	Construction: Negligible loss of approximately 0.7 ha garden area. Of this, less than 0.35ha loss is expected at the Main Arena Baseline size is 15.5 ha.	Construction: Site formation and building works.	Construction: Negligible	Construction: Negligible
			Operation: Same loss as for construction phase, however approximately 0.2 ha will be added around the Main Arena and approach paths for decoration purposes. These garden areas will be temporary; and An additional 0.2 ha permanent gardens will be implemented. Note the total loss compared with the baseline conditions will be 0.3ha during the operation phase.	Operation: Bringing in new temporary plants (beneficial).	Operation: Negligible	Operation: Negligible
			Reinstatement: Planting of 0.5ha shrubs and groundcovers. Note that the planting of 0.5ha in addition to the 0.2ha permanent gardens of the operation phase will total 0.7ha, which is equal to the construction loss.	Reinstatement: Planting works (beneficial).	Reinstatement: Nil	Reinstatement: Nil Note the impact is nil, since the gain up to this stage will equal the construction loss
LR5	River Channel and Pond		Construction: No direct landscape or visual impact to this landscape resource will result from the works.	Construction: Nil.	Construction: Nil	Construction: Nil

LR Ref.	LR Notation	Sensitivity to Change	Impact Description	Source of Impact	Magnitude of Change	Significance Threshold
			Operation: No direct landscape or visual impact to this landscape resource will result from the operation.	Operation: Nil.	Operation: Nil	Operation: Nil
			Reinstatement: No direct landscape or visual impact to this landscape resource will result works.	Reinstatement: Nil.	Reinstatement: Nil	Reinstatement: Nil

7.7.2 Impacts on Landscape Character Areas

Table 7-16 below describes the impact on landscape character areas.

Table 7-16: Impacts on landscape character areas before mitigation

LCA Ref.	LCA Notation	Sensitivity to Change	Impact Description	Source of Impact	Magnitude of Change	Significance Threshold
LCA 1	Sports Complex	Medium	Construction: Loss of existing hard and soft outdoor sports fields and courts: 6.4 ha. Construction works for the Main Arena will comprise 2.3ha of land. Existing LCA size is 15.5 ha; Minor change of landform; and Temporary change of landscape quality.	Construction: Construction of Olympic facilities; Temporary storage of building material; and Site formation works.	Construction: Large	Construction: Moderate / Significant Adverse
			Operation: Loss of outdoor sports facilities; Operation of Main Arena for Olympic Competition (beneficial); and Existing buildings to be enhanced.	Operation: Temporary discontinued use of original sports facilities; and Day-to-day activities of Test, Olympic and Paralympic events.	Operation: Large	Operation: Moderate / Significant Adverse
			Reinstatement: Reinstatement of existing synthetic sports fields and courts, including Athletics Field where Main Arena is proposed; and	Reinstatement: Construction of reinstated sports fields and courts (beneficial); and Planting works (beneficial).	Reinstatement: Intermediate	Reinstatement: Moderate Adverse
LCA 2	Racecourse	High	Construction: Upgrading works at dirt footpath to HKSI. Portal of underpass.	Construction: Site formation and construction works for the tunnel portal.	Construction: Negligible	Construction: Negligible
			Operation: Minor character change when high numbers of spectators pass along footpath and use of underpass.	Operation: Use by spectators to gain access to HKSI. Use of underpass by vehicles, horse and maintenance people.	Operation: Negligible	Operation: Negligible

LCA Ref.	LCA Notation	Sensitivity to Change	Impact Description	Source of Impact	Magnitude of Change	Significance Threshold
			Reinstatement: Minor character change when underpass is used in future.	Reinstatement: Use of underpass by vehicles, horse and maintenance people.	Reinstatement: Negligible	Reinstatement: Negligible
LCA 3	Penfold Park	Medium	Construction: No direct impacts due to this Project. It should be noted that works associated with the 2008 Olympic Equestrian Event will be carried out under another project.	Construction: Nil.	Construction: Nil.	Construction: Nil.
			Operation: Nil.	Operation: Nil.	Operation: Nil.	Operation: Nil.
			Reinstatement: Nil.	Reinstatement: Nil.	Reinstatement: Nil	Reinstatement: Nil
LCA 4	Built-up Area	Low	Construction: Nil. No works will be carried out in this LCA.	Construction: Nil.	Construction: Nil	Construction: Nil
			Operation: Nil.	Operation: Nil.	Operation: Nil	Operation: Nil
			Reinstatement: Nil.	Reinstatement: Nil.	Reinstatement: Nil	Reinstatement: Nil
LCA 5	Transportation Facilities	Low	Construction: Additional vehicles.	Construction: Construction vehicles will use roads.	Construction: Negligible	Construction: Negligible
			Operation: Additional vehicles; Additional pedestrians.	Operation: Vehicle and pedestrian to gain access to HKSI during the events.	Operation: Small	Operation: Slight Adverse
			Reinstatement: Additional vehicles for short period.	Reinstatement: Construction vehicles will use road.	Reinstatement: Negligible	Reinstatement: Negligible
LCA 6	Natural Hills	Medium	Construction: Nil. No works will be carried out in this LCA.	Construction: Nil.	Construction: Nil	Construction: Nil
			Operation: Nil.	Operation: Nil.	Operation: Nil	Operation: Nil

LCA Ref.	LCA Notation	Sensitivity to Change	Impact Description	Source of Impact	Magnitude of Change	Significance Threshold
			Reinstatement: Nil.	Reinstatement: Nil.	Reinstatement: Nil	Reinstatement: Nil
LCA 7	River Channel	Medium	Construction: Closure of cycle path for construction works.	Construction: Fencing of peripheries.	Construction: Small	Construction: Slight / Moderate Adverse
			Operation: Closure of cycle path during operation phase for vehicle use.	Operation: Fencing of peripheries.	Operation: Small	Operation: Slight / Moderate Adverse
			Reinstatement: Reinstatement to a condition similar to the existing.	Reinstatement: Paving renovation works.	Reinstatement: Negligible	Reinstatement: Negligible

7.8 Visual Baseline Conditions

7.8.1 Introduction

This section describes the visual baseline conditions of all visually sensitive receiver (VSR) groups within the visual envelope of the works boundaries. Descriptions are on the visual properties enjoyed by these VSRs.

Drawing No. ST/L/S/HK/230 illustrates the works boundaries, the visual envelope and the location of VSRs.

7.8.2 Visual Baseline Conditions

7.8.2.1 VSR 1 – Ravana Garden, Garden Vista and Pictorial Garden

This VSR group represents viewers South of the Shing Mun River Channel. The area has a large number of residents with views to HKSI at varying distances. Viewers from Ravana Garden, Garden Vista and Pictorial Garden are the nearest to the site. Their sensitivity to change of their views are defined in Table 7-17 below.

Table 7-17: VSR 1: Sensitivity to potential change

Sensitivity of VSR at Baseline Conditions	
Sensitivity Parameter	*Rating*
Value of existing view to HKSI	Medium
Quality of existing view to HKSI	Medium
Availability of alternative views	High
Amenity of alternative views	Medium
Number of VSRs in group	High
Duration of views to Project	Medium
Frequency of views to Project	Medium
Degree of visibility	High
Sensitivity Rating	Medium

7.8.2.2 VSR 2 – HK Jockey Club Staff Quarters

This is the nearest VSR group outside the HKSI site. It is a residential building used by HKJC staff and their families. Their sensitivity to change of their views are defined in Table 7-18 below.

Table 7-18: VSR 2: Sensitivity to potential change

Sensitivity of VSR at Baseline Conditions	
Sensitivity Parameter	*Rating*
Value of existing views to HKSI	Medium
Quality of existing views to HKSI	Medium
Availability of alternative views	Low
Amenity of alternative views	Low
Number of VSRs in group	Medium
Duration of views to new Project	Medium to Long
Frequency of views to new Project	High
Degree of visibility	High
Sensitivity Rating	High

7.8.2.3 VSR 3 – KCR House and Jubilee Garden

This VSR Group represents viewers from the areas around Jubilee Garden including a pedestrian footbridge over Tai Po Road – Shatin Section. Their sensitivity to change of their views are defined in Table 7-19 below.

Table 7-19: VSR 3: Sensitivity to potential change

Sensitivity of VSR at Baseline Conditions	
Sensitivity Parameter	*Rating*
Value of existing views to HKSI	Medium
Quality of existing views to HKSI	Medium
Availability of alternative views	Medium
Amenity of alternative views	Medium to High
Number of VSRs in group	High
Duration of views to new Project	Long
Frequency of views to new Project	High
Degree of visibility	High
Sensitivity Rating	High

7.8.2.4 VSR 4 – Royal Ascot

This VSR group represents viewers North of the Tai Po Road – Shatin Section who are further away from the Project Site compared to viewers at Jubilee Garden. Their sensitivity to change of their views are defined in Table 7-20 below.

Table 7-20: VSR 4: Sensitivity to potential change

Sensitivity of VSR at Baseline Conditions	
Sensitivity Parameter	*Rating*
Value of existing views to HKSI	Low
Quality of existing views to HKSI	Medium
Availability of alternative views	Medium to High
Amenity of alternative views	Medium to High
Number of VSRs in group	High
Duration of views to new Project	Medium
Frequency of views to new Project	Medium
Degree of visibility	Medium to Low
Sensitivity Rating	Medium

7.8.2.5 VSR 5 – Grand Stand of Shatin Racecourse

This VSR group represents viewers at the grand stand. Visual impacts during the events are expected to be negligible since the racecourse will not be in operation during the event (except for management and maintenance purposes), however new floodlights at the Main Arena will be permanent and future sports events at the HKSI may coincide with racing events. Their sensitivity to change of their views are defined in Table 7-21 below.

Table 7-21: VSR 5: Sensitivity to potential change

Sensitivity of VSR at Baseline Conditions	
Sensitivity Parameter	*Rating*
Value of existing views to HKSI	Medium
Quality of existing views to HKSI	Medium
Availability of alternative views	High
Amenity of alternative views	High
Number of VSRs in group *in future*	Medium
Duration of views to new Project	Short
Frequency of views to new Project	Low
Degree of visibility	Low
Sensitivity Rating	Low

7.8.2.6 VSR 6 – Hong Kong Sports Institute

This VSR group represents visitors to HKSI during the construction phase, since sports training and events will continue during the early works phase of the Project. This VSR Group also represents viewers, including spectators, during the three events and viewers who visit the HKSI

after the Paralympic event. Their sensitivity to change of their views are defined in Table 7-22 below.

