



# SINGAPORE BOTANIC GARDENS

Candidate World Heritage Site Nomination Dossier

January 2014

01 The Bandstand (Front and Back Cover) 02 Ginger Garden



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# FOREWORD

It gives me great pleasure to present this Nomination Dossier for inscribing the Singapore Botanic Gardens as a UNESCO World Heritage Site.

The Singapore Botanic Gardens was established in 1859. At 74 hectares with a six hectare track of virgin rainforest, the Gardens is an invaluable green lung in the midst of highly urbanised and densely populated Singapore. Remarkably, it is also less than a 10-minute walk from Singapore's main shopping belt – Orchard Road. Indeed, Singapore has carefully preserved and protected the Gardens as an oasis of cultural and natural heritage in the heart of our modern island state.

The Gardens is home to more than 40 heritage trees, the oldest of which pre-date the Gardens' establishment. The Gardens is also home to several buildings and structures that were constructed between 1867 and 1930. From 1875, the Gardens was developed to explore the cultivation of economic cash crops for the then-British Empire, including the commercial growth of rubber trees and oil palms. In the early 20<sup>th</sup> Century, the Gardens was a key player in developing innovative rubber cultivation techniques that contributed greatly to the rubber boom in Southeast Asia and transformed the face of the regional economy. Today, the Gardens is widely regarded as the best preserved English colonial botanic gardens in the tropics. As one of the world's most visited botanic gardens with over 4 million visits annually, the Singapore Botanic Gardens is at the same time one of Singapore's most beloved public spaces. With more than 10,000 kinds of plants, the Gardens is also the leading international institution for Southeast Asian tropical botany, and a key reference centre for many researchers from all over the world. The Gardens has a world renowned orchid hybridisation programme, which was established in the 1920s. To date, the Gardens has registered more than 500 orchid hybrids.

As a key part of Singapore's culture since its establishment, the Gardens continues to host recreational activities and musical events, which bring people from all walks of life together. Recognising the Gardens' historical significance and the pride that many Singaporeans feel for the Gardens, we have prepared this Nomination Dossier for discussion at the 2015 World Heritage Committee Session. 2015 also marks Singapore's Golden Jubilee Year – the 50<sup>th</sup> anniversary of Singapore's independence. This nomination is a fitting tribute to the rich history of our young nation.

I would like to take this opportunity to thank the many local community groups and partner institutions that have worked quietly behind the scenes to put together this document. I am happy to give my full support to the Singapore Botanic Gardens' nomination as a UNESCO World Heritage Site.

MR LAWRENCE WONG Acting Minister for Culture, Community and Youth

Chairman of the Singapore National Commission for UNESCO



# PREFACE

Among all the colonial botanic gardens in the world, those in Southeast Asia have an unrivalled importance in the steering of the course of history in new directions, revolutionising trade, establishing and toppling economies and determining the international power balance. The British colonial botanic gardens as outposts of the Royal Botanic Gardens. Kew were at the forefront of the interchange of botanic research and information and ensured that the influence of these was very much greater than that of the botanic gardens of other colonial powers. Nowhere in the British colonies were the effects of economic growth and discoveries more felt than at the Singapore Botanic Gardens through, in particular, the pioneering work on rubber cultivation in the late 1880s, which set in place the foundations of the worldwide 20<sup>th</sup> century rubber boom. Notably the Singapore Botanic Gardens has continued to have a leading role in the development of tropical plant science, economic botany and conservation in Southeast Asia. Achievements in the 20<sup>th</sup> and 21<sup>st</sup> centuries include the establishment internationally of the Botanic Gardens as the cradle of breeding science for orchids. Since the 1960s the Botanic Gardens has made a key and influential contribution to the 'greening' of Singapore, now the world premiere garden city in this respect. The Botanic Gardens, throughout its history and to the present day, has also always been a national place of culture, science and heritage much cherished and valued by generations of Singaporeans. It is etched in the memories of generations of visitors/ residents and provides a continuous sense of place and identity in an otherwise rapidly changing and developing city.

The current nomination for World Heritage status for the Singapore Botanic Garden seeks to encapsulate much of the above spectrum. The welldefined multi-lavered cultural landscape of the Botanic Gardens includes the unusual and original landscape design and layout of the pleasure gardens of the 1860s, a tract of original primary rainforest uniquely located in the heart of the city, numerous heritage trees, invaluable living and preserved plant collections and an ensemble of historic buildings and structures. All of these, in combination, are the tangible evidence of the development and influence of the premier British tropical colonial botanic garden in the region and the legacy on which the success of today's Botanic Gardens is built.

This document is the Nomination Dossier that supports the bid for Singapore Botanic Gardens to become a World Heritage Site.

The Nomination Dossier is formatted according to the Operational Guidelines for the Implementation of the World Heritage Convention published by the UNESCO World Heritage Centre in July 2013. It therefore includes the Management Plan for the Singapore Botanic Gardens Candidate World Heritage Site.

The Dossier has been prepared by Chris Blandford Associates (CBA) on behalf of the National Heritage Board, the National Parks Board, Singapore Botanic Gardens and other stakeholders. Stakeholders and the public were consulted during the preparation of the dossier during 2012/2013. An overview of the consultation and awareness building which took place is provided in **Appendix A**.

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# EXECUTIVE SUMMARY

State Party Singapore

#### State, Province or Region

Singapore (Central Tanglin District), Southeast Asia

Name of Property Singapore Botanic Gardens

# **Geographical Coordinates to the Nearest Second**

Latitude: N 1° 18' 55" Longitude: E 103° 48' 58"

# Textual Description of the Boundaries of the Nominated Property

The Nominated Property is bounded by Holland Road to the south, Tyersall Avenue/Cluny Park Road to the west, the northern end of the Botanic Gardens to the north and the National University of Singapore's Law Faculty/Evans Road and Cluny Road to the east.

Its boundaries have been drawn to include all those areas or attributes that are a direct and tangible expression of its Outstanding Universal Values as an outstanding example of a British tropical colonial botanic garden.

A Buffer Zone is proposed around the Nominated Property. It defines an area where additional planning guidance will be given to protect the immediate setting of the candidate World Heritage Site. Careful consideration will be given to development proposals within the Buffer Zone to determine whether they are likely to significantly detract from the Outstanding Universal Values, authenticity or integrity of the site.

#### Map of the Nominated Property, Showing Boundaries of the Nominated Property and Proposed Buffer Zone

See **Figure 1** (2013, scale: 1:10,000) and maps annexed to the nomination dossier.

#### Criteria under which property is nominated

The Singapore Botanic Gardens is proposed for inscription on the World Heritage List under Criteria (ii) and (iv) of the World Heritage Convention.

#### **Draft Statement of Outstanding Universal Value**

#### **Brief Synthesis**

The Singapore Botanic Gardens, originally laid out in the 1860s, is a green lung in the midst of rapid and extensive urban development. In addition to its botanic excellence today, the continued presence of the Botanic Gardens has provided generations of Singaporeans and visitors alike with a sustained sense of place and anchor to the island's local cultural history.

The Singapore Botanic Gardens is an exceptional example of a 'British tropical colonial botanic garden' which emerged during the 19th century period of global expansion, exploration and colonisation in Southeast Asia. The Botanic Gardens assumed a pre-eminent role in the promotion of economic botany in the Malay Peninsula and Straits Settlements administration during the late 19th century and early 20th century. Today the landscape of the Botanic Gardens bears testimony to the history of British colonial botanic gardens, the 19th century colonial legacy of economic botany and the long lasting history of and unique contribution to the economic, social and scientific developments of the region. In particular, the pioneering work on rubber cultivation and techniques for tapping carried out in the 1880s and 1890s set in place the foundation of the early 20th century rubber boom in Southeast Asia.

The Botanic Gardens has a well–defined cultural landscape which includes a rich variety of historic

landscape features that demonstrate clearly its initial establishment as a pleasure garden in the 1860s and its subsequent evolution and continued role as a botanic garden. The extensive living collections include many veteran trees and unusually the site includes a six hectare tract of primary, lowland, equatorial rainforest within its boundaries. An ensemble of historic buildings including colonial style bungalows, built between the 1860s and 1920s for staff residences and administration, contributes to the cultural landscape of the Botanic Gardens.

Since its beginning, the Singapore Botanic Gardens has been a leading centre in plant science, research and conservation in Southeast Asia. Today it is internationally recognised as a leading institution of tropical botany and horticulture and its library and herbarium collections serve as an important reference centre for botanists all over the world. The site represents the cradle of breeding science for orchids in Asia, a hybrid programme having first been initiated in the Botanic Gardens in the 1920s, with formal orchid breeding programmes continuing to the present.

The Botanic Gardens has played an integral role in the social history of Singapore, providing a backdrop for the lives of residents, both past and present and a continual sense of place and identity in an otherwise changing city. It was and continues to be instrumental in the 'greening' and transformation of Singapore into a 'City in a Garden', successfully implementing the former Prime Minister Lee Kuan Yew's vision for this in the 1960s.

The British South and Southeast Asian colonial botanic gardens were preeminent in terms of other colonial botanic gardens, as a direct consequence of their mutually advantageous role as outposts of the Royal Botanic Gardens, Kew. Singapore Botanic Gardens was part of a wide network of over 100 other British botanic gardens, which was many times bigger than that of other colonial empires. All these sites to some degree contributed to 19th century developments in economic crop growing which established this region of Asia as an important economic power. However, Ridley's late 19th/ early 20th century extensive work on perfecting rubber cultivation and extraction, undertaken at the Singapore Botanic Gardens, combined with his relentless promotion of the crop, can be singled

out as perhaps the most significant contribution to Malaya becoming the biggest rubber producer in the world and creating an entirely new and booming economy with global influence. As stated by Brockway (1979) '*between the two world wars, Singapore was the rubber capital of the world*'.

Other remaining British tropical colonial botanic gardens that have survived fully or in part in South and Southeast Asia include Penang (Malaysia), Peradeniya (Sri Lanka), Calcutta (India) and Hong Kong. Only Peradeniya and Calcutta continue as significant botanic gardens today with a degree of scientific and recreation functions. The combination of Singapore Botanic Gardens' rich and diverse historic cultural landscape; long-established scientific, educational and recreational world-class functions; remarkable contribution to economic and ornamental plant research (particularly in relation to rubber production and orchid hybridisation); high level of authenticity and integrity; role in the greening of Singapore and the shaping of the island's identity; along with the presence of a tract of primary lowland rainforest make it stand out when compared to other similar properties.

**Criteria under which Inscription is Proposed** (and Justification)

The Singapore Botanic Gardens is proposed for inscription on the World Heritage List under Criteria (ii) and (iv) of the World Heritage Convention.

#### Criterion (ii) – "Exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town planning or landscape design".

The Singapore Botanic Gardens has been a prominent centre for plant research in Southeast Asia since the 19th century. It continues to play a leading role in the interchange of ideas, knowledge and expertise in tropical botany, agricultural economy and horticulture and represents an important reference centre for botanists all over the world. The Botanic Gardens has gained international recognition for starting and maintaining traditions in plantation agriculture, natural history, biodiversity science and conservation in the region and has also played a pivotal role in the greening of Singapore, which influenced town planning in other cities in Southeast Asia.

#### Criterion (iv) – "Be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history".

The Singapore Botanic Gardens is an outstanding example of a British tropical colonial botanic garden and the best preserved of its kind. This cultural landscape demonstrates its different stages of development since 1859 through its layout<sup>1</sup>, extant historic landscape and built features and its uses and functions. The evolution and sustained preservation of the Botanic Gardens reflects the changing shift in attitudes regarding the role and functions of botanic gardens worldwide and throughout Southeast Asia. The assemblage of historic landscape features and buildings and conserved lowland primary rainforest in combination, richly illustrate the development and mixed role of the Botanic Gardens during the period of British colonisation. These, together with more recent interventions since Singapore's independence, which respect the cultural heritage of the Gardens, continue to support the very significant scientific, educational, cultural and recreational role and offer of the Botanic Gardens in the modern citystate of Singapore.

#### **Statement of Integrity**

The Nominated Property includes within its boundary all elements necessary to express its Outstanding Universal Values. Its completeness is represented by the range of landscape features, buildings and structures most closely associated with the Singapore Botanic Gardens as a British colonial botanic garden. The layout and ensemble of landscape, buildings and structures included in the Nominated Property have high integrity, being in good condition and having survived virtually intact. The physical fabric of the property largely has not suffered from adverse effects of developments or neglect, with inappropriate changes controlled through statutory protection and management measures. In addition, late 20th century changes reflect the on–going development of the historic use of the Nominated Property and its role in public education. They do not significantly dilute the cultural landscape, strong sense of place or traditions that endure at the Singapore Botanic Gardens.

#### **Statement of Authenticity**

The key attributes that contribute to the Outstanding Universal Values of the Nominated Property meet the conditions of authenticity. The landscape, buildings and structures within the Nominated Property have high levels of surviving authentic fabric and the spatial planning and layout of the Nominated Property is authentic. Considerable elements of the Nominated Property are either still used in the manner in which they were originally intended, or are used in a manner that is sensitive to their original purpose.

#### **Protection and Management Requirements**

The Nominated Property is protected by laws of the Singapore Government, namely the Parks and Trees Act and the Planning Act, which provide for a range of statutory conservation designations and development control planning measures that will protect and conserve its attributes of Outstanding Universal Value. The majority of the Gardens is designated as a National Park, and the whole of the Nominated Property is designated as a Conservation Area (which includes a number of Conserved Buildings and Structures) and it is also designated as a Tree Conservation Area. Works affecting these conservation designations are strictly controlled under the relevant legislation. The visual setting of the Nominated Property within the proposed Buffer Zone is protected by stringent controls on the height and form of buildings implemented through the Singapore Master Plan.

All land within the Nominated Property is within the ownership of the State and under the management of NParks. The Singapore Botanic Gardens' current annual operating and staff budget is S\$15 million, with substantial additional funding available to support a variety of infrastructural developments and maintenance works. The Singapore Botanic

<sup>1</sup> The layout has left the unusual legacy of the English Landscape movement in a tropical environment.

Gardens employs 125 full-time staff, supported by an active volunteer base. Responsibility for the Gardens' overall management lies with its Director who is assisted by two Senior Deputy Directors and four Deputy Directors. The Management Plan submitted with the Nomination provides an overarching framework for the long-term protection and conservation of the Nominated Property. There are currently no substantial threats to the Outstanding Universal Values of the Nominated Property.

# Name and Contact Information of Official Local Institution/Agency

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- 1.0 IDENTIFICATION OF THE PROPERTY
- 1a Country (and State Party if different)

The State Party is Singapore.

#### 1b State, Province or Region

The Nominated Property is located in Singapore's Central Region, within the Tanglin District.

#### 1c Name of Property

SINGAPORE BOTANIC GARDENS.

### 1d Geographical Coordinates to the Nearest Second

The centre of the Nominated Property, the Singapore Botanic Gardens, is at:

Latitude: N 1° 18′ 55″ Longitude: E 103° 48′ 58″

### 1e Maps and Plans showing the Boundaries of the Nominated Property and Proposed Buffer Zone

**Figure 1** shows the boundaries of the Nominated Property and proposed Buffer Zone.

The following maps have been annexed to the Nomination:

- Map 1: An A3 sized street map showing the boundaries of the Nominated Property and proposed Buffer Zone (Scale 1:7500).
- Map 2: An A3 sized aerial map showing the location of the Nominated Property within the State Party (Scale 1:150,000; aerial photo dated 2013).
- Map 3: An A3 sized topographic map showing the boundaries of the Nominated Property and proposed Buffer Zone. (Scale 1:7500; base map dated 1924).

1f Area of Nominated Property (ha) and Proposed Buffer Zone (ha)

Area of Nominated Property: 49 hectares.

Proposed Buffer Zone: 137 hectares.







15km

Aerial Image  $\ensuremath{\mathbb{C}}$  Microsoft product screen shot reprinted with permission from Microsoft Corporation.

#### LOCATION FIGURE 2

NOMINATION DOCUMENT DESCRIPTION 10

### 2.0 DESCRIPTION

#### 2.a Description of the Nominated Property

The Singapore Botanic Gardens, at the heart of the city of Singapore, is the legacy of 150 years of human and scientific achievements. The landscapes of the site represent the evolution of a British tropical colonial botanic garden to a modern and world-class botanic garden, scientific institution and place of conservation and education. Easily accessible to the people of the city and the island as a whole, from its origins to the present day, the Singapore Botanic Gardens has also always provided great pleasure, knowledge and inspiration to many generations of residents, Singaporeans and visitors. The Botanic Gardens is the most visited botanic garden in the world, having welcomed c. 4.4 million visitors in the year 2012/2013. The Chinese proverb 前人栽树,后人乘凉(translation: 'An earlier generation plants trees under whose shade later generations rest'), cited by Singapore's current Prime Minister, Lee Hsien Loong, when opening the Singapore Botanic Gardens' new Heritage Museum in November 2013, encapsulates the value and appreciation which Singaporeans attach to the Botanic Gardens and the work of their forefathers and earlier generations of botanists and directors.

The following paragraphs provide a detailed description of the Nominated Property (hereafter also referred to as the site, the Botanic Gardens and the Singapore Botanic Gardens<sup>2</sup>) at the date of nomination and refers to all the significant features of the property and elements that make it culturally significant. In line with Article 1 of the *World Heritage Convention*, the Nominated Property shall be considered as a cultural heritage site and in accordance with paragraph 47 of the *Operational Guidelines for the Implementation of the World Heritage Convention* (July 2012) it should also be regarded as a cultural landscape. The Guidelines state that:

Cultural landscapes are cultural properties and represent "combined works of nature and of man" designated in Article 1 of the Convention. They are illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal.

# Location and Boundaries of the Nominated Property

The Nominated Property is located in the south– central part of Singapore (see **Figure 2**), within the compact and densely populated western edge of the city centre. Orchard Road and the Central Business District of the city are located respectively 1.5km and 4km to the south–east of the site. The southern tip of the Central Water Catchment area, which comprises a network of nature reserves/reservoirs, is located approximately 2.5km to the north.

The Nominated Property includes 49 hectares of the total 74 hectares which make up the Singapore Botanic Gardens. The boundary of the Nominated Property in relation to that of the wider Singapore Botanic Gardens is shown on Figure 3. As illustrated on this figure, the northern end of the Singapore Botanic Gardens has been excluded (this includes the Jacob Ballas Children's Garden, the Plant Resource Centre/nursery, Eco Lake and surrounding lawns/gardens, the Trellis Garden and two Mass Rapid Transport [MRT] stations - one of which is still under construction). The Nominated Property also excludes the new Tyersall Learning Forest extension to the Botanic Gardens. The latter and northern zone referred to above have not been included as they do not contain features of historic importance that are not already represented adequately.

The Nominated Property is bounded by Holland Road to the south, Tyersall Avenue/Cluny Park Road to the west, the Botanic Gardens' Bukit Timah Core to the north and the National University of Singapore's (NUS) Faculty of Law/Evans Road and Cluny Road to the east.

<sup>2</sup> It should be noted that the full extent of the Singapore Botanic Gardens is wider than the boundary of the Nominated Property. For the purpose of this document reference to the Singapore Botanic Gardens refers to the extent of the Nominated Property only



# The Singapore Botanic Gardens in the Context of the City

Rapid and continuing urbanisation and development of Singapore since the 1960s has dramatically changed the landscape and townscape character of the island, including the area within which the Singapore Botanic Gardens is located. The Botanic Gardens has however been conserved relatively unchanged. This wellpreserved historic landscape (which retains six hectares of primary lowland rainforest), particularly within the context of its high density urban setting, is recognised as forming a special and important component of the city's landscape. It continues to provide Singaporeans and visitors alike with a sustained sense of place and anchor to the island's local cultural history and memories gone by. In addition, it provides a valuable green oasis and essential access to nature for Singaporeans, being the main park within this part of the city. As well as its recreational, educational, research and conservation functions, it also forms a key component of a wider green infrastructure network established across Singapore, which includes over 300 parks, four nature reserves, more than 2,000 hectares of tree-lined streets and over 200km of park connectors.



09 Momentous occasions: The Botanic Gardens is popular as a location for marriage proposals



10 An educational school visit

The Singapore Botanic Gardens was named *Asia's Best Urban Jungle* by Time Magazine in 2008, *Garden of the Year* by the Canadian Garden Tourism Council in 2012 and *Asia's Top Park* by online travel site TripAdvisor in 2013.

**Figure 4** indicates the land use context of the site. The land immediately surrounding the Nominated Property consists of:

- Low-rise residential areas to the west/north-west and east/south-east.
- Landscaped gardens/the Eco Lake and two MRT stations (one under construction) immediately to the north (located within the Singapore Botanic Gardens).
- The Tyersall Learning Forest, an area of secondary vegetation to the south–west (which now forms part of the Singapore Botanic Gardens).
- The campus of NUS's Faculty of Law, Lee Kuan Yew's School of Public Policy and sports grounds owned by the Ministry of Education to the north– east.

#### **Topography, Geology and Climatic Conditions**

The Botanic Gardens has an undulating topography being situated on one of a series of north-south ridges and hills that underlie the Tanglin District of the city (see Figure 5). Its height varies between 2.2 metres and 33.6 metres above sea level. The topography and steep slopes in some parts of the site has greatly influenced its layout in the different periods of its development. The highest areas rising relatively steeply to over 30 metres above sea level include Bandstand Hill (the historic core of the Botanic Gardens), the tract of primary rainforest, Burkill Hall (and the National Orchid Garden), and the area now primarily occupied by NUS's Faculty of Law and associated houses (the latter were originally erected as part of the former Raffles College and today form part of the Nominated Property). The rapidly changing topography of the site enhances the constant sense of enclosure (further emphasised by tree cover and vegetation) experienced by visitors walking around the site.

The Botanic Gardens has a uniform underlying geology, the bedrock of which is granite overlain by a



FIGURE 4 LAND USE

NOMINATION DOCUMENT DESCRIPTION

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FIGURE 5 TOPOGRAPHY

substantial thickness of heavy impervious clay. The root systems of trees, apart from some species which have anchoring taproots, largely remain at the surface of the clay and develop their feeding roots in the layer of decomposing leaf litter that accumulates on the forest floor. The same clay is also responsible for the creation of swamp vegetation on slopes of less than 3° and has enabled their easy modification into lakes. The climate in Singapore is tropical with mean daily minimum and maximum temperatures of 23.8° Celsius and 30.7° Celsius respectively. The wettest month is December and the driest February, though variations are large. The average annual precipitation is 2,367mm and relative humidity 84.5%.

#### **Evolution of the Botanic Gardens' Landscape**

The extent/boundary and certain components of the internal layout of the Singapore Botanic Gardens (first established in 1859) have inevitably changed over time. Indeed, botanic gardens are dynamic and living landscapes, where change is not only inevitable and continuous but also integral to their history and ability to remain relevant.

The evolution of the Gardens' boundary is illustrated on **Figure 6**.

The key phases of the site's historic landscape development are:

- The 'Pleasure Gardens' of the Agri–Horticultural Society.
- Emergence of the Botanic Gardens.
- Addition of Economic Gardens.
- Impact of Higher Education College Development.
- Minor Developments from the mid-1920s to 1960s.
- Spearheading the Garden City Vision.
- Modern Botanic Garden and Key Tourist Destination.

A full account of the site's historical development is provided in Section 2.b.

The 'Pleasure Gardens' of the Agri–Horticultural Society

In 1859 an Agri–Horticultural Society was granted c.22 hectares of land by the colonial administration to establish gardens in the Tanglin area. Under the Society's instruction, the land (partly covered by secondary vegetation) was developed into pleasure gardens for the Society's subscribers by Lawrence Niven, a Scottish born and trained gardener and local nutmeg plantation manager. By 1870, Niven had transformed the land into an attractive landscape laid out in the English Landscape Style, complete with curving paths, a lake, flower beds, a band parade area and a conserved six hectare tract of virgin rainforest. The Botanic Gardens however had little, if any, scientific input at this point in time. In 1866 it was extended by c.12 hectares to the west and north-west. A black and white bungalow (today known as Burkill Hall) as well as Swan Lake were both created on this newly acquired land. Overall, the Botanic Gardens' layout, as developed by Niven, largely survives intact today.



II Tanglin Gate, main historical entrance since the site's establishment (gate posts dated c.1890)

#### **Emergence of the Botanic Gardens**

In 1874, the ownership and management of the Singapore Botanic Gardens was taken over by the British colonial Government, the Agri–Horticultural Society having run into serious financial difficulties. The Botanic Gardens was soon after transformed into a typical colonial botanical establishment and working botanic gardens, superintended by a qualified gardener–botanist, James Murton, appointed upon the recommendation of the Royal Botanic Gardens, Kew.

NOMINATION DOCUMENT DESCRIPTION



Extent between 1859 and 1865



Extent between the early 1920s and 1985





Extent between 1866 and 1878



Extent between 1986 and 2003



FIGURE 6 EVOLUTION OF THE GARDENS' BOUNDARY



Extent between 1879 and the early 1920s



Extent between 2004 and 2005

Under Murton's supervision a library and herbarium were established, a wide array of new plant specimens introduced (including many trees to the south and the first economic garden to the north– west) and the Botanic Gardens' role in economic botany developed. The Botanic Gardens contained a significant zoological collection between 1875 and 1878, which was thereafter much reduced and eventually removed from the Botanic Gardens in 1905. Palm Valley was established in 1879 and The Dell in 1882, the latter under the supervision of the Botanic Gardens' new Superintendent Nathaniel Cantley (1800-87).

#### **Addition of Economic Gardens**

In 1879, c.41 hectares of 'Military Reserve' land, located immediately adjacent to the Botanic Gardens' northern boundary, were annexed to the Botanic Gardens and developed into an economic/ experimental crops' area (known as the Economic Gardens). The Botanic Gardens was at its largest, encompassing c.75 hectares of land. Cantley and subsequent Directors continued to develop this aspect of the Botanic Gardens' role until the 1920s when the majority of the Economic Gardens were redeveloped into Singapore's first higher education college. Extant buildings/structures constructed between 1880 and the early 1920s include Ridley Hall (1882), E.J.H. Corner House (1910), House 6 (the Field Assistant's House, 1919) and Holttum Hall (1921). Cantley (1880-87) also developed the Potting Yard nursery to supply trees for city parks and forest reserves in c.1882-84.