Table 7-22: VSR 6: Sensitivity to potential change

Sensitivity of VSR at Baseline Conditions	
Sensitivity Parameter	*Rating*
Value of existing views in HKSI	Medium
Quality of existing views in HKSI	Medium
Availability of alternative views	Medium
Amenity of alternative views	Medium to High
Number of VSRs in group	Low
Duration of views to new Project	Long
Frequency of views to new Project	High
Degree of visibility	High
Sensitivity Rating	Medium

7.8.2.7 VSR 7 – Dragon Bridge

This VSR group represents vehicle passengers using the Dragon Bridge while driving on the Sha Tin Road. Their sensitivity to change of their views are defined in Table 7-23 below.

Table 7-23: VSR 7: Sensitivity to potential change

Sensitivity of VSR at Baseline Conditions	
Sensitivity Parameter	*Rating*
Value of existing views to HKSI	Low
Quality of existing views to HKSI	Low
Availability of alternative views	Medium
Amenity of alternative views	Medium
Number of VSRs in group	Medium
Duration of views to new Project	Short
Frequency of views to new Project	Low
Degree of visibility	Low
Sensitivity Rating	Medium

7.8.2.8 VSR 8 – Floating Restaurant

This VSR group represents visitors to the restaurant. Their sensitivity to change of their views are defined in Table 7-24 below.

Table 7-24: VSR 8: Sensitivity to potential change

Sensitivity of VSR at Baseline Conditions	
Sensitivity Parameter	*Rating*
Value of existing views to HKSI	Medium
Quality of existing views to HKSI	Medium
Availability of alternative views	High
Amenity of alternative views	Medium to High
Number of VSRs in group	Low
Duration of views to new Project	Intermediate
Frequency of views to new Project	Medium
Degree of visibility	High
Sensitivity Rating	Medium

7.8.2.9 VSR 9 – Cycle Track Next to Ravana Garden

This VSR group represents cyclists and pedestrians using the track. Their sensitivity to change of their views are defined in Table 7-25 below.

Table 7-25: VSR 9: Sensitivity to potential change

Sensitivity of VSR at Baseline Conditions	
Sensitivity Parameter	*Rating*
Value of existing views to HKSI	Medium
Quality of existing views to HKSI	Medium to High

Availability of alternative views	Medium
Amenity of alternative views	Medium to High
Number of VSRs in group	Low
Duration of views to new Project	Long
Frequency of views to new Project	High
Degree of visibility	Medium
Sensitivity Rating	Medium

7.8.2.10 VSR 10 – Cycle Track Next to HKSI

This VSR group represents cyclists and pedestrians using the track. Their distance from the Main Arena will be less than 10m, however the track will be closed during the later construction stages and operation phase. It will be re-opened after the event. Their sensitivity to change of their views are defined in Table 7-26 below.

Table 7-26: VSR 10: Sensitivity to potential change

Sensitivity of VSR at Baseline Conditions	
Sensitivity Parameter	*Rating*
Value of existing views to HKSI	High
Quality of existing views to HKSI	Medium
Availability of alternative views	Medium
Amenity of alternative views	Medium to High
Number of VSRs in group	Low
Duration of views to new Project	Long
Frequency of views to new Project	High
Degree of visibility	High
Sensitivity Rating at present	High

7.8.2.11 Existing Light Glare Conditions

At present the VSRs experience light glare from a number of sources. Three notable sources are the floodlights at the HKSI, floodlights at the Shatin Racecourse and streetlights. The area is also surrounded by residential and commercial buildings that cause light glare. Floodlights at the HKSI are located at the Cycle Track, tennis courts, Athletics Field, Multi Purpose Hard Sports Court and soccer pitches. Amongst these, the largest lights are those at the tennis courts, which shines at a 400 lux illumination level. (A lux is the illumination equals to a luminous flux of 1 lumen per square metre. A lumen is the luminous flux emitted in a solid angle of 1 steradian by a point source having a uniform intensity of 1 candela. Comparative examples: An office normally requires an illumination level of 320 lux; 40 lux is sufficient for corridors, 240 lux is good for a kitchen.) The Main Arena will require a 2000 lux illumination level to ensure sufficient light for broadcasting purposes. To achieve this the Main Arena will be equipped with, 2000W metal halide lamps and the Warm-up Arena with 1000W / 1800W metal halide lamps. The floodlights at the Main Arena will be located on 40m high floodlight posts. The posts of the Warm-up arena will be 20m high. The light output of each of the 2000W metal halide lamps will be similar to the light output of the lamps of the floodlights of the Shatin Racecourse. The number of lamps will be approximately 70 at each of the floodlight posts compared to the 42 per floodlight post at the Shatin Racecourse.

Besides the 400 lux at the present tennis courts, the other main sources of illumination at the HKIS are the Athletics Field and soccer pitches. Their illumination levels varies between 200 and 400 lux. Floodlights at the Shatin Racecourse shines at a 600 to 800 lux illumination level on the track and 400 lux at the footpath directly adjacent to it. The various types of street lights have illumination levels of less than 100 lux.

7.9 Visual Impact Assessment

7.9.1 Impacts on VSRs

Table 7-27 below describes the impact of the Project on the visually sensitive receivers.

Table 7-27: Impacts on visually sensitive receivers before mitigation

VSR Ref.	VSR Notation	Sensitivity to Change	Impact Description	Source of Impact	Magnitude of Change	Significance Threshold
VSR 1	Ravana Garden, Garden Vista and Pictorial Garden	Medium	Construction: Construction vehicle movement will change the character of views when delivering building material and plant to site. The nearest viewing distance to the Main Arena will be approximately 250m; and Change in the quality of views.	Construction: Construction vehicle movement; Site formation works; and Clearance of vegetation.	Construction: Small	Construction: Slight / Moderate Adverse
			Operation: Daytime change of visual character due to loss of lawn at Stable Complex. Temporary seating of event will also change view character. Light glare. An increase of less than 30 lux is expected at the surfaces of these buildings that face the venue. The increased at-surface illumination will occur at most levels of the buildings, except for those lower one or two storeys that are screened by tree planting. Impacts will be the highest between levels 2 and 10.	Operation: New Project features; Floodlights of Main Arena and Warm-up Arena; and New lighting at Stable Complex.	Operation: Intermediate	Operation: Moderate Adverse

VSR Ref.	VSR Notation	Sensitivity to Change	Impact Description	Source of Impact	Magnitude of Change	Significance Threshold
			Reinstatement: During construction phase of reinstatement works impacts will be similar to construction phase of event. Future use of floodlights may influence viewers, however the number of lamps per floodlight post will be reduced to have an illumination level similar to the racetrack.	Reinstatement: Construction activities; and Use of new floodlights.	Reinstatement: Intermediate	Reinstatement: Moderate Adverse
VSR 2	HK Jockey Club Staff Quarters	High	Construction: Change of character of views. The nearest viewing distance to the Main Arena will be approximately 150m; and Change in the quality of views.	Construction: Construction vehicle movement; Site formation works; and Minor of vegetation.	Construction: Intermediate	Construction: Moderate / Significant Adverse
			Operation: Daytime change of visual character due to loss of lawn at Stable Complex. Temporary seating of event will also change view character. Light glare. An increase of less than 30 lux is expected at the surfaces of these buildings that face the venue. The increased at-surface illumination will occur at most levels of the buildings, except for those lower one or two storeys that are screened by tree planting. Illumination at the parking areas of the staff quarters will increase with less than 30 lux.	Operation: Visiting spectators during event; Project features; Floodlights of Main Arena and Warm-up Arena; and New lighting at Stable Complex.	Operation: Intermediate	Operation: Moderate / Significant Adverse

VSR Ref.	VSR Notation	Sensitivity to Change	Impact Description	Source of Impact	Magnitude of Change	Significance Threshold
			Reinstatement: During construction phase of reinstatement works impacts will be similar to construction phase of event. Future use of floodlights may influence viewers. The number of lamps per floodlight post will be reduced to have an illumination level similar to the racetrack.	Reinstatement: Construction activities; and Use of new floodlights.	Reinstatement: Intermediate	Reinstatement: Moderate / Significant Adverse
VSR 3	KCR House and Jubilee Garden	High	Construction: Construction vehicle movement will change the character of views when delivering building material and plant to site. The nearest viewing distance to the Main Arena will be approximately 300m; and Change in the quality of views.	Construction: Construction vehicle movement; Site formation works; and Clearance of vegetation.	Construction: Small	Construction: Moderate Adverse
			Operation: Daytime change of visual character due to loss of lawn at temporary seating, Stable Complex s. Light glare. An increase of less than 30 lux is expected at the surfaces of these buildings that face the venue. The increased at-surface illumination will occur at most levels of the buildings, except for those lower one or two storeys that are screened by tree planting. Impacts will be the highest on the podium levels up the 10^{th} level of building towers.	Operation: New Project features; Floodlights of Main Arena and Warm-up Arena; and New lighting at Stable Complex.	Operation: Small	Operation: Moderate Adverse

VSR Ref.	VSR Notation	Sensitivity to Change	Impact Description	Source of Impact	Magnitude of Change	Significance Threshold
			Reinstatement: During the construction phase of reinstatement works impacts will be similar to construction phase of event. Future use of floodlights may influence viewers, however the number of lamps per floodlight post will be reduced to have an illumination level similar to the racetrack.	Reinstatement: Construction activities; and Use of new floodlights.	Reinstatement: Small	Reinstatement: Moderate Adverse
VSR 4	Royal Ascot	Medium	Construction: Construction vehicle movement will change the character of views when delivering building material and plant to site. The nearest viewing distance to the Main Arena will be approximately 320m; and Change in the quality of views.	Construction: Construction vehicle movement; Site formation works; and Clearance of vegetation.	Construction: Small	Construction: Slight / Moderate Adverse
			Operation: Daytime change of visual character due to loss of lawn at Stable Complex. Temporary seating of event will also change view character. An increase of less than 30 lux is expected at the surfaces of these buildings that face the venue. Impacts will be the highest on the podium level and the 10th level of buildings.	Operation: New Project features; Floodlights of Main Arena and Warm-up Arena; and New lighting at Stable Complex.	Operation: Small	Operation: Slight / Moderate Adverse

VSR Ref.	VSR Notation	Sensitivity to Change	Impact Description	Source of Impact	Magnitude of Change	Significance Threshold
			Reinstatement: During construction phase of reinstatement works impacts will be similar to construction phase of event. Future use of floodlights may influence viewers. The number of lamps per floodlight post will be reduced to have an illumination level similar to the racetrack.	Reinstatement: Construction activities; and Use of new floodlights.	Reinstatement: Small	Reinstatement: Slight / Moderate Adverse
VSR 5	Grand Stand of Shatin Racecourse	Low	Construction: Minor change of the character of views. The nearest viewing distance to the Main Arena will be approximately 600m; and Change in the quality of views.	Construction: Construction vehicle movement; and Clearance of vegetation.	Construction: Small	Construction: Slight Adverse
			Operation: Minor daytime change of visual character due to loss of lawn at Stable Complex. Temporary seating of event will also change view character. Light glare at less than 30 lux at the seating areas of the Grand Stand, which will not be used during the Olympic Equestrain Events.	Operation: New Project features; Floodlights of Main Arena and Warm-up Arena; and New lighting at Stable Complex.	Operation: Small	Operation: Slight Adverse
			Reinstatement: During construction phase of reinstatement works impacts will be similar to construction phase of event. Future use of floodlights may influence viewers. The number of lamps per floodlight post will be reduced to have an illumination level similar to the racetrack.	Reinstatement: Construction activities; and Use of new floodlights.	Reinstatement: Small	Reinstatement: Slight Adverse

VSR Ref.	VSR Notation	Sensitivity to Change	Impact Description	Source of Impact	Magnitude of Change	Significance Threshold
VSR 6	Hong Kong Sports Institute	Medium	Construction: Early works construction activities will change the character of views when delivering building material and plant to site. The nearest viewing distance to the Main Arena will be approximately less than 10m; and Change in the quality of views.	Construction: Construction vehicle movement; Site formation works; and Clearance of vegetation.	Construction: Large	Construction: Moderate / Significant Adverse
			Operation: Visitors to the Project will experience the venue as constructed. Impacts from floodlights will occur. This is however expected. The lux levels at the HKSI will vary from 2000 lux inside the sand footing of the Main Arena to 400 lux at the Spectator Forecourt and very little in areas with no lighting. The illumination levels will be beneficial for broadcasting purposes. Sand for the competition footing in the Main Arena will be chosen to firstly have a texture that is suitable for the competition, secondly to be a suitable background for camera recordings, thirdly to drain properly and fourthly to be as dark as possible in order to reduce light reflection.	Operation: New Project features; Floodlights of Main Arena and Warm-up Arena; and New lighting at Stable Complex.	Operation: Small	Operation: Slight / Moderate Adverse

VSR Ref.	VSR Notation	Sensitivity to Change	Impact Description	Source of Impact	Magnitude of Change	Significance Threshold
			Reinstatement: Future use of floodlights may influence viewers. The number of lamps per floodlight post will be reduced to have an illumination level similar to the racetrack.	Reinstatement: Use of new floodlights.	Reinstatement: Small	Reinstatement: Slight / Moderate Adverse
VSR 7	Dragon Bridge	Medium	Construction: Minor change of character of views to HKSI site. Passengers travel in opposite direction with respect to the Site, therefore the views to the site are minimal. The nearest viewing distance to the Main Arena will be approximately 300m; and Change in the quality of views.	Construction: Construction vehicle movement; Site formation works; and Minor removal of vegetation.	Construction: Negligible	Construction: Negligible
			Operation: Daytime change of visual character due temporary seating of event and stable complex. Light glare. An increase of less than 30 lux is expected at the surfaces of the road. Lights will be aimed to ensure no temporary blinding effect to drivers.	Operation: Floodlights of Main Arena and Warm-up Arena; and New lighting at Stable Complex.	Operation: Small	Operation: Slight / Moderate Adverse
			Reinstatement: During construction phase of reinstatement works impacts will be similar to construction phase of event. Future use of floodlights may influence viewers. The number of lamps per floodlight post will be reduced to have an illumination level similar to the racetrack.	Reinstatement: Construction activities; Use of new floodlights; and Views to Stable Complex	Reinstatement: Small	Reinstatement: Slight / Moderate Adverse

VSR Ref.	VSR Notation	Sensitivity to Change	Impact Description	Source of Impact	Magnitude of Change	Significance Threshold
VSR 8	Floating Restaurant	Medium	Construction: Change of character of views. The nearest viewing distance to the Main Arena will be approximately 250m; and Change in the quality of views.	Construction: Construction vehicle movement; Site formation works.	Construction: Negligible	Construction: Negligible
			Operation: Daytime change of visual character due to Stable Complex and Main Arena. Temporary seating of event will also change view character. Light glare. An increase of less than 30 lux is expected at the top deck of the restaurant.	Operation: Visiting spectators during event; Project features; Floodlights of Main Arena and Warm-up Arena; and New lighting at Stable Complex.	Operation: Intermediate	Operation: Moderate Adverse
			Reinstatement: During construction phase of reinstatement works impacts will be similar to construction phase of event. Future use of floodlights may influence viewers. The number of lamps per floodlight post will be reduced to have an illumination level similar to the racetrack.	Reinstatement: Construction activities; and Use of new floodlights.	Reinstatement: Small	Reinstatement: Slight / Moderate Adverse
VSR 9	Cycle Track Next to Ravana Garden	Medium	Construction: Change of character of views. The nearest viewing distance to the Main Arena will be approximately 200m; and Change in the quality of views.	Construction: Construction vehicle movement; Site formation works; and Minor clearance of vegetation.	Construction: Small	Construction: Slight / Moderate Adverse

VSR Ref.	VSR Notation	Sensitivity to Change	Impact Description	Source of Impact	Magnitude of Change	Significance Threshold
			Operation: Daytime change of visual character due to views of new seating at Main Arena and new Stable Complex. Light glare. An increase of less than 30 lux is expected at the surfaces of the track.	Operation: Visiting spectators during event; Project features; Floodlights of Main Arena and Warm-up Arena; and New lighting at Stable Complex.	Operation: Intermediate	Operation: Moderate Adverse
			Reinstatement: During construction phase of reinstatement works impacts will be similar to construction phase of event. Future use of floodlights may influence cyclists and pedestrians. The number of lamps per floodlight post will be reduced to have an illumination level similar to the racetrack.	Reinstatement: Construction activities; and Use of new floodlights.	Reinstatement: Intermediate	Reinstatement: Moderate Adverse
VSR 10	Cycle Track Next to HKSI	High	Construction: Change of character of views. The nearest viewing distance to the Main Arena will be less than 10m; and Change in the quality of views. Note the track will only be available to users at the early stages of the construction phase and will be used for construction at later stages	Construction: Construction hoarding and fencing; Construction vehicle movement; Site formation works; and Minor of vegetation.	Construction: Intermediate	Construction: Moderate / Significant Adverse
			Operation: No operation impact will occur as the track will be closed during the event.	Operation: Nil	Operation: Nil	Operation: Nil

VSR Ref.	VSR Notation	Sensitivity to Change	Impact Description	Source of Impact	Magnitude of Change	Significance Threshold
			Reinstatement: Very early reinstatement construction activities will require using the track, hence the track will not be available for use by cyclists and pedestrians. It will however be available be available as soos as practical prior to completion of reinstatement construction works. Compared to the existing conditions there will be a slight change in character of views to HKSI. Future use of floodlights may influence viewers. The number of lamps per floodlight post will be reduced to have an illumination level similar to the racetrack.	Reinstatement: Construction activities; Views to Stable Complexand Use of new floodlights.	Reinstatement: Small	Reinstatement: Moderate Adverse

7.10 Recommended Landscape and Visual Impact Mitigation Measures

7.10.1 Introduction

In order to mitigate landscape and visual impacts, mitigation measures will be implemented. These can be categorised in the following groups:

- Construction areas;
- Tree planting;
- Shrub and groundcover planting;
- Engineering infrastructure: floodlights, underpass, roads, etc; and
- Buildings: Stable Complex.

7.10.2 Standards, Legislation and Guidelines

The landscape and visual mitigation design has been carried out with respect to the following requirements:

- Hong Kong Planning Standards and Guidelines;
- Application for Tree Felling or Transplanting for private projects - LAO Practice Note No. 8/2002;
- Management and Maintenance of Natural Vegetation and Landscape Works, and Tree Preservation – WBTC No. 14/2002;
- Maintenance of Vegetation and Hard Landscape Features – ETWB TCW No. 2/2004;
- Management of Man-made Slopes and Emergency Repair on Stability of Land – WBTC No. 26/99;
- Control of Visual Impact on Slopes – WBTC 17/2000;
- Technical Guidelines on Landscape Treatment and Bio-engineering form Man-made Slopes and Retaining Walls – GEO Publication No. 1/2000; and
- EIAO Guidance Note No. 8/2002.

7.10.3 Mitigation Measures

Construction Areas

- MC 1: Site offices, construction yard and holding nursery:
  - Site offices and the construction yard will be decommissioned after construction.
  - Construction roads will be decommissioned and landscape areas be restored to its original or newly proposed state.
  - The holding nursery for decorative plants at show jumps will be decommissioned after the Olympic events.
- MC 2: Height of site offices:
  - The height of site offices will be controlled in order to avoid visual impacts.

- MC 3: Hoarding and screening:
  - Where practical the site offices areas, construction yards and storage areas will be screened with decorative hoarding or vegetation around the peripheries until the completion of relevant construction phases.
- MC 4: Construction plant and building material:
  - Will be orderly and carefully stored in order to appear neat and avoid visibility from outside where practical;
  - Excess materials will be removed from site as soon as practical;
  - All construction plant will be removed from site upon completion of construction works.
- MC 5: Construction light:
  - To be oriented away from the viewing location of VSRs; and
  - All construction lights will have frosted diffusers and reflective covers.
- MC 6: Vegetation:
  - Temporary construction sites will be restored to standards as good as, or better than, the original condition;
  - The potential for soil erosion shall be reduced at the construction stage by minimizing the extent of vegetation disturbance on site and by providing a protective cover over exposed ground; and
  - No construction equipment or building materials will be stored under the dripline of retained trees and no vehicle movement or other construction activities like washing, concrete mixing etc will be carried out under the dripline of trees.