12 Holttum Hall, 1921

NOMINATION DOCUMENT DESCRIPTION Impact of Higher Education College Development

In a bid to conserve some of the Economic Gardens' most valuable collections, a number of plants were moved to the Botanic Gardens' historic core between 1918 and the mid–1920s. Following the loss of most of the Economic Gardens, the Botanic Gardens shrank back in size to c.40 hectares. Extant buildings/structures associated with the former Raffles College include Houses 1–5 (1924– 28), the Garage (1924–28) and Raffles Hall (now known as Raffles Building, dated 1958).

Approximately 13 hectares of land, which had formed part of the Economic Gardens, was eventually returned to the Botanic Gardens in 1986 and a further 12 hectares in 2004/05.

#### Minor Developments from the mid-1920s to 1960s

Only relatively minor landscape developments took place between the mid–1920s and 1960s. These included, for example, the creation of an Orchid Enclosure (where the Ginger Garden now stands) and the redevelopment of a former Rose Garden<sup>3</sup> in 1929 into the Sundial Garden. An active orchid hybridisation programme was started in the late 1920s and the now iconic bandstand erected in 1930.

#### **Spearheading the Garden City Vision**

Between the early 1960s and late 1980s the Botanic Gardens revised its mission and focus from a largely research–oriented organisation to one that would spearhead and be the driving force behind Singapore's 'Garden City' vision – this, in a sense, was similar to the Botanic Gardens' role in the 1880s when they assumed the role of propagating trees for planting in Singapore's streets and parks. Taxonomic research was temporarily de–emphasised during this period and the Botanic Gardens' expertise and resources redirected to support the Garden City movement. Parts of the Botanic Gardens were turned into nurseries and a School of Ornamental Horticulture was opened in Burkill Hall.

3 Originally developed by Cantley in 1882 on the site of Murton's previous orchid/plant house A number of new features, such as a Japanese Garden and miniature waterfall, were added to the Botanic Gardens during the 1970s but, with the exception of Symphony Lake, these were later removed (when the Botanic Gardens underwent a major programme of works in line with the National Parks Board's Masterplan, unveiled in 1989).

Modern Botanic Garden and Key Tourist Destination

A 30-year masterplan for the Botanic Gardens was unveiled by NParks in 1989, one year after the appointment of Dr Kiat W. Tan as its new Director. It enabled his new vision for the site to be articulated through a range of proposals grouped according to three core areas (the Bukit Timah, Central and Tanglin Cores) and delivered in three phases (see **Box 7** in Section 2.b for further details). Excellence in botanical research and conservation, education programmes and the preservation of the site's heritage features all underpinned the Masterplan. Under Dr Tan's directorship the Botanic Gardens' regained its status as a premier institution for botanical and horticultural research, whilst providing a key tourist destination and flagship park.



13 Evolution Garden

Extant works that were carried out within the Nominated Property as part of the masterplan include the creation of the National Orchid Garden (1995), Visitor Centre/NParks' Headquarters (1998), Ginger Garden (2001), Evolution Garden (2005) and Healing Garden (2011). The scientific collections and facilities were also enhanced through the construction of the Botany Centre (2006), which houses the herbarium, library and various laboratories. Under Nigel Taylor's directorship works have included the creation of the Fragrant Garden (2013) and Heritage Museum (2013). The development of the Tyersall Learning Forest on approximately nine hectares of land added to the Botanic Gardens' south–western boundary in 2006, is expected to be completed by 2015.

By the late 1980s, the Botanic Gardens' activities relating to the greening of the island had been substantially realised and remaining activities redistributed to other new branches of what subsequently became NParks (see **Box 1**).

#### **Existing Landscape of the Botanic Gardens**

#### **Overall Character of the Landscape**

The Botanic Gardens has a range of landscape features, living collections, themed gardens and spaces, which, taken as a whole, provides a world-class visitor attraction and important environment for recreation as well as a vital resource to support the Botanic Gardens' scientific research. The locations of the Botanic Gardens' primary landscape features are shown on **Figure 7**.

The existing landscape of the Botanic Gardens gives visitors and users the overall impression of a lush tropical garden. A rich assemblage of planting (the predominant land cover) provides an intense diversity of green tones and textures with exotic splashes of colour for the observer, both in the wider landscape and in more close examination of the planting.

The extensive existing tree cover and thick vegetation along most of the boundaries of the Botanic Gardens provide a strong sense of enclosure, insulation and relief, from the surrounding urban areas. There are therefore only intermittent views of surrounding urban development and high-rise buildings (see Figure 8). Within the site the complex combination of the mature tree cover and plant collections, as well as the pronounced and changing landform, generally limits the opportunity for an overview of the Gardens. However, a number of key internal view corridors within the site, from higher ground, provide vantage points and a local sense of openness in some areas as well as orientation for visitors. These more open areas include the lawns above Swan Lake (in the historic Tanglin Core), Palm Valley (in the Central Core) and the less mature landscape of the Bukit Timah Core in the north of the site (see Figure 8).

#### BOX 1 THE NATIONAL PARKS BOARD AND ITS ROLE

The histories of the National Parks Board (NParks) and of tree–planting in Singapore are closely interlinked. Indeed, following the former Prime Minister Lee Kuan Yew's tree planting campaign (launched 1963) and Garden City Campaign (launched 1967), the Public Works Department set about creating a specialist Parks and Trees Unit (established 1967). In 1973, this unit merged with the Singapore Botanic Gardens, which at that time was the lead organisation in providing the expertise and plant materials for the greening programmes. It eventually became, in 1975, the Parks and Recreation Department (under the Ministry of National Development), which was renamed NParks in 1996. The Botanic Gardens along with the island's nature reserves came under its management. As NParks continued to spearhead the maintenance of the garden city and its roadside greenery, developing new parks and upgrading existing ones, it also embarked on the development of a comprehensive network of park connectors to bring the island's parks and green spaces to the community and vice versa. NParks' headquarters are located in the Botanic Gardens.

Overseen by a 10-member board, NParks is a statutory board managed by a Chief Executive Officer and three Assistant and Deputy Chief Executives in charge of three 'clusters': Corporate Development and Services Cluster, Professional Development and Services Cluster (under which the Botanic Gardens sits) and Park Management and Lifestyle Cluster. NParks' remit includes 300 parks, four nature reserves, roadside greenery and the development of a comprehensive network of park connectors.

'Let's make Singapore our Garden' is NParks' vision. Its mission is "to create the best living environment through excellent greenery and recreation, in partnership with the community". NParks works towards achieving the following goals: to provide and manage stimulating, diverse and valuable greenery; inspire ownership and care for greenery and nature; promote 'green' recreation as a lifestyle; manage nature areas for the advancement of life sciences; and achieve organisational excellence.

Over the years, NParks' mission has evolved from creating a Garden City to creating a City in a Garden. In summary, the new vision is aimed at building a quality living environment for a vibrant community, a vision built upon a framework of six strategic thrusts: 'Establish world–class gardens' (which the Singapore Botanic Gardens falls under), 'Rejuvenate urban parks and enliven our streetscape', 'Optimise urban spaces and infrastructure for greenery and recreation', 'Enrich biodiversity in our urban environment', 'Enhance competencies of our landscape and horticulture industry' and 'Engage and inspire communities to co–create a greener Singapore'. A key strategy in the City in a Garden masterplan is to position the Singapore Botanic Gardens as an iconic world–class garden and to enhance it as a centre for heritage and botanical excellence.

NParks strives to deliver diverse educational initiatives relating to eco–awareness, nature and landscaping. Knowledge is conveyed through lesson plans, hands–on learning, confidence and skills–building activities, print and social media, broadcast, online resource packages, theatrical productions, upskilling, scholarships and awards and knowledge sharing among colleagues. The Singapore Botanic Gardens delivers a wide-ranging and quality educational programme at the site - 746 educational activities were run there between April 2012 and March 2013. The Centre for Urban Greenery and Ecology's (CUGE) programmes are also conducted at the Botanic Gardens.



14 Arborist at work



15 City in a Garden



FIGURE 7 LANDSCAPE FEATURES






The undulating topography, distribution of diverse vegetation, historic features, a limited number of structures and buildings, man-made lakes, several display gardens and view corridors all combine to create in detail the distinctive character of the many different parts of the Botanic Gardens that give it its sense of place and history. Figure 9 defines these different 'character areas' (i.e. areas or zones that have a relatively uniform and distinctive visual character in terms of landform, vegetation, features and experience. They are described in detail in Appendix i of **Appendix B. Figure 9** defines all the character areas that form part of the Botanic Gardens even though some of these are excluded from the Nominated Property. They are included here for completeness since they all contribute to the overall character and history of the Botanic Gardens.

#### **Botanic Gardens Core Zones**

NParks' 1980s masterplan for the Botanic Gardens acknowledged the large scale of the site and the long walking distance needed for visiting both ends of it. It also recognised the landscape diversity and multi-faceted character of different parts of the site together with the wide range of user types, including the local community, schools, tours, researchers, exercise groups and tourists. In providing for the latter in particular, the masterplan proposed and ultimately implemented improvements (see Box 7 in Section 2.b for further details) within the framework of three 'core zones', which now include a fourth one - the recently added Tyersall Learning Forest zone (learning zone). Today, each of the core zones still broadly provide access, amenities and facilities for different user groups and include in detail a range of different landscapes of varying character. Figure 9 therefore indicates the zones as follows:

- Tanglin Core historic zone.
- Central Core tourism/administration zone.
- Bukit Timah Core education/learning zone.
- Tyersall Learning Forest Core education/ learning zone.

In reality there is inevitably some overlap in zone management, functions, uses and character but the zones remain a useful way to understand and describe the complex existing landscape of the site at the broad level. It is important to note that the extant historic features (see **Figure 14**) that are the heritage attributes of the Nominated Property, whilst concentrated in the Tanglin Core, are also represented in all the other core zones, with the exception of the Tyersall Forest zone.

#### **Tanglin Core Zone**

This zone was the approximate site of the original pleasure gardens/Botanic Gardens and includes the Tanglin Gate (current gates dated 2006), the main historical entrance to the Gardens (originally a road entrance but now restricted to pedestrians). A new MRT station is planned opposite this gate. Throughout the zone the historic landscape and layout remains clearly evident. Niven's paths, ring roads, sweeping lawns and Swan Lake (1860s) still reflect his response to the topography and the influence of the English Landscape Style of the time.

**Display Gardens** (the 1980s *Vanda* 'Miss Joaquim' display, 2004 Sun Garden, 2005 Bonsai Garden and 1929 Sundial Garden) and a frangipani collection (to the east, dated 1920s) have been laid out on the gently sloping sides of Bandstand Hill (Character Area 5), on the top of which sits the decorative white painted Bandstand (1930), which is the focal but secluded point among the veteran tree canopies ad lawns. **Bandstand Hill**, which formed part of the 1860s design of the then pleasure gardens, commands the highest point in the original area of the Nominated Property. The layouts of the Sundial Garden, Sun garden and Bonsai collections all contrast with the more informal landscape surrounding them.



16 Bandstand Hill



24 NOMINATION DOCUMENT DESCRIPTION Swan Lake (Character Area 1) nestles at the foot of sloping lawns peppered with a wide variety of specimen and veteran trees. Although tropical in appearance, the lake setting reflects its historic character, which was intended to emulate British pleasure gardens/public parks, with a wide promenade following a large water body and scattered trees set within mown grass. The Marsh Garden, laid out in 1969, is located to the south and incorporates the remnants of a rhinoceros wallow and alligator ponds present in the Botanic Gardens during the late 19th century, when the Botanic Gardens contained such zoological collections.



17 Swan Lake and surrounding lawns

The **Ginger Garden** (Character Area 6) is filled with lush tropical planting showcasing over 550 different types of gingers and species in the related families of the heliconias, bird–of–paradise, bananas and arrowroot. The Halia restaurant complex, opened in April 2001, occupies the northern end of this Ginger Garden and serves some of the visitors going to the National Orchid Garden from the coach drop off.



18 Ginger Garden

The water supply for Swan Lake originates from the Tyersall Learning Forest, entering the site in the area known as The Dell, located by the Swan Lake's northern extremity. First developed as a fernery in the early 1880s, it has retained its distinctive character. The sheltered, humid environment favours certain unusual plants, such as *Monophyllaea horsfieldii*, though it does not have a taxonomic collections focus. There is an abundance of tall Dracaena along the various paths and a number of large and climbing Araceae. Attractive ferns and fern allies can be found in the shadiest spots.

The Botany Centre and Green Pavilion (Character Area 3), which were built in 2006, feature Singapore's first pitched green roof and accommodate research facilities and the visitor information centre for arrivals at the Tanglin Gate or Botany Centre itself. An imposing veteran tree, Callophyllum inophyllum, which influenced the layout of the Botany Centre, stands tall at its centre. A large lawn slopes southwards to the west of the Centre, with the Green Gallery (2013) and Holttum Hall (1921, today housing the Heritage Museum) on the crest of the slope. Ridley Hall (1882) is located immediately to the north of the Botany Centre. The administrative/research centre of the Botanic Gardens has been located in this part of the Botanic Gardens since the late 19th century.