Tree Preservation and Planting Works

- MT 1: Compensation for losses:
  - The tree compensation to tree loss ratio will be 1:2;
  - At least 82 new trees of light standard or larger size will be planted.
- MT 2: The majority of compensation species will comprise species that already occurs within the LIA boundaries;
- MT 3: Where practical, trees that require removal will be transplanted on Site;
- MT 4: Planting Works:
  - New trees, bamboos and shrubs will be planted in groups in order to screen visual impacts and to provide additional shade.
- MT 5: Tree Planting on Slopes:
  - New slopes with a gradient larger than 30^{o} will have shrub, groundcover or grass planting.
- MT 6: Tree Preservation:
  - No tree will be transplanted or felled without prior approval by relevant Government departments in accordance with WBTC 14/2002 and ETWB 2/2004;

- All trees that are marked for retention will be fenced off with a 1.2m high fence;
- Transplant preparation works will be carried as soon as possible after commencement of construction. Rootball and crown pruning will be carried out over a period of at least 1 month.

- MT 7: Existing shrub and ground cover planting areas that will not be removed will be maintained in good condition and enhanced where practical.
- MT 8: Site formation works at slopes will be followed with hydroseeding as soon as practical or be covered with shrubs and groundcovers.
- MT 9: Grassing will be carried out as soon as practical after construction of footing stratum at one of the General Training Arenas.

Floodlights

- MF1: All floodlight units on the floodlight poles will be properly aimed at the competition and practice areas of the Main and Warm-up arenas. In this regards, the central light focus of each floodlight unit will always be aimed on the arena areas and not on any other adjacent area.
- MF2: Each floodlight unit will have a built-in anti-glare baffle and visor shield to limit the glare.
- MF3: Operational hours of the floodlights will be restricted to competition hours only. Floodlights will be turned off when spectators have left the seating area.

7.11 Residual Landscape Impacts

7.11.1 Introduction

This section describes the landscape impacts that will remain after the implementation of mitigation measures. Summary of unmitigated impacts on landscape resources, landscape characters and VSRs are illustrated in Drawings No.: ST/L/S/HK/310, ST/L/S/HK/320 and ST/L/S/HK/330, respectively. Summary of residual impacts on landscape resources, landscape character areas and VSRs are illustrated in Drawings No.: ST/L/S/HK/510, ST/L/S/HK/520 and ST/L/S/HK/530, respectively.

Photomontage views from HKJC Staff Quarters and the existing football fields are shown in Drawings No.: ST/L/S/HK/541 and ST/L/S/HK/543, respectively.

7.11.2 Residual Landscape Resource Impacts

Table 7-28 below describes the residual impacts on landscape resources.

Table 7-28: Impacts on landscape resources before and after mitigation

LR Ref.	LR Notation	Impact Before Mitigation	Proposed Mitigation Measures (see Section 7.10.3 for code references)	Impact After Mitigation
LR 1	Turf Lawns	Construction: Moderate / Significant Adverse	Construction: Nil as Space for additional turf planting is not available.	Construction: Moderate / Significant Adverse
		Operation: Moderate / Significant Adverse	Operation: Nil as space for additional turf planting is not available.	Operation: Moderate / Significant Adverse

LR Ref.	LR Notation	Impact Before Mitigation	Proposed Mitigation Measures (see Section 7.10.3 for code references)	Impact After Mitigation
		Reinstatement: Moderate Adverse	Reinstatement: Nil as further space turf planting in addition to what will be reinstated is not available. Note the reinstatement works will already include the planting of turf on the infield part of the Athletics Field.	Reinstatement: Moderate Adverse
LR 2	Trees	Construction: Moderate Adverse	Construction: MC6 MT1 to MT6 Note that the felling of trees like *Psidium guajava*, which is a species with a relatively low landscape value on this site will take place when in conflict with the proposed works. In general compensation planting for such species will be with trees of high horticultural value.	Construction: Slight / Moderate Adverse
		Operation: Moderate Adverse	Operation: No additional mitigation to compensate for the loss of trees will be carried out at this stage. Note that approximately 40 new trees will be planted during the construction phase. The impact will therefore be comparable with the construction stage, though slightly less because of minor tree growth over two growing seasons.	Operation: Slight / Moderate Adverse
		Reinstatement: Slight / Moderate Adverse	Reinstatement: MC6 MT1 to MT6 Note that more than 40 compensatory trees will be planted during this stage. Compared to the approximately 40 trees that will be felled during the construction stage the joint increase of new trees that will be planted during the construction and reinstatement phases will be more than 80.	Reinstatement: Slight Beneficial This slight beneficial impact will improve over time, as the trees grow larger.
LR 3	Synthetic Sports Fields	Construction: Moderate / Significant Adverse	Construction: Nil as space for temporary synthetic sports fields and courts are not available at the HKSI site.	Construction: Moderate / Significant Adverse
		Operation: Moderate / Significant Adverse	Operation: Nil as space for temporary synthetic sports fields and courts are not available at the HKSI.	Operation: Moderate / Significant Adverse
		Reinstatement: Moderate / Significant Beneficial	Reinstatement: Nil required as existing synthetic sports fields will be reinstated. Present defects will be made good. The reinstatement outcome will therefore have a beneficial effect.	Reinstatement: Moderate / Significant Beneficial
LR 4	Garden Areas	Construction: Negligible	Construction: MT5 and MT7	Construction: Negligible
		Operation: Negligible	Operation: Nil as decorative planting will already improve the aesthetic appearance of the site.	Operation: Negligible
		Reinstatement: Nil	Reinstatement: Nil required as reinstatement works will include the reinstatement garden areas of similar size to what will be lost in the construction phase.	Reinstatement: Nil
LR5	River Channel and Pond	Construction: Nil	Construction: Nil as the water resources will not be altered during the construction phase.	Construction: Nil

LR Ref.	LR Notation	Impact Before Mitigation	Proposed Mitigation Measures (see Section 7.10.3 for code references)	Impact After Mitigation
		Operation: Nil	Operation: Nil as character of water resources will not be altered during the operation phase.	Operation: Nil
		Reinstatement: Nil	Reinstatement: Nil as character of water resources will not be altered during the reinstatement phase and no reinstatement works will be carried out.	Reinstatement: Nil

7.11.3 Residual Landscape Character Area Impacts

Table 7-29 below describes the residual impacts on landscape character areas.

Table7-29: Impacts on landscape character areas before and after mitigation

LCA Ref.	LCA Notation	Impact Before Mitigation	Proposed Mitigation Measures (Refer to Section 7.10.3 for mitigation codes)	Impact After Mitigation
LCA 1	Sports Complex	Construction: Moderate / Significant Adverse	Construction: MC 1 to MC 6 MT1 to MT9	Construction: Moderate Adverse
		Operation: Moderate / Significant Adverse	Operation: Nil. Note the affects MT1 to MT7 and MT9 and MT10 will decrease the unmitigated impact during the operation phase	Operation: Moderate Adverse
		Reinstatement: Moderate Adverse	Reinstatement: MC 1 to MC 6 MT1 to MT9	Reinstatement: Slight / Moderate Adverse Though hard sports courts will be reinstated, the character of the site will be changed by the presence of the new Stable Complex.
LCA 2	Racecourse	Construction: Negligible	Construction: Nil as the impact is negligible.	Construction: Negligible
		Operation: Negligible	Operation: Nil required as the impact is negligible.	Operation: Negligible
		Reinstatement: Negligible	Reinstatement: Nil as the impact is negligible.	Reinstatement: Negligible
LCA 3	Penfold Park	Construction: Nil	Construction: MC3 to MC6 MT1 to MT7 The above mitigation measures apply to areas that will be affected by the construction of the underpass.	Construction: Moderate Adverse
		Operation: Nil	Operation:	Operation: Slight Adverse
		Reinstatement: Nil.	Reinstatement: Nil as no reinstatement works will be carried out due the Project hence no mitigation is required.	Reinstatement: Nil
LCA 4	Built-up Area	Construction: Nil	Construction: Nil as character of built-up areas will not be altered during the construction phase.	Construction: Nil

LCA Ref.	LCA Notation	Impact Before Mitigation	Proposed Mitigation Measures (Refer to Section 7.10.3 for mitigation codes)	Impact After Mitigation
		Operation: Nil	Operation: Nil as character of built-up areas will not be altered during the operation phase.	Operation: Nil
		Reinstatement: Nil	Reinstatement: Nil as character of built-up areas will not be altered during the reinstatement phase and no reinstatement works will be carried out in the built-up areas.	Reinstatement: Nil
LCA 5	Transportation Facilities	Construction: Negligible	Construction: Nil as impact due to additional vehicles on roads will cause a negligible impact on the character.	Construction: Negligible
		Operation: Slight Adverse	Operation: MT4 Applies to pedestrian approach paths with sufficient space for planting works.	Operation: Negligible
		Reinstatement: Negligible	Reinstatement: Nil as impact due to additional vehicles on road will cause a negligible impact on the character.	Reinstatement: Negligible
LCA 6	Natural Hills	Construction: Nil	Construction: Nil as there will be no impacts.	Construction: Nil
		Operation: Nil	Operation: Nil as there will be no impacts.	Operation: Nil
		Reinstatement: Nil	Reinstatement: Nil as there will be no impacts.	Reinstatement: Nil
LCA 7	River Channel	Construction: Slight / Moderate Adverse	Construction: MC3 MT4, MT5 and MT6	Construction: Slight Adverse
		Operation: Slight / Moderate Adverse	Operation: The effects of implementing MT4, MT5 and MT6 will continue during the operation phase	Operation: Slight Adverse
		Reinstatement: Negligible	Reinstatement: MC3 MT4, MT5 and MT6	Reinstatement: Negligible

7.12 Residual Visual Impacts

7.12.1 Introduction

This section describes the visual impacts that will remain after the implementation of mitigation measures.

7.12.2 Residual Impacts on Visually Sensitive Receivers

Table 7-30 below describes the impacts on VRS after the implementation of mitigation measures.

Table 7-30: Impacts on visually sensitive receivers before and after mitigation

VSR Ref.	VSR Notation	Impact Before Mitigation	Proposed Mitigation Measures	Impact After Mitigation
VSR 1	Ravana Garden, Garden Vista and Pictorial Garden	Construction: Slight / Moderate Adverse	Construction: MC1 to MC6 MT1 to MT9	Construction: Slight Adverse

VSR Ref.	VSR Notation	Impact Before Mitigation	Proposed Mitigation Measures	Impact After Mitigation
		Operation: Moderate Adverse	Operation: MF1 to MF3	Operation: Slight Adverse
		Reinstatement: Moderate Adverse	Reinstatement: MC1 to MC6 MT1 to MT9	Reinstatement: Slight Adverse
VSR 2	HK Jockey Club Staff Quarters	Construction: Moderate / Significant Adverse	Construction: MC1 to MC6 MT1 to MT9	Construction: Moderate Adverse
		Operation: Moderate / Significant Adverse	Operation: MF1 to MF3	Operation: Moderate Adverse
		Reinstatement: Moderate / Significant Adverse	Reinstatement: MC1 to MC6 MT1 to MT9	Reinstatement: Moderate Adverse
VSR 3	KCR House and Jubilee Garden	Construction: Moderate Adverse	Construction: MC1 to MC6 MT1 to MT9	Construction: Slight Adverse
		Operation: Moderate Adverse	Operation: MT8 MF1 to MF3	Operation: Slight / Moderate Adverse
		Reinstatement: Moderate Adverse	Reinstatement: MC1 to MC6 MT1 to MT9	Reinstatement: Slight / Moderate Adverse
VSR 4	Royal Ascot	Construction: Slight / Moderate Adverse	Construction: MC1 to MC6 MT1 to MT9	Construction: Slight Adverse
		Operation: Slight / Moderate Adverse	Operation: MF1 to MF3	Operation: Slight Adverse
		Reinstatement: Slight / Moderate Adverse	Reinstatement: MC1 to MC6 MT1 to MT9	Reinstatement: Slight Adverse
VSR 5	Grand Stand of Shatin Racecourse	Construction: Slight Adverse	Construction: MC1 to MC6 MT1 to MT9	Construction: Negligible
		Operation: Slight Adverse	Operation: MF1 to MF3	Operation: Negligible
		Reinstatement: Slight Adverse	Reinstatement: MC1 to MC6 MT1 to MT9	Reinstatement: Negligible
VSR 6	Hong Kong sports Institute	Construction: Moderate / Significant Adverse	Construction: MC1 to MC6 MT1 to MT9	Construction: Moderate Adverse

VSR Ref.	VSR Notation	Impact Before Mitigation	Proposed Mitigation Measures	Impact After Mitigation
		Operation: Slight / Moderate Adverse	Operation: MF1 to MF3	Operation: Slight Adverse
		Reinstatement: Slight / Moderate Adverse	Reinstatement: MC1 to MC6 MT1 to MT9	Reinstatement: Slight Adverse
VSR 7	Dragon Bridge	Construction: Negligible	Construction: Nil as impact is negligible	Construction: Negligible
		Operation: Slight / Moderate Adverse	Operation: MF1 to MF3	Operation: Slight Adverse
		Reinstatement: Slight / Moderate Adverse	Reinstatement: MF1 to MF3	Reinstatement: Slight Adverse
VSR 8	Floating Restaurant	Construction: Negligible	Construction: MC1 to MC6	Construction: Negligible
		Operation: Moderate Adverse	Operation: MF1 to MF3	Operation: Slight Adverse
		Reinstatement: Slight / Moderate Adverse	Reinstatement: MC1 to MC6 MF1 to MF3	Reinstatement: Slight Adverse
VSR 9	Cycle Track Next to Ravana Garden	Construction: Slight / Moderate Adverse	Construction: MC1 to MC6	Construction: Slight Adverse
		Operation: Moderate Adverse	Operation: MF1 to MF3	Operation: Slight Adverse
		Reinstatement: Moderate Adverse	Reinstatement: MC1 to MC6 MF1 to MF3	Reinstatement: Slight Adverse
VSR 10	Cycle Track Next to HKSI	Construction: Moderate / Significant Adverse	Construction: MC1 to MC6 MT1 to MT9	Construction: Moderate Adverse
		Operation: Nil as the track will not be used by cyclists and pedestrians during the games	Operation: Nil required	Operation: Nil
		Reinstatement: Moderate Adverse	Reinstatement: MC1 to MC6 MT1 to MT9 MF1 to MF3	Reinstatement: Slight Adverse

7.13 Provisional Programme of Landscape Works

Tree felling and transplantation works will be carried out in the last semester of 2006.

Permanent landscape works for the Olympic and Paralympic modes will be carried between July 2006 and August 2007.

Temporary decorative flowering plants will be implemented around the Main Arena and approach footpaths in July 2008 and will be maintained and replaced as required throughout the Olympic competitions.

Permanent reinstatement planting works will be carried out between October 2008 and June 2009.

7.14 Funding, Implementation, Management and Maintenance of Landscape Works

Subject to agreement between HKJC and Government it is likely that HKJC shall take up maintenance of the Olympic Venue until the end of the games once these areas have been handed over by HKSI and LCSD for construction. Overlay areas that have been reinstated shall be returned to LCSD for maintenance similar to the current arrangement for HKSI.

7.15 Summary and Conclusions

The overall impact of the DP on the landscape and visual environments is acceptable with mitigation measures.

Impacts on landscape resources will be acceptable. The only notable impacts will be the loss of turf lawns during the construction and operational phases. This will be partially mitigated in future when the turf of the Athletics Arena is reinstated. Impacts on existing trees will be acceptable. An approximate number of 33 trees will require felling, while 53 will be transplanted. In total 628 trees will be retained, including the three trees with diameters at breast height of over 1m. To compensate for the loss of trees due to felling, more than 80 new trees will be planted. Beneficial impacts are expected by enhancing landscape areas and the renovating synthetic sports fields after the Paralympic Event.

Impacts on character of landscapes will be acceptable. The HKSI site that is currently characterised by its sports facilities and landscape resources. Trees in particular will undergo a character change during the construction phase. This change will be mitigated to ensure landscape resources are preserved as far as possible. Particular attention will be given to protect trees during the construction phase. The operational phase will return the character of the site to a sports venue, though the nature of sports will change to equestrian. The site's character will after reinstatement largely be comparable to the present.

Visual impacts will be acceptable after mitigation. Glare impacts from the floodlights at the Main and Warm-up arenas are expected. This is due to required upgrading of existing floodlights to enable camera recordings of the Olympic Equestrian events for broadcasting purposes. The upgrading will be to an illumainance level 2000 lux, which is inline with Olympic requirements. The impact at the HK Jockey Club Staff Quarters, which is the nearest residential VSR group to the Main Arena will be moderate with the use of anti-glare baffles and visor shields. This is considered acceptable, since light intrusion to the windows of the residential units will be less than 30 lux and alternative views are available to the VSRs when looking outside at night. These impacts will occur when lights are set up and also during the Olympic and Paralympic competitions. The floodlights will also be used in future for athletics events that will be broadcasted, however the number of lamps will be reduced to achieve an illuminance level comparible with that of the racecourse. The duration of the impacts is therefore temporary. Existing floodlights at the soccer pitches and the Cycle Track will not be used during the later construction and operational phases of the venue.

8. SUMMARY OF ENVIRONMENTAL OUTCOME

8.1 Population and Environmental Sensitive Areas Protected

8.1.1 Noise Impact

Sensitive receivers have been identified as residential buildings and education institutions. A package of noise mitigation measures has been recommended to protect these sensitive receivers to the maximum practicable extent.

Assessment results indicate that the noise levels at all the sensitive receivers would meet the relevant standards for construction/reinstatement and operational phase, respectively, with the implementation of proper noise control measures. Residual environmental impact is not anticipated.

NSRs likely protected by the noise control measures recommended are presented in Table 8.1.

Table 8.1: Population of Protected Environmental Sensitive Receivers

Protected Environmental Sensitive Receivers	No. of Dwelling Protected
HKJC Staff Quarters	76
Racecourse Villa	20
International Christian School – Elementary	N/A
Leung Kui Kau Primary School	N/A
Garden Vista	88
Pictorial Garden Phase I	348
Total:	532

8.2 Environmental Friendly Design and Benefit

8.2.1 Environmental Friendly Construction Method

Mitigation measures such as adoption of quieter plant, mobile noise barriers and enclosures would be implemented throughout the construction and reinstatement period. Phased construction programme would be adopted so as to minimize the potential noise impact during construction/reinstatement period.

8.2.2 Orientation of E&M Plant

E&M plant is the essential element for the operation of sporting facilities. In order to minimise the noise impacts associated with E&M plant, the orientation of louvers would be designed to face away from the neighbouring sensitive receivers, as far as practicable. This will ensure the noise emanating is self-screened as much as possible. Noise control measures with adequate attenuation will also be incorporated into the detailed design to ensure compliance with the relevant noise limits.

8.2.3 PA system design

The following measures would be incorporated to the detailed design of the PA system for the Main Arena so as to minimize the possible noise impact to the neighbouring NSRs during operation:

- To use a cluster of small power rated loudspeakers instead of a few large power rated loudspeakers; and
- To use directional loudspeakers and orientate them to point towards the audience and away from the nearby noise sensitive receivers.
- To include a limiter device on the system to ensure full control setting of the maximum output sound level.

8.2.4 Odour Minimization

The new Stable Complex will be designed to an improved standard. The full-enclosure design of the stables and the adoption of activated carbon filter with a minimum odour removal efficiency of 90% at exhaust would further eliminate any odour potential from stables during operation. With the implementation of the above designs, the odour emission criterion specified in the TM-EIAO will be met.

8.3 Key Environmental Problems Avoided

The potential of noise impact during construction/reinstatement phase would be avoided by the adoption of quieter construction plant and the erection of noise barriers/enclosures where necessary.

The potential of noise impact during the operation of the Event would be minimized by adopting proper design to the PA System for the Main Arena.

The potential of pollution of stormwater drainage system during operational phase due to stable runoff has been avoided by the implementation of a low-flow interception system

The possible glare impact of Main Arena floodlight on the surrounding sensitive receivers would be minimised by proper design of spill control to contain the floodlight within the field; by incorporating built in anti-glare baffle and visor shield on the units; and by applying strict control of the operation hours of the lighting system.