19 The Botany Centre

The **Potting Yard** area (dating back to the 1880s), **Fernery Garden** (1980), **Aroid Garden** (1999) and Plant House Garden (first established in 1882 and redesigned in the 1950s) are located at the foot of an east facing slope enclosed in dense vegetation, close to Cluny Road (Character Area 4). The shady **Plant House Garden** is more symmetrical and formal in appearance/design than most of the rest of the Botanic Gardens (with the exception of the Sundial Garden). It originally contained a large rectangular 'plant/exhibition house' (completed in 1882 and roofed in 1885) erected to accommodate public flower shows and displays of potted plants and annuals (some of which were for sale). It now comprises a grass quadrangle surrounded by pergolas, with a central water lily pond (completed 1958).



20 The Plant House

North of Bandstand Hill, a raised boardwalk leads visitors through a tract of dense and tall **primary rainforest**. Only limited glimpses of the sky can be achieved through small openings in the canopy of the mature forest trees. A total of 300 tree species have been recorded in the Rainforest by the Botanic Gardens' scientists, but many of these are represented by few or solitary individuals, as is to be expected in such a small area of species–rich vegetation. This element of the Botanic Gardens was carefully preserved and integrated into the landscape from the outset.



21 Rainforest

**Central Core Zone** 

Once part of the Economic Gardens, this zone now includes primary tourist attractions - **Visitor Welcome Centre Plaza/Palm Court** and amenity facilities, closely related to a parking and drop-off zone (at the Nassim Gate on Cluny Road); NParks' headquarters buildings; the National Orchid Gardens and the historic Palm Valley. Most of this area was redeveloped during the 90s following the 1980's masterplan. Key veteran trees, other heritage features and buildings were carefully retained.

**E.J.H. Corner House**, a traditional Black and White style bungalow completed in 1910, dominates a small grass hill to the west. It is set among lush tropical planting and includes a small domestic scale garden immediately adjacent to the house. A diverse collection of palms contiguous with those of the nearby Palm Valley is located on the south side of the house.

Palm Valley (Character Area 8), planted from 1879 (where an Economic Garden developed under Murton's superintendence once stood), stretches northwards from Orchid Plaza, gently sloping down to Symphony Lake. This large expanse of grass, with multiple scattered mature palms of varying sizes (c.220 species represented) and other tree species, is nestled in a shallow valley between the Rainforest and the National Orchid Garden (whose eastern side once included part of the original extent of Palm Valley). While being more open in character than other parts of the Botanic Gardens, the many palms and topography still limit full panoramic views. Symphony Lake dominates the northern end of this character area, with its iconic stage (the Shaw Symphony Stage, built in 2005 to replace an earlier stage erected in 1995) providing a focal point in views along the valley. An arrow (installed in 1974-76) emerges from the lake, pointing towards Greenwich, London. This marks the location of a temporary station for the observation of terrestrial magnetism set up in the Gardens in 1914. Broad views to the south are afforded from the Viewing Terrace. A series of beds located along Heliconia Walk (to the east, dated 1998) showcase the larger growing and more spectacular species of this genus. This strengthens the lush tropical character of Palm Valley.

26 NOMINATION DOCUMENT DESCRIPTION



22 Palm Court



23 Symphony Lake

The National Orchid Garden (Character Area 9), which represents the largest permanent display of orchids in the world, was designed to showcase the products of the Botanic Gardens' orchid breeding programme. It was completed in 1995 and is sited on the side of the hill upon which Burkill Hall (1868), a black and white plantation style bungalow is located. The winding paths of the orchid gardens lead visitors through this secluded and lush landscape showcasing a tapestry of orchid blooms of all shapes, shades and sizes. The misthouse (1995), bromeliad enclosure (1995) and cool house (2004) provide further specialist tropical display gardens within the National Orchid Garden. The latter houses an artificially controlled montane tropical cloud forest display with trees and rocks draped with orchids and carnivorous plants. The Orchid Plaza at the entrance to the National Orchid Garden provides a key meeting place, overlooking Palm Valley and providing access into the National Orchid Garden to the west and Ginger Garden to the south.

A small semi–wild remnant of freshwater swamp (where water runs through throughout the year), the **Orchid Nursery** and mature trees are located to the north. The latter are mostly assumed to have been transplanted from the former Economic Gardens. Indeed, from 1918 until the early 1920s a number of valuable fruit and timber species were transplanted from the Economic Gardens, which were expected to be lost. Transplanted trees included durian, tamarind, *Diospyros blancoi*, mahoganies (African and American), *Erythrophleum guineense* and *Sterculia foetida*. These are now the largest examples of these species in the Botanic Gardens and will be made accessible to the public after the National Orchid Garden undergoes refurbishment during 2014–2018.



24 Palm Valley



25 Orchid Garden

The Raffles Building (Character Area 11) completed in 1958 and adjacent carpark/food and beverage facility dominate the north-east corner of this zone.



26 Raffles Building

#### **Bukit Timah Core Zone**

This zone includes the redevelopment of the old Economic Gardens and later the former Raffles College Grounds. Most parts of the zone have relatively recently been recreated as a family landscape for the participation and demonstration of active living and learning through the appreciation of themed plant areas, speciality gardens and play. The zone has public access with parking at the Cluny Park Gate or via the existing MRT Station at the junction of Cluny Road and Bukit Timah Road. Another MRT station for a different MRT line is also under construction along the northern boundary of this zone. The Botanic Gardens' plant resource centre (1995, located outside the boundary of the Nominated Property) for rare plant propagation and acclimatisation, staff training, conservation and education is also located on the northern boundary.

The **Eco Lake** and its surroundings (Character Area 15) has a gently undulating topography, with small grass man-made mounds topped with wooden shelters overlooking the Eco Lake. It is generally open with views possible across it and to high rise buildings located beyond the site boundary. The Eco Lake, a naturalistic lake with a shingle shore and swamp plants along its margins, dominates the area. A number of plant collections/display gardens (fruit trees, spices, bamboo/reflexology, trellis garden and foliage garden) are dotted around the lake providing variety and ornamental interest. Planting here is generally not yet fully mature.

The **Jacob Ballas Children's Garden** (Character Area 16) was designed and planted from 2004 to 2007 to provide a unique discovery and learning experience in a garden setting for children of up to 12 years of age. Set in woodland it includes interactive play equipment, indoor and outdoor living classrooms, hands-on gardens, sensory garden and maze. A reception centre and car park are located to the east of the area.

The **Evolution Garden** (Character Area 13) was laid out in 2005 on a small open hill, once the site of the Economic Gardens' worker housing. It is visually enclosed by dense tree planting. A winding path takes the visitor on a journey revealing different epochs of time and exhibits the evolution of plant life. Specimens, outcrops of rocks, large boulders and fossils (some real and some artificial) border both sides of the main path spiralling to the base of the hill, giving it a distinctive character. Its south– western and eastern edges contain older plantings of timber trees.

Completed as a new speciality garden in 2011, the Healing Garden (Character Area 12) replaced college land bearing derelict university outbuildings, a few large trees (retained) and some smaller trees, shrubs and lawn. The Healing Garden is located adjacent to the old university houses and is laid out over sloping and terraced ground facing south-east. A complex of winding paths leads the visitors through generally new plantings (which includes highly floriferous herbaceous species) interspersed with tall tree specimens (including veteran trees such as Palaquium obovatum, planted by Ridley in the then Economic Gardens) which give it a distinctive character. 500 species of plants used for traditional medicine in Southeast Asia are laid out in the shape of the human body, the plantings corresponding to those body areas the plants are used to treat. This garden surrounds the former Economic Gardens' historic Field Assistant's House (House 6, completed in 1919) and includes mature oil palms dating from c.1920, likely to have been planted as sources of seed for the nascent plantation industry at the time.



27 Eco Lake



28 Jacob Ballas Childrens' Garden

Five houses and their setting (Character Area 14), originally constructed between 1924 and 1928 for the former Raffles College, are located along the edge of a hilltop (set back against the Botanic Garden's boundary), which slopes down steeply to the west. This part of the zone, unlike the younger planting to the north, contains numerous mature trees (including old tembusu trees and palms dating back to the 1920s). The Garage (built sometime 1924 and 1928) is located at the foot of the hill below the five houses, with old nutmeg and durian trees in between. The Fragrant Garden completed in 2013 (replacing derelict university out-buildings) wraps around House 5 and contains new planting including diverse shrubs and herbs with sweetsmelling flowers. Chinese tombs (1842–81) set within an open grass lawn with scattered shrubs and trees are located to the north-east of the zone.



29 Evolution Garden



30 Steep slopes below Old College Houses



31 Healing Garden



32 Fragrant Garden



#### **Tyersall Learning Forest Core Zone**

This whole zone comprises century-old dense secondary forest overgrown with laurel, Albizia and towering tembusu trees, some of which were planted in 1862. Vegetation currently blocks views in and out. Recently added as an extension to the Botanic Gardens, this zone will be developed into a 'learning forest'. This will involve the conservation of existing biodiversity, curation of botanical collections, establishment of better connectivity with the Rainforest, repositioning of the existing Tyersall Avenue, restructuring of visitor access to the National Orchid Garden/Ginger Garden, creation of fresh water swamp forest and extension of the National Orchid Garden nursery. It is anticipated that this project will be completed by the end of 2015.



33 Tyersall Forest

#### Trees

Trees are an important component of the Nominated Property, contributing strongly to its character and overall structure. The site contains a wide variety of trees, of varying ages, planted for scientific/botanical research, conservation and/ or horticultural/aesthetic purposes. A number of trees are over 100 years old and some pre-date the site's creation. 44 trees have been designated as Heritage Trees (qualifying criteria include: a girth of more than 5 metres, rarity of species and historical significance). These are listed in **Appendix C.** 

#### **Buildings and Structures in the Landscape**

**Historic Buildings in the Botanic Gardens** 

Many of the historic buildings of the Singapore Botanic Gardens reflect a tradition of providing housing for officials and administrators during the colonial era. While Burkill Hall and E.J.H. Corner House were constructed as residences for the Botanic Gardens' Directors and Assistants, Holttum Hall and Ridley Hall were constructed as administrative buildings (offices, laboratories and library/herbarium). House 6 and the Garage were built in 1919 and 1924–28, serving as the residence of the Field Assistant and parking space for College staff respectively. Houses 1-5, on the other hand, were built between 1924-28 to provide accommodation and offices for academics working in the then newly constructed Raffles College, Singapore's first tertiary college (later these were used as the bases for various university faculties), built on land which had previously formed part of the Botanic Gardens.

Raffles Hall was not built until the 1950s and was intended as a residence for college students. Extant as well as lost historic buildings in the Botanic Gardens were generally modest, wooden and domestic in scale and were often placed in locations deemed convenient for the operational requirements of the site at the time. The early institutional buildings of the Botanic Gardens were also domestic in scale and were built in the styles popularly used for residential buildings of their time. **Box 2** provides more detailed historical architectural context for the buildings in the Botanic Gardens.

#### **Built Features**

**Figure 10** indicates the location of all built features in the Singapore Botanic Gardens including those located outside of the boundary of the Nominated Property. The Nominated Property contains a range of built heritage features which are living testaments to the site's different phases of development, the renowned figures who lived in them and also the architectural history of Singapore. The earliest structure to have been erected within the Nominated Property is Burkill Hall (1868) and the most recent City Development Limited (CDL) Green Gallery outside Holttum Hall (2013). The following sections consider all built features located within the Nominated Property.



FIGURE 10 BUILT FEATURES

# BOX 2 ARCHITECTURE OF BUNGALOWS IN SINGAPORE

Amid Singapore's collective built environment, enlivened by a plethora of architectural styles, forms and cultural influences, certain forms of architecture such as the colonial bungalow stand out. Some of the historic buildings of the Singapore Botanic Gardens reflect periods of the evolution of the colonial bungalow in Singapore. The houses or bungalows in the Botanic Gardens built at various times between 1868 (Burkill Hall) and the 1920s (Holttum Hall) also reflect a tradition of providing housing for officials during the colonial era.

Houses built for the English in Asia and Africa during the colonial era are frequently referred to as 'bungalows'. However, the word has been employed to describe a broad range of building types in different cultural contexts over the centuries. From its origins in India where they were first adapted by the East India Company in the 17th century, the colonial bungalow spread to various outposts of the Empire, including Singapore. Anglo–Indian neoclassical style was utilised for the early examples which were single–storey, square or rectangular forms raised on plinths and featured hipped thatched roofs supported by timber or bamboo pillars. These pillars also supported the elevated verandahs surrounding the house which helped cool Europeans unused to living in such hot and humid tropical climates. Later designs were typically two–storey, symmetrical in appearance and with a forward projecting portico. Living rooms were placed on the upper floor and offices located on the ground floor.

A product of the British Arts and Crafts movement, the Black and White style house or bungalow is a kind of tropical version of mock Tudor or Tudorbethan, a style popularised in England in the Edwardian period (early 20th century). Characterised by a stuccoed brick base, stuccoed Doric or Tuscan columns of load bearing masonry, and a timber framed upper floor, with interlocking clay 'Singapore' tiles to the roof, the typical colour scheme of these Singaporean houses was not an original feature but became fashionable later. The living and dining rooms were placed downstairs with a central staircase up to a central 'lounge verandah' extending over a projecting porch with bedrooms off it to either side. The Black and White house came to epitomise social distinction in the colony. With some exceptions, the Black and White era ended in Singapore with the end of the World War I building boom. Few privately built examples remain today although some of the military housing from the post–World War II period, while much altered internally, has survived. Another two types of bungalows emerged in the first half of the 20th century, although these were often constructed from reinforced concrete, sometimes with some timber frame elements remaining.

The Art Deco bungalow of the late 1920s – 1930s is noted for the stylisation of classical motifs and the reduction of ornamental mouldings and profiles. The houses were being adapted to more compact family living, with formerly exterior functions now being incorporated into the main house. Later stages saw verandahs disappearing from the front of the houses. Bungalows of the 1950s–1960s often had asymmetrical floor plans, no ornamentation and were characterised by overhanging concrete sunshading fins, patterned vents above windows, occasional circular windows and curved corners.



34 Burkill Hall

Additional information is provided in **Appendix D**. This section has been informed by ICOMOS Singapore Ltd's *Research Report* (2013).

#### Chinese Graves (Figure 10 – No. 6)

Three historic tombs are located close to the entrance to NUS' Faculty of Law. The oldest tomb is that of a husband and wife buried together in 1842<sup>4</sup>. The tablet was erected by the couple's grandson. A second tomb (with two separate tombstones) is located nearby, where another couple was buried next to one another, by their daughter and grandsons in 1881. Research has revealed that it is likely that the descendants of the tomb dated 1842 and those dated 1881 were related. A third tomb is also located nearby but is missing its tablet. The site where the tombs were erected is likely to have formed part of a series of gambier plantations (as described in J.T. Thomson's 1841-45 working map and G. D. Coleman's 1836 Map of Singapore). These heritage features are important in their own right but also provide a link to an earlier use and occupants of this part of the Botanic Gardens.

The tombs possibly represent the oldest surviving evidence of the presence of Chinese settlers in the early 19th century. Older burials are present in Bukit Brown, but the 1842 grave found in the Botanic Gardens is the oldest *in situ* burial since those at Bukit Timah were moved there during the 1940s. Very few intact artefacts pre–dating 1842 survive in Singapore, with the exception of one or two Chinese temples.



35 Chinese Grave

Buildings of the Former Raffles College (Figure 10 – Nos. 7–12 and 14)

Buildings of the former Raffles College include Houses 1–5 (designated as Conserved Buildings in 2006), the Raffles Building (Hall) (designated as a Conserved Building in 2006) and the Garage (designated as a Conserved Building in 2013).

#### Houses 1–5

Although located within the Botanic Gardens, this group of five houses, positioned in a crescent form around the former Raffles College (which was gazetted as a National Monument in 2009), were built sometime between 1924 and 1928 as part of the staff housing provision for the College (by the 1960s, they had become faculty buildings). The land on which the former college is located originally formed part of the Botanic Gardens' Economic Gardens.

The former Raffles College, officially opened in 1929, was designed by the architects Cyril A. Farey (1988–1954) and Graham R. Dawbarn (1893–1976), London–based architects who won the commission in an (British) empire–wide architectural competition held in 1922. Local architectural firm Swan and Maclaren supervised the construction. It can be assumed that Farey and Dawbarn were also the architects of Houses 1–5. Both architects have housing schemes that have been published in England.

The five houses (bungalows) are in the then prevalent Arts and Crafts style with some Art Deco elements. The sheer architectonic expression and response to the tropical climate makes them somewhat severe. No single house has survived intact with all of its original features, but the survival of different features in the various houses provides a good understanding of their original layout and character. These blockish double-storey houses, with bays numbered in an octastyle, are modest but well-proportioned, combining characteristics of the traditional Singapore colonial bungalow with features of English domestic houses of the time, such as a prominent central staircase and various decorative finishes. Their design calls for an over-sailing gablehip roof with extensive eaves, supported on timber shoulders. This in turn creates impressive shadows that fall on the walls and side-shoulders.

<sup>4</sup> Possibly the oldest *in situ* tomb on the island. This belongs to Qiu Zheng Zhi and his wife, Li Ci Shu. Nearby are two other tombs belonging to Huang Hui Shi and his wife Si Ma Ni (Information from ICOMOS Singapore Ltd *Research Report*, 2013).

Within the context of the Singapore/Straits Settlements bungalow, they share some but not all of the characteristics of the Art Deco bungalow, which is of the same period. Unlike the Art Deco bungalow, these houses have a symmetrical layout and retain the entrance hallway and the separate outhouse/ ancillary building. The verandah, however, is no longer visible on the front of the house, but appears only on the first floor facing the rear. All the houses are situated so that their gardens look down onto the Botanic Gardens and are largely secluded by vegetation. On the front the houses look onto what has become a ring road around the college buildings.

Houses 1–5 do not strictly conform to the defined forms of the Singapore/Straits Settlements bungalow but rather represent a unique type that should be considered in the evolutionary history of the bungalow between the Black and White and the Art Deco types. These well–proportioned and well–built domestic residences uniquely combine elements of the traditional bungalow with British Edwardian period features at a key evolutionary stage of the Singapore/Straits Settlements bungalow.

#### House 1 (originally named Kedah House)

House 1 is a two-storey, seven-bay house, with a hipped tiled roof and rendered finish, currently occupied by the offices of the Centre for Urban Greenery and Ecology (CUGE). It comprises a simple porch at its centre with half-round arches to the side, a balcony above and distinct water sprouts to either side. The windows on the front and side elevations are side-hung casements, with a glazed double door with side-lights and overlight onto the balcony. The front door has a lattice pattern with glazing and overlight, with a narrow window to either side, also with the same lattice pattern.

The machine-tiled roof has deep sprocketed eaves supported by timber brackets. On the rear (garden) elevation the central staircase tower is defined by a blank base and high-level casement windows, some with shutters, up to the distinctly pointed eaves. The upper floor windows are a continuous run of casement windows on both sides with louvers to the top pane. On the ground floor on each side a central glazed double door with side-lights and overlight of louvered vents is flanked by a casement window on either side, also with louvered vents at the top. The ancillary building to the southwest shown on a 1950s aerial photograph no longer remains. House 1 is lower than the road level and a large modern canopy has been erected in front of the building. It also now faces a number of modern college buildings.

#### House 2

House 2 is a two-storey, seven-bay house, with a hipped tiled roof and rendered finish, currently occupied by NUS' Faculty of Law's Society Guild House. It comprises a simple porch at its centre with halfround arches to the side, balcony above and distinct water sprouts to either side. The windows on the front and side elevations are side-hung casements with shutters. There is a glazed double door with side-lights and overlight with lattice pattern onto the balcony. The front door has a lattice pattern with glazing and overlight, with a narrow window to either side, also with the same lattice pattern. The machine-tiled roof has deep sprocketed eaves supported by timber brackets. On the rear (garden) elevation the central staircase tower is defined by a blank base and high-level casement windows up to the distinctly pointed eaves.

The upper floor verandah of House 2 remains open with louvered shading to the top part. On the ground floor there are three openings to each side, with louvered vents on one side and with double doors and overlight with the lattice pattern on the other side (possibly added later). A single–storey covered walkway on the north–west with a scalloped concrete trellis and tiled roof connects the property to a single– storey ancillary building. This building is shown on a 1950 aerial photograph and is likely to be part of the original design. House 2 now faces a number of modern college buildings.

#### House 3 (originally named Johore House)

House 3 is a two-storey, seven-bay house, with a hipped tiled roof and rendered finish, currently occupied by NParks Facilities Management Team. It comprises a simple porch at its centre with half-round arches to the side, balcony above and distinct water sprouts to either side. The windows on the front and side elevations are side-hung casements, with a glazed double door with side-lights and overlight onto the balcony. The front door has a lattice pattern with glazing and overlight, with a narrow window to either side, also with the same lattice pattern. The machinetiled roof has deep sprocketed eaves supported by timber brackets. On the rear (garden) elevation the central staircase tower is defined by a blank base and



36 House 1



37 House 2



38 House 3



39 House 4

high–level casement windows up to the distinctly pointed eaves. The upper floor windows are a continuous run of casement windows on both sides. On the ground floor, on each side, a central glazed double door with side–lights and overlight is flanked by a casement window on either side. A single–storey covered walkway on the east with a scalloped concrete trellis and tiled roof connects the property to a single– storey ancillary building running north south. This building is shown on a 1950 aerial photograph and is likely to be part of the original design. House 3 remains in close proximity to the historic college buildings with which it still forms a discernible group.

#### House 4 (originally named Mansfield Lodge)

House 4 is the slightly larger and grander of the five houses, originally intended for the College President. In the layout of the crescent it is positioned very slightly off centre to the college buildings, shown with a circular driveway with 'in' and 'out' access on a 1950 aerial photo, where all the other houses have a single driveway entrance.

It is a two-storey, seven-bay house, with a hipped tiled roof and rendered finish, currently used as a restaurant. It includes a porch with half-round arches to the side and front, with a glazed verandah above positioned at the centre. The windows on the front and side elevations are side-hung casements, the ground floor ones having shutters. The windows on the first floor verandah are modern with shutters. The front door has a lattice pattern with glazing and overlight, with a narrow window on either side. The machinetiled roof has deep sprocketed eaves supported by timber brackets. On the rear (garden) elevation the central staircase tower is defined by a blank base and high-level casement windows up to the eaves with louvered shutters. The upper floor windows are a continuous run of casement windows, though much has been altered or replaced.

A single–storey covered walkway survives on the north–west with a scalloped concrete trellis and tiled roof connecting the property to a single–storey ancillary building. This building is one of two, one on each side, seen on a 1950 aerial photograph. The building to the north–east has since been removed and replaced by a single–storey extension. House 4, being placed on the same axis as the President's house, remains in close proximity to the historic college buildings with which it still forms a discernible group.

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#### House 5

House 5 is a two-storey, seven-bay house, with a hipped tiled roof and rendered finish, currently occupied by the Institute of Policy Studies. It comprises a simple porch at its centre with half-round arches to the side, a balcony above and distinct water sprouts to either side. The windows on the front and side elevations are side-hung casements, with a glazed double door with side-lights and overlight onto the balcony. The front door has a lattice pattern with glazing and overlight, with a narrow window to either side, also with the same lattice pattern. The machine-tiled roof has deep sprocketed eaves supported by timber brackets. On the rear (garden) elevation the central staircase tower is defined by a blank base and high level casement windows up to the distinctly pointed eaves. The upper floor windows are a continuous run of casement windows on both sides with shutters. On the ground floor the walls are largely blank with small ventilation openings. A single-storey ancillary building to the southwest shown on a 1950 aerial photograph has been replaced by a new twostorey building. House 5 remains in close proximity to the historic college buildings with which it still forms a discernible group. To its side a new two-storey building has been erected.

#### Raffles Hall (now known as the Raffles Building)

Founded in 1958, Raffles Hall was the first residential hall for students to be established at the Bukit Timah campus, along Evans Road (on the outer edges of the Botanic Gardens). The building is mainly constructed in reinforced concrete with three connecting wings. It is raised off the ground on thin round pilotis, a characteristic architectural feature of the era. The circulation cores are well-ventilated and finished with differentiated patterns across the building which add visual interest to the façades. At one wing, the façade is composed of windows that are angled to give better ventilation and privacy. The windows also have a decorative infill metal panel beneath them, with solid colours that contrast with the walls. Overall, a different variety of materials and textures are used across the different façades of the well-proportioned building, resulting in a pleasing visual composition.

# The Garage (Figure 10 – No. 7)

The Garage, located by the Foliage Garden, was completed sometime between 1924 and 1928. Used today as storage space, it was originally intended to be used by a number of college professors/high ranking officials to park their vehicles. The Garage is a seven-bay, two-storey service building with a rendered finish and a hipped machine-tiled roof, constructed against a slope. It is well-proportioned and executed in a distinctly Art Deco style, with a modernist aesthetic. The ground floor is formed of a plinth with half-round arched entrances to the garages. The first floor is set back from the front and sides and accessed by a staircase from either side. The windows to the front are casements with overlights. The rear elevation opens onto a small courtyard with the service rooms (kitchen and bathroom) located to either side. The rear elevation is glazed with long strips of casement windows intercepted by structural columns. The ground floor is made up of individual garage spaces with new metal roller doors. The first floor is a single open space with an exposed timber truss roof. It should be noted that the building has some termite damage and a leaking roof, issues which are scheduled to be addressed during 2014.

#### House 6 (Figure 10 – No. 13)

This property was built as the Field Assistant's house and was competed in 1919. It is however unclear how long it was used for this purpose as the Field Assistant position became redundant with the replacement of most of the Economic Gardens with the former Raffles College. It is currently occupied by the National Biodiversity Centre and is largely secluded by vegetation. It consists of a two-storey, five-bay house with a hipped tiled roof and rendered finish. Concrete string courses run beneath and above the windows, extending into shade canopies over the windows. There is a porch at the centre with half-round arches to the side and front, glazed in above. The windows on the front and side elevations are side-hung casements. The front door, up five steps, is a modern replacement with a narrow window to either side. On the rear elevation the central staircase tower projects out. A single-storey ancillary building to the rear is connected to the house by a covered walkway.