The potential of odour impact from horse manure would be further eliminated by the adoption of full-enclosure design of stables and the installation of carbon filter at exhaust.

8.4 Environmental Protection Measures

With the benefits of the recommended mitigation measures, no unacceptable residual environmental impacts are expected. The details of the implementation schedule of the recommended mitigation measures are summarized in the EMIS. Table 8.2 summaries the key environmental outcome of the Project.

Table 8.2: Summary of Environmental Outcome

Key environmental problems avoided	Environmentally friendly designs / mitigation measures recommended	Population and environmentally sensitive areas protected	Environmental benefits of the environmental protection measures recommended	Residual Impact
Construction dust	• Dust suppression measures in accordance with the Air Pollution Control (Construction Dust) Regulation.	All ASRs	Reduction of the potential dust impact during construction of the Project	Unlikely
Odour from Stable Complex	• Fully enclosed stable design • Suitable MVAC system design • Installation of activated carbon filter • Regular cleansing of stables • Confinement of stockpiled stable waste	All ASRs	Minimization of potential odour emission from new stables	Unlikely
Construction noise	• Adoption of quieter construction plant • Adoption of noise barriers when necessary	All NSRs	Reduction in noise level during construction phase	Unlikely
PA system broadcast	• To use a cluster of small power rated loudspeakers instead of a few large power rated loudspeakers • To use directional loudspeakers and orientate them to point towards the audience and away from the nearby noise sensitive receivers. • To apply strict control over the broadcasting sound level by including a limiter device on the system	All NSRs	Reduction in noise level due to the events.	Unlikely
Water quality pollution due to contaminated runoff	• low-flow intercepting system	Shing Mun River Channel	Improvement to the quality of stormwater runoff from the Project site.	Unlikely
Glare Impact from the Floodlight	• Proper control of floodlight spill • Built-in anti-glare baffle and visor shield on the unit • Control on operational hours of floodlights	All VSRs	Reduction of the potential glare impact	Acceptable

9. ENVIRONMENTAL MONITORING AND AUDITING REQUIREMENTS

9.1 Introduction

The findings and recommendations of the EIA report will constitute a formal commitment by the Project Proponent to minimise environmental nuisances arising from the Project. It also states the Project Proponent's environmental performance criteria for the Project. In order to ensure the performance commitments are incorporated throughout various implementation phases (e.g. detailed design, tendering, construction, operation and reinstatement of the project), a number of contractual, managerial and administrative mechanisms will be implemented, including:

- Setting up of a project organization and hierarchy;
- Development of Environmental Monitoring and Auditing (EM&A) programme;
- Monitoring of Environmental Mitigation Implementation Schedule;
- Formulation of Environmental Management Plan;
- Approval of Contractor's Work Method Statement; and
- Provision of complaint hotline.

9.2 Project Organisation

A project organisation consisting of the Independent Environmental Checker (IEC), Contractor's Environmental Team (ET), Engineer's Representative (ER), and Contractor shall be formed to take the responsibilities of the environmental protection for this project. An IEC will be appointed by the Project Proponent to conduct independent auditing on the overall EM&A programme including the implementation of all environmental mitigation, submissions relating to EM&A, and any other submission required under the Environmental Permit (EP). The organisation, responsibilities of respective parties and lines of communication with respect to environmental protection works will be given in the EM&A Manual.

9.3 EM&A Manual & Implementation Schedule

EM&A is an important aspect in the EIA process that specifies the time frame and responsibilities for the implementation of the environmental mitigation measures identified. Requirements on environmental monitoring (including baseline and impact monitoring) will be given.

A project specific EM&A Manual will be prepared based on the latest design information available and EPD's generic EM&A Manual. The project specific EM&A Manual specifies the following:

- Organisation, hierarchy and responsibilities of the Contractor, the Engineer or ER, ET, and IEC with respect to the EM&A requirements during construction;
- Information on project organisation and programming of construction activities for the project;
- Requirements with respect to the construction schedule and the necessary EM&A programme to track the varying environmental impact;

- Full details of the methodologies to be adopted, including all field, laboratory and analytical procedures, and details on quality assurance;
- Procedure for undertaking on-site environmental audits;
- Definition of Action and Limit levels;
- Establishment of event and action plans;
- Requirements of reviewing pollution sources and working procedures required in the event of non-compliance of the environmental criteria and complaints;
- Requirements for review of EIA predictions, implementation of mitigation measures, and the effectiveness of the environmental protect and pollution control measures adopted; and
- Presentation requirements for EM&A data and appropriate reporting procedures including real-time reporting of monitoring data for the Project through a dedicated internet website.

An Environmental Mitigation Implementation Schedule (EMIS) has been prepared to summarise all the required mitigation measures that need to be implemented during the design, construction and operation of the Project (Appendix 9-1). The implementation responsibilities are also identified. This EMIS will also be included in the EM&A manual for submission to EPD.

9.4 EM&A programme

Detailed requirements of the EM&A programme will be described in the EM&A Manual. Measurements and activities that shall be conducted in accordance with the requirements in the EM&A Manual are summarised in the following:

- baseline monitoring on noise, air quality and water (to be agreed with EPD);
- impact monitoring on noise, air quality and water (to be agreed with EPD);
- remedial actions in accordance with the Event and Action Plan within the time frame in cases where specified criteria in the EM&A Manual are exceeded;
- logging and keeping records of the details of monitoring results;
- preparing and submitting monthly EM&A Reports.

9.5 Environmental Management Plan

A systematic Environmental Management Plan (EMP) shall be set up by the Contractor to ensure effective implementation of the mitigation measures, monitoring and remedial requirements presented in the EIA, EM&A and EMIS. The Project Proponent and IEC will audit the implementation status against the EMP and advise the necessary remedial actions required. These remedial actions shall be enforced by the ER through contractual means.

The EMP will require the Contractor (together with it's sub-contractors) to define in details how to implement the recommended mitigation measures in order to achieve the environmental performance defined in the Hong Kong environmental legislation and the EIA documentation.

The review of on-site environmental performance shall be undertaken by ET and IEC through a systematic checklist and audit once the project commences. The environmental performance review programme comprises a regular assessment on the effectiveness of the EMP.

9.6 Method Statements

The environmental aspects of working methods will be controlled through the checking of the Contractor's method statements which will be submitted and approved by the IEC and ER prior to the works being carried out. This will ensure that the environment is consistently and routinely considered in all works processes.

9.7 Complaint Hotline

The Contractor will provide a manned complaint hotline (tape recording is not acceptable) so that action can be immediately taken to reduce the environmental nuisance in response to complaints raised by residents nearby or relayed from other Government Department.

10. ENVIRONMENTAL MANAGEMENT PLAN

10.1 Introduction

In accordance with Clause 3.5 of the EIA Study Brief, an Environmental Management Plan (EMP) shall be included in this EIA report. The EMP shall cover the environmental practices for construction, operation and reinstatement phases of the Venues in pursuit of the Green Olympic themes. In addition, reference has been made to the "Environmental Protection Guideline for Olympic Rebuilding and Extending Projects" and "Guidelines of Environmental Protection for Temporary Olympic Projects" published by BOCOG in preparing the EMP for the Project. A separate chapter on Environmental Monitoring and Audit (EM&A) requirements for the Project is given in Chapter 9. Specifically, the EMP will address environmental management issues with respect to the different stages of the Project as follows:

- Planning and Design Stage
- Construction and Reinstatement Stage
- Operational Stage

In respect of the planning and design stage, the consultant for the Project (the Consultant) should follow the environmental protection guidelines issued by BOCOG in the design and development of the venues for the Olympic events. This should include both compliance with the local legislation in relation to environmental protection and conservation of natural resources eg energy, water, etc in selection of alternatives for material.

In respect of the construction and reinstatement stage, the contractor for the Project (the Contractor) will be required to devise a detailed Environmental Management Plan for implementing the design provisions for environmental protection in the construction and reinstatement works based on the framework of this EMP. In addition, the Contractor should observe and duly follow the best environmental practices as described in S.3.8.1, S.4.8.1, S.5.6.1and S.6.5.1.1.

In respect of the operational stage, the venue operator shall adhere to the operational requirements of the environmental permit, local environmental protection legislation applicable to the events and Olympic Games guideline.

10.2 Outline Environmental Management Plan - Planning and Design Stage

The planning and design shall comply with the following environmental legislation, best practices and guidelines on air, noise, water quality, waste, landscape & visual applicable to the scale of this Project as well as incorporating the BOCOG environmental protection principles and guidelines as far as practicable.

10.2.1 Legislation, Best Practices and Guidelines

The contractor shall comply with the latest versions of the environmental legislation as published by the government from time to time. They include but not limited to the following:

10.2.1.1 Air Impact

- Air Pollution Control Ordiance (APCO) (Cap 311)
- Air Pollution Control (Construction Dust) Regulation

- Criteria for Odour Impact Assessment, Annex 4 of TM-EIAO

10.2.1.2 Noise Impact

- Noise Control Ordinance (NCO) (Cap 400)
- TM on Noise from Construction Work other than Percussive Piling (TM-GW);
- TM on Noise from Construction Work in Designated Areas (TM-DA);
- TM on Noise from Percussive Piling (TM-PP);
- Technical Memorandum for the Assessment of Noise from Places Other than Domestic Premises, Public Places or Construction Sites (TM-Places); and
- TM on Environmental Impact Assessment Process (TM-EIAO)
- Noise from Construction Activities – Statutory (ProPECC PN 1/93)
- Noise from Construction Activities – Non-statutory Controls (ProPecc Note 2/93)

10.2.1.3 Water Quality Impact

- Environmental Impact Assessment Ordinance (Cap. 499, S.16), Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO), Annexes 6 and 14;
- Water Pollution Control Ordinance (WPCO);
- Technical Memorandum on Standards for Effluent Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (WPCO, Cap. 358, S.21);
- Hong Kong Planning Standards and Guidelines (HKPSG); and
- Practice Note for Professional Persons (ProPECC), Construction Site Drainage (PN1/94)

10.2.1.4 Waste

- Waste Disposal Ordinance (Cap 354)
- Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap 354N)
- Waste Disposal (Chemical Waste) (General) Regulation (Cap 354C)
- Land (Miscellaneous Provisions) Ordinance (Cap 28)
- Public Health and Municipal Services Ordinance (Cap. 132) – Public Cleansing and Prevention of Nuisances Regulation
- Dumping at Sea Ordinance (Cap. 466)
- Management of Construction and Demolition Materials Including Rock (WBTC No. 33/2002)
- Waste Management on Construction Sites (WBTC No. 15/2003)

10.2.1.5 Landscape and Visual Impact

- Environmental Impact Assessment Ordinance (Cap. 499, Section 16);

- Environmental Impact Assessment Ordinance (Cap. 499, S.16), Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO), Annexes 10 and 18;
- EIAO Guidance Note No. 8/2002 – Preparation of Landscape and Visual Impact Assessment;
- Hong Kong Planning Standards and Guidelines;
- Outline Zoning Plan No. S/ST/20
- WBTC No. 25/93 – Control of Visual Impact of Slopes;
- WBTC No. 17/2000 – Improvement of Appearance of Slopes;
- GEO Publication No. 1/2000 – Technical Guidelines on Landscape Treatment and Bio-engineering for manmade Slopes and Retaining Walls
- WBTC 14/2002 – Management and Maintenance of Natural Vegetation and Landscape Works, and Tree Preservation; and
- ETWB TCW No. 2/2004 – Maintenance of Vegetation and Hard Landscape Features.