This modest domestic building illustrates a transition from the traditional 19th century colonial bungalow to the later period of Public Works Department housing. It was designated a Conserved Building in 2013.



40 House 5



41 Raffles Building



42 The Garage



43 House 6

# Visitor Centre and National Parks Board Headquarters (Figure 10 – Nos. 15 and 16)

The visitor centre and NParks Headquarters buildings were both constructed in 1998. They are located close to the Nassim Gate. The visitor centre is a timber structure with shingle roof tiles and decorative motives in coloured glass while the NParks headquarters is a partly concrete, partly timber structure with shingle roof tiles. The latter comprises two floors and a basement carpark.

#### E.J.H. Corner House (Figure 10 – No. 17)

This house was built in 1910 and was intended as the residence of the Botanic Gardens' serving Assistant Curators – it is currently used as a restaurant. It is named after Edred John Henry Corner (Assistant Director and its occupant between 1929 and 1946) who specialised in mycology including the collection and study of local fungi. His most famous botanical work, however, is Wayside Trees of Malaya, still the key reference for those interested in the region's trees. During the war Kiyohiko Watanabe (the then assistant of Director Koriba) resided in the house. He is known



44 Visitor Centre and National Parks Board Headquarters



45 E.J.H. Corner House

for having produced over 400 pen and ink drawings of economic plants during his time in Singapore (Tinsley, 2009).

E.J.H. Corner House belongs to a generic group of two-storey Black and White style timber bungalows that government engineers and architects built during the colonial days. It however has its own peculiarities such as the gable-hip roof with front shoulders and attached lean-to-to projections on three sides.

The rendered masonry base with a porte–cochere in the centre of four plain classical style pilasters and pilasters on either side forming the ground floor verandah, supports the first floor timber frame structure with elegantly shaped timber brackets. The half–hipped roof with a gable end to the front has Singapore tiles. The gable end is half–timbered with a simple bargeboard. There are also boarded eaves in the black and white fashion.

The house is organised around interior rooms at the rear, a wide porch at the front and verandah to the side on the ground floor and a large open verandah (lounge verandah) over the porch and to the side on the first floor (which is glassed in). A timber staircase to the side of the entrance porch with square newel posts, half–round handrail and stick balusters connects the two floors. A narrow balcony/verandah at the rear with a second staircase in a similar style connects to the ancillary service block at the rear.

The house was originally located on Cluny Road when this formed the boundary of the Botanic Gardens and was known as 30 Cluny Road. Today it is set among lush vegetation – but it is unclear if this was always the case or the design intention. It is executed to a high level of craftsmanship and is of a climatically sensitive design, with a 'harmonious expression of solid and void on the external façades'. The interior has been restored and updated to accommodate a modern restaurant function, though the main elements of the layout have been retained. It was designated a Conserved Building in May 2008.

#### Symphony Stage (Figure 10 – No. 18)

The Symphony Stage (also known as the Shaw Foundation Symphony Stage) is a prominent feature built on an islet at the southern end of Symphony Lake (an artificial lake located at the northern end of Palm Valley). It plays host to different concerts and performances throughout the year including concerts by the Singapore Symphony Orchestra. The stage's design is inspired by its setting in the Palm Valley. Echoing the organic forms of flowers and leaves, the structure consists of two overlapping petal-like forms growing out of a floral stem. The bigger petal shelters the stage while the smaller one at the rear houses the changing area and support services. The petal-like form of the roof is constructed from free-standing steel ribs and cladded with a titanium zinc roof which allows the complex curvature to be achieved. The ribbed texture of the roof also evokes the venation of flowers and leaves. The stage was completed in 2005, replacing an earlier stage (1995).



46 Symphony Stage



47 Cool House

## National Orchid Garden Structures and Nursery (Figure 10 – No. 19–21 and 23)

The National Orchid Garden zone contains the following structures/buildings:

- Entrance Pavilion a one–storey timber pavilion with shingle roof tiles, completed in 1995, forms the ticket office/entrance to the National Orchid Garden and houses a shop (renovation/ remodelling works are planned for 2014–16).
- Tan Hoon Siang misthouse and Yuen–Peng McNeice bromeliad enclosure, both erected in 1995 when the National Orchid Garden was first laid out. Both of these structures are approximately 3m high, have green painted steel frames and green coloured knitted wire mesh. The misthouse has wire mesh walls and ceiling, while the bromeliad structure only has a wire mesh ceiling.
- A metal and glass cool house, accessed via a raised wooden boardwalk with metal railings, which also runs through the cool house itself. Completed in 2004 (as prototypes to test its viability prior to use in other Singaporean gardens such as Gardens by the Bay) it provides a refrigerated space (often filled with mist) which allows a selection of tropical mountain species of various plant families to be grown at the Botanic Gardens.
- The National Orchid Garden's nursery is located immediately adjacent to its northern boundary.
   It includes a small office building and two caged shade houses (renovation/remodelling works are planned for 2014–16).

#### Burkill Hall (Figure 10 – No. 22)

Built in 1868, Burkill Hall was intended as the residence of the serving Manager, Superintendent or Director of the Botanic Gardens. It was named after two of the directors, Isaac Henry Burkill (Director between 1912 and 1925) and Humphrey Morrison Burkill (Director between 1957 and 1969), both of whom resided at the house. The latter was also born there.

Botanic Garden superintendents who lived at Burkill Hall included Laurence Niven (who lived there between 1868 and 1875), followed by James Murton (1875–1880), Nathaniel Cantley (1880/01–1887) and then Henry Ridley (1888–1912) as the first director, all of whom were influential in the introduction of plantation crops to Southeast Asia. Isaac Henry Burkill was the author of the Dictionary of the Economic Products of the Malay Peninsula (1935), which is to this day one of the most comprehensive texts on the uses of tropical plants. His son Humphrey Morrison Burkill (Director between 1957– 1969) is best known for his research into Malayan seaweeds and steering the Botanic Gardens through tough times in the 1960s. The property was slightly damaged during the Japanese occupation, having been shelled. This fractured the ceiling and left a hole in a corner near the roof (Tinsley, 2009).

Burkill Hall is a two-storey symmetrical Black and White bungalow of the plantation style (Davison, 2010). The square ground floor is made up of 4 x 4 square classical style pilasters, partly filled in with masonry around the external boundary. A central forward-projecting entrance porch also with stuccoed pilasters and stuccoed Tuscan order columns above it supports the first floor timber frame and open central verandah. Double-height timber columns on a masonry base support the roof structure as well as the narrow verandahs to the side. The near pyramidal hipped roof is made of Singapore tiles laid directly onto the timber roof structure. The walls are rendered with the timber frame visible around the edges and the visible gable walls are half-timbered. The verandah railings are timber and the windows are casements with louvered shutters. A covered walkway leads to a two-storey ancillary service building to the rear. The 'sitting-verandahs' are an outstanding feature, suspended under the broad-eaves along a longitudinal axis. The arrangement uniquely conveys a 'wind-tunnel effect' via the central hall that opens to bedrooms on both sides.



48 Burkill Hall

Burkill Hall is not only the oldest surviving building in the Botanic Gardens but also a good and rare example of a plantation style Black and White Straits Settlements bungalow. As such it also exemplifies the climatic functionality of the colonial bungalow with its overhanging eaves and internal air circulation, leading one commentator to describe it as being 'one of Singapore's most environment–friendly buildings' (Powell, 1994). Moreover, it was the home of successive superintendents/directors of the Botanic Gardens, all of whom not only played a key role in the development of the Botanic Gardens, but also contributed significantly to accomplishments in tropical biodiversity research/understanding. It was designated a Conserved Building in May 2008.

## Halia Restaurant Complex (Figure 10 – No. 24)

The Halia restaurant complex, a one-storey complex including a restaurant and separate function rooms (located either side of the main path through the Ginger Garden) was opened at the northern end of the Ginger Garden in April 2001. These are fairly simple buildings, with a rendered finish and clay roof tiles, and are due to be modified in 2013/14.

# Potting Yard Buildings (Figure 10 – No. 25)

A nursery was opened in 1882 in the area currently known as the potting yard. The old building, constructed in wood, which is now used as an office and storeroom, was re–roofed with a corrugated metal roof in 2007. A number of buildings have been added in the potting yard area including:

- Training facilities added in 1999 for the School of Horticulture, in the form of a temporary shed–like structure. This structure has a modular metal sheet wall finish and corrugated metal roof. It was enhanced with additional classrooms in 2005 by CUGE and is still used by them for conducting training/educational courses.
- An enclosed building with a modular metal sheet wall finish and corrugated metal roof, built in late 1980s.
   It currently houses the Landscape Technician's office and a storeroom for exhibition materials.
- Two cool houses with air-conditioning and misting for orchids, gingers, Hoya and Gesneriaceae (year of construction currently unknown).



49 Halia Restaurant Complex



50 Potting yard buildings (the logs are used for chainsaw training)



51 Brick steps detail



52 Pergola in the Plant House Garden

- A block of metal sheds built in 2009 to store golf carts.
- A toilet block with a corrugated metal roof finish, built in 2009.
- Two rows of metal sheds built in 2007 to store landscape tools and leaf mulch.

Pergolas and Brick Steps in the Plant House Garden (Figure 10 – No. 26)

The Plant House Garden (which originally contained a large 'plant/exhibition house' constructed in 1882 and roofed in 1885, to accommodate public flower shows and displays of potted plants and annuals, some of which were for sale), now comprises a grass quadrangle with a central water lily pond (completed 1958). Pergolas draped in plants provide a shaded walkway around all four sides of the quadrangle. The eastern and western pergolas consist of brick pillars supporting cross-beams and a sturdy open lattice. The northern and southern pergolas are made of steel. The raised beds edged with coral limestones are the oldest features of this garden area but it remains unclear whether they are contemporary with the original plant/ exhibition house. The original 'plant/exhibition house' structure also included an extension for orchids at its northern extremity (erected in 1889), which is now a fernery. Brick steps, made during World War II by Australian prisoners of war, provide access down to the Plant House Garden.

#### Pergola by Sun Garden (Figure 10 – No. 27)

A pergola consisting of re–used bricks and timber is located close to the Sun Garden, connecting the Upper and Lower Ring roads to the south–west part of Bandstand Hill. Originally erected in 1935, the pergola was rebuilt in 1957.

#### Bandstand (Figure 10 – No. 29)

The Bandstand, which was completed in 1930, is located in a prominent location in one of the earliest parts of the Botanic Gardens. It was erected on the band parade area (the highest point in the southern part of the Botanic Gardens), which was first laid out by Niven during the early 1860s. The parade area and later the Bandstand were used continuously for concerts until the mid–1970s, when they were transferred to the island in Symphony Lake (1976). The Bandstand is octagonal, raised on a brick base and accessed via timber steps. Simple latticework columns support the octagonal slate tiled roof. The lattice pattern is repeated on the balustrades and cornice. Bandstands were a key feature of Victorian British public parks. It is well–executed and has become a 'picturesque' and symbolic feature within the Botanic Gardens and a favourite site for bridal couples to be photographed. It was designated a Conserved Structure in December 2009.

# Sun Garden, Bonsai Garden and Sundial Garden Structures (Figure 10 – Nos. 28, 30 and 31)

The Sun Garden contains a green painted steel structure, erected in 2005, with a glass roof which provides shelter for some of the garden's collections. The Bonsai Garden includes a modern concrete and steel semi–circular shaped structure, which houses some of the bonsai collection. The structure includes a steel and glass roof, which has some openings. It was erected in 2005. A small wooden pergola is located at the top of a short set of steps along the Sundial Garden's eastern boundary.







54 Sun Garden

#### Shelter and Toilet Block (Figure 10 – No. 32)

A modern shelter and toilet block is located close to Holttum Hall. These facilities are in good condition.

#### Holttum Hall (Figure 10 – No. 33)

Holttum Hall is a fine example of a colonial bungalow in Singapore. Although 'domestic' in scale, this building, completed in 1921, was intended as an office. It is named after Eric Holttum (appointed Director in 1925) who is best known for developing methods of propagating orchids which allowed the mass production of orchid hybrids. Holttum Hall was his office and, on the upper floor, his orchid laboratory. It ceased to be used as offices/ research laboratories in 2010 and has housed the site's Heritage Museum since 2013. It was designated a Conserved Building in May 2008.

The building is rectangular with a three-bay frontage. It is rare that Edwardian Architecture in Singapore is so clean-cut and trimmed by an elegant stucco work and joinery details. It has a rendered finish with double-height pilasters dividing each bay, the centre bay being wider. Mouldings are located beneath and above the ground and first floor windows. A single-storey pitched roof porch, supported by timber columns on a masonry base, is located in the centre of the hall and is in a vernacular of Arts and Crafts style compared to the more classical features of the building itself. Holttum Hall is the only building in the Botanic Gardens in a more distinctly European style, though still incorporating features such as roof vents and louvered vents over the windows to cope with the tropical climate.

# CDL Gallery (Figure 10-No.34)

The CDL Green Gallery, located just south of Holttum Hall (where a former herbarium building once stood), is a temporary exhibition centre showcasing botanical and greening-related exhibits, which will be present for at least the next 10 years. It is Singapore's first purpose-built zero-energy gallery and includes for the first time in Singapore, two eco-innovative technologies (a fully complete prefabricated modular system for quick construction and the use of the durable biomaterial Hempcrete). Other sustainable features



55 Holttum Hall



56 Ridley Hall



57 Green Pavilion



58 Tanglin Gate (decorated with red banners for National Day)

include green walls, a green roof, solar photovoltaic cladded roof panels and energy efficient interior fittings. The Building and Construction Authority (BCA) has accorded this gallery the BCA Green Mark Platinum status (the highest tier for green buildings in Singapore).

#### Ridley Hall (Figure 10 – No. 35)

Built in 1881–82, Ridley Hall is one of the oldest properties in the Botanic Gardens and the earliest surviving administrative building. Although originally constructed during Nathaniel Cantley's tenure as Superintendent to house the Herbarium and Library collections, it was later named after the Botanic Gardens' first Director, Henry Nicholas Ridley, who used it as his office and laboratory. Ridley is best known for his extensive work on rubber cultivation - his work having been pivotal to the development and expansion of the Malayan/ Southeast Asian rubber industry. The herbarium/ library collections were rehoused in a new building erected immediately south of where Holttum Hall stands. Today, Ridley Hall serves as a meeting space and the rear part of it as accommodation for visiting scientists and exchange programmes. It was designated a Conserved Building in May 2008.

It consists of two blocks, a Hall itself, set apart by an open lobby and a service wing. The impact comes from a reductive front elevation, via a sunken piazza, adjacent to a new annex wing. Here the facade is flanked by two pylon-like shoulders and leavened by a pair of doors and timber louvers flushed to the underside of the eaves. The scale is unusually intimate, matched by express details, like a ventilator slit justified above the stiles of the central doorways. There is evidence of Chinese joinery details that support the roof structure and broad eaves in the form of chunky top-plate and carved timber brackets. It is a craft form that no longer exists today in Singapore. The construction of the side elevation constitutes an Anglo-Malayan tradition, like a semi-basement, comprised of five semi-elliptical arches., which correspond with the semi-basement arcade below.

# Botany Centre and Green Pavilion (Figure 10 – Nos. 36 and 37)

The Botany Centre, completed in 2005 and officially opened the following year, was designed around a heritage *Calophyllum* tree and provides a range of facilities arranged on five floors. The two basement floors contain a carpark, store rooms, a restaurant and mechanical and electrical rooms. A function hall, toilets, laboratories, offices, library and herbarium and mechanical and electrical rooms are located at Level 1, which extends under Holttum Lawn. Levels 2 and 3 provide access to offices, laboratories, function/meeting rooms, toilets and a mechanical and electrical room.

The Green Pavilion, located to the south of the main Botany Centre, features Singapore's first pitched green roof. It houses the visitor services desk at ground level (which is open on four sides, the pitched roof supported by concrete pillars) and a restaurant in its basement. There are plans to convert part of the visitor service area into a retail outlet.

#### Tanglin Main Gate (Figure 10 – No. 38)

A new aluminium gate, replacing gates dating from the 1980s (which have been reused at the Bukit Timah MRT gateway), was erected in 2006 at the main historical entrance to the Botanic Gardens (located at the junction of Holland, Napier and Cluny Roads). The gate's motif is based on the flowering climber, *Bauhinia kockiana*.

#### Swan Lake Gazebo (Figure 10 – No. 39)

The Swan Lake gazebo, which is believed to date back to the 1850s, originates from Old Admiralty House on Grange Road. It was brought to the Singapore Botanic Gardens in 1969 and has since been re–located a number of times within the Botanic Gardens. This cast iron three–bay by three–bay garden structure is in the Gothic Revival style, with slender columns, decorative brackets and railings. The tiled roof, acroteria and ridge casting decoration formed part of repair works carried out after a tree fell on the gazebo. Since 2001 the gazebo has been located on the south–east edge of Swan Lake. Although this is a new location, it was typical in parks and gardens of the English Landscape tradition for shelters to be placed on the side of lakes and water features. Its cast iron elements are standard pieces produced at a time when they were commonly used for a variety of functions, including railway stations. It was designated a Conserved Structure in December 2009.

#### Historic Gazebo (Figure 10 – No. 40)

A second gazebo/shelter is located to the north–east of Swan Lake. This feature accentuates the 19th century origins of the Botanic Gardens although little is known of its actual history. It is made up of cast iron columns and decorative brackets in the Gothic style. The columns support new rolled steel joists (RSJ) beams to which the brackets are fixed with modern fixings. Its hipped roof is new. Although the cast iron components are original, the structure into which they have been formed with modern RSJs is new. Whether the components originally formed a gazebo–like structure is unknown.

#### Sculptures

The Botanic Gardens includes a number of sculptures, named: Girl on a Swing (1984), Girl on a Bicycle (1987), Lady on a Hammock (1989), the Swiss Granite Fountain (1991), Swing Me Mama (1999), Passing of Knowledge (2003), Joy (2005), Flight of Swans (2006), Chopin (2008), Chang Kuda (2011), Conservation with Nature (2011) and the Book Reader (2006). The corner statues in the Sundial Garden were added in 2006.

#### Shelters

In addition to the two shelters/gazebos already described, the Botanic Gardens contain 21 shelters, which are predominantly simple wooden shelters. These are peppered across the site as a whole. The shelter south–west of Holttum Hall is made up of three individual concrete rendered shelters with tiled roofs and a toilet block in the same style.



59 Swan Lake Gazebo



60 Historic Gazebo



61 Girl on a Bicycle sculpture



62 Shelter by Swan Lake

#### The Botanic Gardens' Collections

**Relevance of the Collections** 

Since at least the late 19th century, the Botanic Gardens' diverse and comprehensive collections have underpinned its continued role as a leading centre for plant research and conservation in Southeast Asia and key community green space/ visitor attraction. Today, the site is internationally recognised for its importance in relation to tropical botany and horticulture and as a world–class visitor attraction. Its collections are used daily at many different levels, supporting the work of scientists and researchers (employed by the Botanic Gardens and visiting) as well as the site's educational and recreational functions.

The site's Research and Conservation Branch focuses on three core areas: plant systematics research led by the Herbarium Team; orchid breeding and native plant conservation research and development conducted by the Conservation and Molecular Biology Team; and the continuing development of research support capabilities led by the Library of Botany and Horticulture Team. The collections are important research tools which are studied by the Singapore Botanic Gardens' researchers (and other international, regional and local researchers), leading to advancements in the scientific understanding of plant and fungal diversity and the publication of research in scientific journals, conference proceedings, books etc. (42 scientific papers were published by the Botanic Gardens' staff in refereed journals in 2012–13). The living collections are also used for reintroductions to natural and semi-natural habitats as part of the Botanic Gardens' conservation efforts. The most important preserved collections (nomenclatural types) are being image-scanned at high resolution and made available via the Internet for remote access.

The Singapore Botanic Gardens has and continues to run a range of activities/training programmes which contribute to capacity building and technology transfer. Recent examples include:

 2008 and 2010: the Singapore Botanic Gardens, in collaboration with the Royal Botanic Garden Edinburgh, actively supported the French funded Botanical study of *Zingiberaceae* in Cambodia, Laos and Vietnam by preparing and delivering training workshops.

- 2009: The Singapore Botanic Gardens organised the 1st International Working Group Meeting on the Taxonomy of *Convolvulaceae*.
- 2010: The Singapore Botanic Gardens, in collaboration with the Flora Malesiana Foundation, organised the 8th International Flora Malesiana Symposium.
- 2010: The Singapore Botanic Gardens hosted a Botanic Gardens Management Training Course for the Southeast Asian region, run by Botanic Gardens Conservation International (BGCI) which at the time had an office in the Botanic Gardens.
- 2012: Two weeks training was provided to five members of staff from the Pha Tad Ke Botanic Garden (Laos) at the Singapore Botanic Gardens. Two scientists from the Singapore Botanic Gardens later visited the Pha Tad Ke Botanic Garden to train local staff in field survey and collection techniques.
- 2012: Two members of staff from the Singapore Botanic Gardens provided training in field survey, collection techniques and living collections to six employees from the Biotechnology and Ecology Institute (Ministry of Science & Technology, Laos) over a six day period.
- 2012: A member of staff from the Singapore
  Botanic Gardens trained 12 local students/staff in
  Thailand and Laos over a one week period.
- 2012/2013: Three French horticultural interns trained at the Singapore Botanic Gardens over a period of two months.
- 2013: A member of staff from the Singapore Botanic Gardens trained 57 individuals over six days in Laos on orchid cultivation and breeding.
- 2013:13 members of staff from the Tambling Tiger Reserve (Sumatra) received two days of training at the Singapore Botanic Gardens. Eight members of staff subsequently received training in Sumatra.
- 2013: The Singapore Botanic Gardens hosted a United Nations Environment Programme (UNEP)
   Global Strategy for Plant Conservation workshop for ASEAN countries.

A member of staff from Singapore Botanic
 Gardens provided training on herbarium
 collection management to staff at the Brunei
 Herbarium.

Collaborative work takes place between the Singapore Botanic Gardens and other Gardens/ scientific institutions, which is reflected in the recent Memorandum of Understanding (MoU) on joint botanical surveying signed by NParks and Brunei's Forestry Department. Whilst NParks/the Singapore Botanic Gardens has collaborated with Brunei in the past on occasional field trips, the MoU outlines a more specialised and planned programme for research and training over five years, extendable for a further five years.

The site's educational remit is aligned with the Global Strategy for Plant Conservation. It aims to connect people and plants and to increase public awareness, appreciation and knowledge of plants, nature and environmental conservation through a wide range of quality educational programmes. The Botanic Gardens works closely with the Ministry of Education (MOE) to develop programmes that meet the curriculum needs of schools for subjects such as geography, national education, history, science and social studies. For example, the Jacob Ballas Children's Garden (located outside of the Nominated Property but within the proposed Buffer Zone) and National Orchid Garden (located within the Nominated Property) are recommended sites for field-based learning in the Social Studies Syllabus for Primary 1 and Primary 2 students respectively.

746 educational activities were run at the site between April 2012 and March 2013. The site offers approximately 50 different educational programmes for schools (guided tours, talks and workshops), over 20 for adults and monthly talks by local and international speakers focused on botany, biodiversity and conservation. 89,000 school children visited the Botanic Gardens in 2012/13 (83,000 visited the Royal Botanic Gardens, Kew in that same year), 24,000 of which received programmed educational activities. A further 9,000 adults benefitted from such programmes. Much can also be learned informally at the Botanic Gardens through the interpretation provided across the site. There is an aspiration, for example, that individuals visiting the Healing Garden will become more aware of the fast disappearing knowledge of medicinal plants and their uses. It should be noted that the Botanic Gardens' living collections are used by some tertiary institutions for teaching (e.g. students from the Ngee Ann Polytechnic and National Institute of Education use the living collections for Plant Identification Classes, Certified Practising Horticulturist Course and Certified Arborist Course). University students also make use of the reference collections.

The collections underpin the site's important role as a public recreational space and visitor attraction. Welcoming approximately 4.4 million visitors annually, it is the most visited botanic garden in the world. The Botanic Gardens provides much needed access to nature and open space for many Singaporeans, for whom the natural world is only generally present in the street trees, urban greenery and the city's all–important public parks. Visitors come to the Botanic Gardens for many different reasons including, for example, to exercise, have a stroll, learn about the plant world, see specific horticultural attractions/displays, observe nature, meet friends/family and celebrate a momentous occasion.

The Botanic Gardens is also a venue for the arts (Zadok Ben–David's exhibition in 2012/13 being an example) and musical performances. In addition, the VIP Orchid Naming programme plays a role in bolstering international relations. To date nearly 200 orchid hybrids have been specially bred and named in honour of visiting heads of state and dignitaries from a wide range of countries. These include:

- Rhyncattleanthe Juan Manuel Santos Calderon, named in honour of the President of the Republic of Columbia (2012).
- Dendrobium Tarja Halonen, named in honour of the then President of Finland (2008).
- Dendrobium Angela Merkel, named in honour of the Chancellor of Federal Republic of Germany (2011).
- Vanda Usha, named in honour of the then First Lady of India (2000).

- Renantanda Akihito, named in honour of the Emperor of Japan (1970).
- Dendrobium Karim Massimov, named in honour of the Prime Minister of the Republic of Kazakhstan (2010).
- Dendrobium Roh Moo-Hyun, named in honour of the then First Lady of South Korea (2003).
- Dendrobium Najib Rosmah, named in honour of the Prime Minister and Spouse of Malaysia (2009).
- Ascocenda Benigno S Aquino III, named in honour of the President of the Republic of the Philippines (2011).
- Ascocenda Donald Malgorzata, named in honour of the Prime Minister and Spouse of Poland (2012).
- Rhyncholaeliocattleya Maria Cavaco Silva, named in honour of the First Lady of the Republic of Portugal (2012).
- Dendrobium Sheikh Abdullah, named in honour of the Prime Minister and Minister of Interior of the State of Qatar (2013).