10.2.2 BOCOG Environmental Protection Principles and Guidelines

BOCOG has established environmental guidelines on planning for rebuilding and extending the existing facilities/structures for the Olympic Venues. The relevance of these guidelines to the development of the Equestrian Venue in Hong Kong will be reviewed through an environmental audit on the design. The BOCOG principle on the Olympic venue development is to achieve the Green Olympic theme on affordable cost. Appendix 6-1 gives a copy of the original Chinese version documents and their English translation for reference.

10.3 Outline Environmental Management Plan – Construction/Reinstatement Stage

10.3.1 Scope of Works

The Contractor shall list out the scope of works for the Project in details to include all associated construction / reinstatement activities and a working programme.

The Contractor's EMP shall include the following items:

- Environmental Policy Statement from each of the joint venture companies, if any;
- Project environmental organisation and the individual responsibilities of both the construction and environmental staff;
- Summary of environmental requirements;
- Forecast Impact Schedule;
- Communication procedures;
- Environmental auditing;
- Preparation of on-site records and environmental progress report;
- Restrictions on contractor's on-site operation;
- Environmental Mitigation Implementation Schedule;
- Contractor's Specific Waste Management Plan (WMP); and

- Contractor's Specific Environmental Monitoring and Audit (EM&A) Manual.

10.3.2 Environmental Obligations

The Contractor shall be responsible for the overall compliance of all statutory and contractual environmental requirements during the construction stage of the Project.

It shall be a contractual requirement that the Contractor should prepare and submit the Contractor's specific EMP to the Resident Engineer (RE) for review and acceptance. The Contractor shall be responsible for ensuring that his employees (whether direct or indirect via sub-contractor arrangements) implement the accepted version of the Contractor's EMP as an integral part of their daily activities on-site.

10.3.3 Environmental Policy Statement

The Contractor shall devise Environmental Policy Statements with their senior management of the company on commitment to integrate environmental considerations into planning, design and construction activities of the Project.

10.3.4 Project Environmental Organisation

The Contractor shall appoint and identify suitably qualified individuals to be responsible for implementing their EMP. A project environmental organization chart showing the requirements and responsibilities of the following key persons shall be provided:

- **Contractor's Representative (CR):** The CR shall be responsible for overall planning, site operations, appointment of committee members for environmental management, staff supervision control co-ordination and external liaison. The primary responsibilities of the CR shall be to ensure adequate resources are provided to the Environmental Team for implementation of the EMP.
- **Contractor's Environmental Team (ET) Leader ET:** The ET Leader shall have at least 7 years relevant working experience in environmental protection management or an equivalent professional qualification to the satisfaction of RE. The responsibilities of the ET Leader shall include day to day management of both technical and administration issues.
- **Site Agent:** The role of the site agent shall be clearly stipulated on the EMP.
- **General Foremen:** The role of the general foremen shall be clearly stipulated on the EMP.

10.3.5 Summary of Environmental Requirements and Mitigation Plan

Environmental mitigation measures shall be implemented to limit adverse effects on air quality, noise, water quality, solid waste, dangerous goods and chemical waste management. The Contractor shall prepare a summary of all planned mitigation measures in form of an Environmental Mitigation Implementation Schedule (EMIS).

Apart from local licensing requirements and performance criteria, the Contractor shall observe the BOCOG environmental guidelines for Temporary Olympic Projects and Rebuilding & Extending Projects on the construction / reinstatement activities.

10.3.5.1 Air Quality

The Contractor's EMIS shall include at least the descriptions of the following items:

- Licensing requirement

- Performance criteria
- Air quality mitigation measures
- On-site procedures for implementation of mitigation measures

10.3.5.2 Water Quality

The Contractor's EMIS shall include at least the descriptions of the following items:

- Licensing requirement
- Performance criteria
- Water quality mitigation measures
- On-site procedures for implementation of mitigation measures

10.3.5.3 Noise

The Contractor's EMIS shall include at least the descriptions of the following items:

- Licensing requirement
- Performance criteria
- Noise mitigation measures
- On-site procedures for implementation of mitigation measures

10.3.5.4 Waste

The Contractor's EMIS shall include at least the descriptions of the following items:

- Licensing requirement
- Performance criteria
- Waste Management Plan
- On site procedures for handling of health, safety and environmental issues

10.3.5.5 Chemical Waste Management

- Inventory: An inventory of chemicals including their Material Safety Data Sheet (MSDS) to be used for construction activities shall be kept on site. The Contractor shall, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation, submit the application for registration as a "Waste Producer".
- Handling and Storage: The Contractor shall devise steps to be followed for handling and storage of chemicals.
- Dangerous Goods Licensing Requirement: The Contractor shall identify in his EMP the licensing requirements with regard to handling and storage of dangerous goods.
- Dangerous Goods Handling and Storage: The Contractor shall devise the procedures to be followed with regard to the handling and storage of dangerous goods. Fire precautions and general storage provisions shall be provided in the Contractor's EMP.

10.3.6 Forecast Impact Schedule

10.3.6.1 Environmental Emergency Procedures

The Contractor shall devise Environmental Emergency Procedures for chemical spillage. An emergency contact telephone list shall be prepared and distributed to every employee and shall be posted up at prominent places. Key personnel of EPD, ER, CR and ET Leader shall be informed in case of emergency.

10.3.6.2 Environmental Monitoring and Audit

The Contractor shall prepare a project specific Environmental Monitoring and Audit Manual detailing the monitoring scope of work, locations of monitoring stations and the specific monitoring requirements.

10.3.6.3 On-site Powered Mechanical Equipments (PMEs) Use

The Contractor shall provide a list of the PMEs to be used on site and their sound power levels.

10.3.6.4 Typhoon and Heavy Rainstorm Procedures

The Contractor shall prepare a set of Typhoon and Heavy Rainstorm Procedures for environmental protection control detailing the actions to be taken by General Foreman to minimize the adverse impacts during typhoon and heavy rainstorms.

10.3.6.5 Wheel Washers and Effluent Discharge

In the Contractor's EMP, descriptions on the Wheel Washing System and measures to be implemented to ensure the compliance of effluent discharge standards shall be provided.

10.3.6.6 Environmental Responsible Purchasing

The Contractor shall present in the EMP his strategy and plan on enhancing the adoption of environmentally friendly products. The EMP shall also specify the prohibition of the use of tropical hardwoods.

10.3.7 Communication Procedures

10.3.7.1 Sub-contractor's Environmental Meeting

The Contractor's EMP shall specify the requirements for the environmental meeting between the Contractor and it's sub-contractors. The functions of the meeting shall be identified.

10.3.7.2 Training

The Contractor shall present his training plan on environmental protection awareness in his EMP.

10.3.7.3 Training Record

The Contractor's EMP shall specify the personnel to be responsible for maintaining an auditable record of all trained persons on environmental protection awareness.

10.3.7.4 Waste Recycling / Reduction

The Contractor's EMP shall include proposal on ways to minimise the amount of waste generation.

10.3.7.5 Document Control

The Contractor's EMP shall describe the procedures for document control.

10.3.7.6 Complaints Handling

The Contractor shall devise his own procedures for handling of complaints via the site personnel or by any other means.

10.3.7.7 On-site Records

The Contractor shall stipulate the types of records to be prepared and maintained on site.

10.3.7.8 Contractor's Site Environmental Inspection Procedures

The Contractor shall devise the procedures for site environmental inspections.

10.3.7.9 Contractor's Site Environmental Inspection Frequency and Areas Covered

The Contractor shall describe in his EMP the frequency of site environmental inspection and the areas to be covered.

10.3.7.10 Environmental Progress Report

The Contractor shall prepare and submit a "Contractor's Monthly Environmental Progress Report" to the RE and IEC summarizing the following information:

- A summary of any environmental incidents occurred in the month;
- A detailed description of any non-compliance incidents and actions or remedial measures taken in the follow up investigation;
- A summary of any baseline or impact monitoring results undertaken in the month; and
- A registry of complaint logs on all records of complaints and results of investigations during the construction period.

10.3.8 Restrictions on Contractor's On-site Operation

10.3.8.1 General

The Contractor and his sub-contractors should comply with the following on-site operation restrictions in order to avoid potential adverse environmental impacts caused by the project:

(a) Comply in every respect with the provisions of any relevant statutory environmental requirements and guidelines as may be applicable to the Works, and enforce compliance therewith from:

- Sub-contractors (of any level);
- All persons employed by Contractor on-Site; and
- Any other person authorized by him to be on-Site,

and ensure that proper and adequate provisions to that end are included in all sub-contracts, purchase orders, etc.

(b) Use, whenever practicable, "environmental-friendly" products and practices in carrying out the Works, and to that end:

- Do not use ozone-depleting fire extinguishers as the temporary fire fighting measure during construction works and do not use ozone depleting substances in carrying out the Works;
- Ensure all Contractor's Equipment used on-Site are unleaded petrol or ultra low sulphur diesel based unless otherwise approved by RE.
- Use best endeavours to employ biodegradable plastic materials in carrying out the Works whenever such material is reasonably available;
- Avoid the use of diesel hammers in carrying out the Works, where appropriate;
- Do not employ hardwood for Temporary or Permanent Works unless otherwise approved by RE; and
- Retain on-site and make available for inspection by RE and IEC documentation certifying that all wood and wood products used in the Works (whether Permanent or Temporary) have been produced from timber emanating from forests managed in a sustainable manner.

The provisions of this section shall not be applicable in the case of emergency response or actions necessary:

- for the saving of life;
- the preservation of property; or
- ensuring the safety of the Works,

and where such response or actions cannot be effectively carried out without contravening those provisions, but in any event, the effects of such measures as have by necessity contravened those provisions shall be set right and made compliant as soon as practicable thereafter.

10.3.8.2 Avoidance of Nuisance

The Contractor and its sub-contractors shall take all reasonable precautions to avoid any nuisance arising from on-site operations, including:

- Where at all possible, suppress the nuisance at source rather than abatement of the nuisance once generated.
- Remove rubbish and debris from the Project site as set forth in the Contractor's WMP;
- Pay due attention to the ways of material usage and/or on-site activities that will or may have impact on the environment;
- Ensure no dumping of any earth, debris, spoil or building materials on Government land;
- In the event of any spoil or debris from site being deposited on adjacent land or water body, or any silt washed down to any area, immediately remove all such spoil, debris and silt and restore the affected land or water body and areas to their natural state.

10.4 Operational Phase

10.4.1 General

The environmental guidelines issued by BOCOG, namely "Guideline of Environmental Protection for Temporary Olympic Projects" and "Environmental Protection Guideline of Olympic Rebuilding and Extending Projects" should be followed as far as practicable during the operational phase.

10.4.2 Environmental Monitoring and Audit

The Event operator shall follow the requirements as stipulated in the EM&A manual for environmental performance during the operational stage.

11. CONCLUSIONS

11.1 Introduction

This EIA Report has provided an assessment of the potential environmental impacts associated with the construction / reinstatement and operation phases of the Project.

Mitigation measures for the Project, Environmental Management Plan as well as environmental monitoring and auditing requirements, have been developed during the detailed assessment. Waste Management Plan will be prepared before the commencement of construction works. The Implementation Schedule of the recommended measures for the Project is presented.

11.2 Site Selection

A number of alternative sites for staging the Equestrian Event have been considered during the site selection stage. The sites having been considered include:

- A number of green field sites including the Old Kai Tak Airport
- Kau Sai Chau Golf Course
- Happy Valley Racecourse
- Penfold Park and Hong Kong Sports Institute (HKSI)
- Beas River Country Club in association with Hong Kong Golf Course (HKGC)

These sites were evaluated against the requirement specified by IOC, FEI and BOCOG, respectively. After a comprehensive review and detailed inspection of the sites, the following combination of sites were selected for staging the equestrian event in Hong Kong:

- HKSI in association with Penfold Park as the Core Venue for Dressage and Show Jumping; and
- Beas River Country Club in association with HKGC as the venue for Cross Country event.

11.3 Air Quality Impact

11.3.1 Construction / Reinstatement Phase

Potential air pollution sources during the construction phase have been identified. With the implementation of proper contractual clauses and best site practice controlled within the Air Pollution Control (Construction Dust) Regulation, adverse dust impact is not anticipated.

11.3.2 Operational Phase

Operational odour impact assessment has been conducted and potential sources of odour have been identified. Odour will be effectively minimized by installation of odour removal system, such as activated carbon filter at the exhaust of ventilation system of the new Stable Complex, fully enclosed stable design and proper confinement of stockpiled stable waste. With the implementation of the above measures, adverse odour impact during the operational phase of the Project is not anticipated.

Given that spectators will arrive the venue by pubic transport similar to a horse-racing day, additional vehicular emission due to increased traffic flow is not anticipated. Secondary impact arising from increased traffic volume is therefore unlikely .

11.4 Noise Impact

11.4.1 Construction / Reinstatement Phase

Potential construction noise impacts are likely to be caused by various construction activities including general site formation, drainage and sewage works, and construction of the main arena and stables.

Construction noise assessment has concluded that the unmitigated construction noise impacts would exceed the noise criteria at some of the neighbouring NSRs. Quiet plants will be adopted as the mitigation measures to control the noise impacts to within the criteria of the NSRs. Other measures including good site practice, the use of site hoarding, installation of movable barriers and sequential operation of construction plant should be incorporated into the Contract Specifications and Implementation Schedule. With the incorporation of the recommended mitigation measures, the predicted construction noise levels could be reduced to below the noise criteria.

11.4.2 Operational Phase

Potential fixed noise sources during the operational phase of the Project include crowd noise, PA system broadcast and noise from M&E plant. Assessment result shows that crowd noise and PA system broadcast would not be significant. A limiter device in the system would be included to ensure full control setting of the maximum output sound level. Operational noise impacts from M&E plant can be effectively mitigated by implementing noise control treatments (e.g. sound attenuator and noise enclosures) at source during the design stage and residual cumulative operational noise impacts are not anticipated. Noise commissioning tests for fixed noise sources should be included in the Contract Documents.

11.5 Water Quality Impact

11.5.1 Construction / Reinstatement Phase

Potential water pollution sources have been identified as construction runoff, sewage from site workforce and drainage diversion. Site control measures such as covering excavated materials and providing sedimentation tanks are recommended. With the implementation of the above measures, adverse water quality impact during the construction/reinstatement phase is not expected.

11.5.2 Operational Phase

There would be no increase in runoff due to the increase in permeability as there would be no change in catchment area and the total impermeable area. The existing drainage downstream of the proposed connection will be upgraded to the current design standard to ensure a sufficient capacity to cater for the surface runoff from the site. A low flow interceptor system is provided to intercept the first foul flush of the surface runoff from the new stables, thus improving the water quality of the effluent to Shing Mun River Channel. Sand traps would also be provided to prevent the siltation of the drainage system.

Temporary toilets will be provided during the operation period of the Olympic Event. Sewage from these temporary toilets will be conveyed to existing sewerage system by existing sewers on the HKSI site. A new sewer running along the access path of Shing Mun River Channel is proposed to convey sewage from the new stables to the existing public sewers.

The application of chemicals, such as pesticides and fertilizers, on the turf area will be in accordance with the current Turf Management Plan. Hence, it would not cause adverse water quality impact to the surrounding water systems, in particular the Shing Mun River Channel.

With the implementation of the recommended measures, no adverse water quality impact is anticipated for construction, operational and reinstatement phase of the Project.

11.6 Waste Management Implications

11.6.1 Construction /Reinstatement Phase

The quantity and timing for the generation of waste during the construction phase have been estimated. Assessment result shows that the Project would only generate a limited amount of C&D waste. The waste management implications arising from the Project is therefore considered not significant. Measures, including on-site sorting and reusing excavated fill materials (stored in stockpiles) are recommended to minimise the surplus disposal off-site.

Recommendations have been made for the Contractor to implement during the construction/ reinstatement period to minimise the waste generation and those for off-site disposal.

11.6.2 Operational Phase

The types and quantities of waste that would be generated during the operational phase have been assessed. Assessment result shows that only a limited amount of waste would be generated from the new stables and by the visitors during the event. With the implementation of proper waste management procedures, the waste management implications of the Project would only be of short term and insignificant.

11.7 Landscape and Visual Impacts

All the landscape resources in the vicinity of the Project have been identified, including the Turf Lawns, Trees, Synthetic Sports Fields and Garden Areas.

All the visually sensitive receivers within the visual envelopes during the construction / reinstatement and operation phases have been identified.

Landscape and visual mitigation measures have been identified for both the construction / reinstatement and operation phases.

Impacts on landscape resources will be acceptable. The only notable impacts will be the loss of turf lawns during the construction and operational phases. This will be partially mitigated in future when the turf of the Athletics Arena is reinstated and lawns are added in new landscape gardens at the present golf driving range.

Impacts on existing trees will be acceptable. An approximate number of 33 trees will require felling, while 53 will be transplanted. In total 628 trees will be retained, including the three trees with diameters over 1m at breast height. To compensate for the loss of 33 trees due to felling, more than 80 new trees will be planted. Beneficial impacts are expected by enhancing landscape areas and the renovating athletic sports fields after the Paralympic Event.

Impacts on character of landscapes will be acceptable. The HKSI site that is currently characterised by its sports facilities and landscape resources, in particular trees will undergo a character change during the construction phase. This change will be mitigated to ensure landscape resources are preserved as far as possible. Particular attention will be given to protect trees during the construction phase. The operational phase will return the character of the site to a sports venue, though the nature of sports will change to equestrian. The site's character will after reinstatement largely be comparable to the present.

Some glare impacts from the floodlights at the Main and Warm-up arenas are expected. This is due to upgrading of existing floodlights to enable camera recordings of the Olympic Equestrian events for broadcasting purposes. The upgrading will be to an illuminance level 2000 lux, which is an Olympic requirements. The impact at the HK Jockey Club Staff Quarters, which is the nearest residential VSR group to the Main Arena will be moderate. As such anti-glare baffles and visor shields will be used. These impacts will occur during the Olympic and Paralympic competitions. The floodlights will be retained for future use but the number of lamps will be reduced to achieve an illuminance level comparable to that of the racecourse.

Overall, with reference to the five criteria defined in Annex 10 of the EIAO TM, it is considered that the landscape and visual impacts in the construction / reinstatement and operation phases are acceptable with mitigation measures.

Impacts on landscape resources and existing trees will be acceptable. The loss of turf lawn at Athletics Arena during construction will be partially mitigated in future after the event.

11.8 Overall Conclusion

An EIA Report has been prepared to satisfy the requirements given in the EIA Study Brief No.: ESB-136/2005 and the TM-EIAO. All the latest design information has been incorporated into the EIA process. Aspects that have been considered in this EIA Report include:

- Site Selection
- Description of construction methodology
- Air Impact
- Noise Impact
- Water Quality Impact
- Waste Management Implications
- Landscape and Visual Impact Assessment
- Environmental Management Plan
- Environmental Monitoring and Auditing

The EIA Report has predicted that the Project would be environmentally acceptable and in compliance with environmental standards and legislation during the construction / reinstatement phase and operation phase with due implementation of mitigation measures, environmental monitoring and audit programme.