- Dendrobium Recep Tayyip-Emine Erdogan, named in honour of the Prime Minister of the Republic of Turkey and Mrs Emine Erdogan (2014).
- Cahuzacara Hanh Sang, named in honour of the \_ President and Spouse of Vietnam (2011).

The National Orchid Garden, a paid attraction within the Botanic Gardens, receives between 500,000 and 600,000 visitors annually, of which c.90% are foreign tourists.

The Singapore Botanic Gardens is the custodian of three main types of collections (preserved, living/ genetic and documentary/visual), commenced at different points in time for different purposes. A summary of the collections held at the Garden is presented in Table 1.

Further information regarding each of the three main types of collections held at the Botanic Gardens is provided in the following sections.



63 Educational activities



64 Art in the Gardens (by Zadok Ben-David)



Collection	Location	Size	Nature
Preserved Collections			
Herbarium	Herbarium/Botany Centre	750,000	Dried pressed plants (general collection Malesia) (includes 8,000 type specimens)
		24,000	Dried pressed plants (Singapore Botanic Gardens collection)
Mycology	Herbarium/Botany Centre	6,000	Dried fungi
Spirit	Herbarium/Botany Centre	6,200	Plants and fungi preserved in alcohol
Living and Genetic Resource Collections			
Living	Singapore Botanic Gardens	36,400	Living plants accessions
Micropropagation	Laboratories/Botany Centre	92,000	Orchid seedlings and plantlets and
			native and ornamental plantlets
DNA	Laboratories/Botany Centre	200	Individual DNA aliquots/samples
Documentary and Visual Reference Collections			
Library	Library/Botany Centre	28,000	Books and pamphlets
		300	Journal titles
Archive	Library/Botany Centre	214	Published/unpublished maps
		290	DVDs
		50	Microfilm
		100	Microfiche
		95	Annual Reports
		-	Other (e.g. unpublished notes/letters)
Photographs	Library Archive/Botany Centre	1,307	Photographs of flora and fauna species, Singapore Botanic Gardens, people
Photographs	Botany Centre/Living Collections database	18,000	High resolution images of the living collections
Photographs	Herbarium/Botany Centre	5,000	High resolution images of type specimens
Artwork	Library Archive/Botany Centre	2,000	Paintings and illustrations of the Botanic Gardens and flora/fauna
Artefacts	Library/Botany Centre	-	Including historic furniture and botanical equipment

# TABLE 1 COLLECTIONS HELD AT THE SINGAPORE BOTANIC GARDENS

## Preserved Collections (The Singapore Herbarium and Plants Systematics Research)

The preserved collections (herbarium, mycology and spirit collections) are located in the herbarium, which is Singapore's major archive for botanical research specimens and associated information. They primarily serve the research needs of the scientific community. Specially prepared sets of herbarium specimens of common plants found in Singapore are available for public referencing in the library but these do not form part of the herbarium collection.



65 Research

Preserved collections were first started at the Singapore Botanic Gardens by James Murton in 1875. Since 1882, these collections have been housed in a number of different herbarium buildings, the most recent of which being the herbarium within the Botany Centre (international acronym SING), which opened in 2006. The herbarium currently contains 750,000 dried paper mounted plant specimens, of which 8,000 are type specimens (the ultimate points of reference for the correct application of species' names); 6,000 fungal specimens and 6,200 plant/fungi specimens preserved in alcohol. The preserved collections include a comprehensive record of plants grown in the Botanic Gardens over the last 130 years or so.

The collections mainly include material from Thailand, Malaysia, Singapore, Brunei, Indonesia, the Philippines and Papua New Guinea, and adjacent regions, with the most extensive collection from Singapore and Peninsular Malaysia dating from the 1880s. Locally the herbarium provides an identification and advisory service. Internationally, it collaborates with all institutions worldwide that maintain active research programmes for research into the spectacularly rich flora of the tropical and subtropical regions. Current taxonomic and plant systematic specialisation at the herbarium involves studies of plant form and adaptation and useful features for their classification, including modern techniques analysing molecularbased evidence. The taxonomic research programme (revisions and monographs) focuses particularly on the following: the woody flora of Southeast Asia, the Southeast Asian Bambusinae alliance; the Fagraea complex (Gentianaceae) in Southeast Asia; the Gardenia alliance (Rubiaceae) in Asia-Pacific; Hoya and related Apocynaceae in South and Southeast Asia; Orchids (various studies on Orchidaceae are being conducted, continuing a historically significant attachment to the study of orchid biodiversity and culture at the Singapore Botanic Gardens); and Zingiberales in Asia (with a particular focus on the Indochinese floristic region and genera Curcuma and Zingiber). The systematics research programme focuses particularly on the following: the systematics and evolution of the tribe Merremieae (Convolvulaceae); the phylogeny, polyploidy and evolution of the genome size in economically important gingers especially Curcuma; and the Southeast Asian Bambusinae alliance. Researchers undertake fieldwork and, as mentioned previously, capacity training and joint collaborative work.

Whilst clearer identifications and character assessments of plants depend greatly on detailed morphological studies, their natural relationship and lineages often form an overarching interest at the Singapore Botanic Gardens. Clearer assessments of inheritance or lineage patterns for natural groups of plants are often a useful platform for other sciences and applications, including horticulture and breeding. The aggregated knowledge on the region's flora, especially that of the Malay Peninsula and Borneo, helps inform the study of distribution patterns (including such aspects as species endemism) - the Singapore Botanic Gardens' research expertise thus includes biogeography and related conservation perspectives on plant endemism, rarity and endangerment.

The herbarium is internationally accredited and has significant archival and research value. It is a key component of over a century and a half of botanical field exploration, collection and documentation in Southeast Asia; it was the major starting point, became the primary resource centre and maintains current importance as the lead holdings for the plant biodiversity/floristic archives of the Malay Peninsula (today's Peninsular Malaysia and Singapore); and is central to on–going accomplishments in tropical biodiversity research and inventorying (more specifically within the Malay Peninsula). All herbaria are valuable scientific facilities, but the Singapore Botanic Gardens herbarium can be singled out as having been fundamental to, and still continuing to play a key role in the only well–documented flora in super–rich ever wet Southeast Asia. 572 foreign scientists/visitors came to the Herbarium between 2008 and June 2013.

The preserved collections have formed the basis for floristic studies over long periods of time by many of the principal researchers in the region (e.g. Flora of the Malay Peninsula by Ridley 1922–25; A Dictionary of Economic Products by Burkill 1935; Orchids of Malaya by Holttum 1953).

# Living (*in vivo*) and Genetic (*in vitro*) Resource Collections

The in vivo collections at Singapore Botanic Gardens are a remarkable asset and underpin its crucial role as a scientific institution, centre for learning and visitor attraction/amenity space. The Singapore Botanic Gardens is the most visited botanic garden in the world. The in vivo collections include 36,400 living plant accessions which vary in age and origin. These represent 226 plant families, 1,739 genera, 6,544 species and 9,021 taxa. Some accessions, such as Adenanthera malayana (00/7038\*A) are thought to pre-date the Botanic Gardens' establishment in 1859. The Botanic Gardens has a rich collection of palms, water plants and trees as well as specialist collections such as 200 kinds of bromeliads and 250 species of gingers and related families. Its largest collection is of orchids, which number over 1,200 species and about 2,000 hybrids. Alongside the more recent Fragrant Garden (2013) and Evolution Garden (2005), a tract of approximately six hectares of primary rainforest survives in the Botanic Gardens, which includes critically endangered species. The Rainforest was an important source of specimens (nomenclatural types) of newly described plant species from the Southeast Asian region. The Singapore Botanic Gardens was historically sub-divided into 'Lawns', which defined management areas for the site. The

living collections are still managed according to these (see Appendix ii of **Appendix B**).

The *in vivo* and *in vitro* collections together support the Botanic Gardens' research and conservation programmes acting as a 'research plant collection' available for staff, students and external colleagues to use in this capacity. Specific groups of plants currently being used for 'active' research projects include, for example *Dipterocarpaceae*, *Myristicaceae*, *Orchidaceae*, *Zingiberales* (especially *Zingiberaceae*), *Apocynaceae* (Hoya) and *Begoniaceae*.



66 The Ginger Garden

Current in situ conservation work focuses on the propagation and reintroduction of orchids and gingers (and their relatives) in Singapore and the reinforcement of rainforest reserves (in Singapore, but also potentially in other parts of the region), with ex situ collections going back in situ. Some of the plants propagated for in situ and ex situ conservation are grown in vitro. Research on cryo-preservation of orchid seeds and cytological studies for artificial induction of tetraploids is also being carried out. The Botanic Gardens' living collections also form an important nexus for in situ conservation of plants and wildlife as part of the Singapore-wide network of nature reserves and nature parks connected via 'green' corridors (some of which rely on community support stimulated through the Botanic Gardens' outreach programmes).

The Conservation and Molecular Biology Team, which operates the specialised orchid breeding

and conservation biotechnology laboratory, is responsible for raising a variety of plants (especially orchids and ferns) which are difficult to propagate (until they can be weaned back to cultivation using conventional nursery techniques outside of the laboratory) and looking after plants precariously cared for under conventional nursery conditions as well as plants that are prone to viral infections or need to be 'cleaned up' from such infections. The Conservation and Molecular Biology Team is also responsible for producing colourful, unique orchids for display in the National Orchid Garden and the Botanic Gardens' programmes. More than 500 hybrids have so far been registered with the International Registration Authority for Orchid Hybrids. The breeding programme focuses on two major groups, dendrobiums and vandaceous orchids. Besides creating new hybrids, selected orchids of superior quality are identified and mass produced through tissue culture techniques (cloning). Molecular biology research is thus far involved with phylogenetic analysis of wild taxa (various families) and parental or lineage analysis for orchid hybrids and forms for which the origins are unclear, including the horticulturally important orchid genera Vanda (sensu lato) and Paphiopedilum. Molecular phylogenetic work is carried out in conjunction with the taxonomic research undertaken at the Herbarium and significant enhancements to the laboratories equipment are taking place (2013/14) in support of such studies. A new development for a seed bank is being initiated, which would strengthen the conservation support for the region's plant life.



67 Shaker room in the Botany Centre, visible to visitors

**Bibliographic and Visual Reference Collections** 

The site contains a botanical and horticultural library, located in the Botany Centre. It is sub–divided into two sections: the public reference centre and the reference library. Altogether it contains approximately 30,000 accessions, which include journals, books, botanical illustrations, CDs, slides, photographs, audiovisuals and other media. The main function of these collections is to support research, both of the Singapore Botanic Gardens and of visiting scientists. It includes a 'rare books' room protected from fire by inert gas.



68 Cypripedium tonsum

The public reference centre serves as the public face for the library and is open to the general public Monday to Friday. It includes materials on botany and horticulture in the form of books, magazines, CDs and specially prepared sets of herbarium specimens of common plants found in Singapore (for referencing). A changing exhibition of dried carpological (fruit) exhibits, botanical artefacts and rare books is also on display. Materials available are only for reference in the public area of the library.

The reference library is a specialist research library, only available to members of staff from NParks, visiting researchers and other authorised users. It is one of the oldest libraries in Southeast Asia, having been in existence at the Botanic Gardens since 1875, albeit in different buildings. It includes journals (c.300 titles), books and pamphlets (c.28,000, including c.2,000 rare books<sup>5</sup>), botanical illustrations (c.2,000 mostly painted by Singapore Botanic Gardens artists between 1890 and 1950), DVDs (290), microfiche/ microfilm (150 on natures reserves and some titles in the rare collection), maps (214) and old photographs (1,307). Many important international scientific journals, reference books, bibliographies, botanical reprints, monographs on botany and taxonomic studies, unique research papers and unpublished material are available here. The library's rich collections play a key role in strengthening the taxonomic and systematic research works carried out at the Botanic Gardens, providing essential references for modern-day taxonomy.

The Singapore Botanic Gardens' century-old scientific journal, The Garden's Bulletin Singapore, is a peerreviewed journal published twice a year by NParks, which has an international scope. It publishes original papers and reviews on plant structure and taxonomy, evolution and biogeography, floristics, ecology and conservation, as well as related fields such as botanical biography, horticulture and ethnobotany, with emphasis on the plant life of the Southeast Asian-Pacific region. The Singapore Botanic Gardens' Gardenwise magazine is also published twice a year, bringing recent research (including into the Botanic Gardens' heritage) and horticultural perspectives from the Singapore Botanic Gardens to a wider audience as part of Singapore Botanic Gardens' public outreach programmes. Both are available online. This strong publications programme supports on-going and new projects on flora of the region. The Botanic Gardens is a member of the Biodiversity Heritage Library, which provides free access to biodiversity knowledge. The Botanic Gardens' historic journals are available online via this library.

#### **Biodiversity of the Botanic Gardens**

The Botanic Gardens is of high biodiversity/nature conservation value.

The flora of the Botanic Gardens is very well documented, from at least Cantley's time onwards. Study of contemporary maps and historical reports relating to the area now occupied by the Singapore Botanic Gardens indicates that, upon the major

5 The oldest book is named Pavli Aegi and is dated 1531.

acquisitions of its land in 1859, 1866 and 1879, the landscape was covered in a series of different vegetation types. Subsequently, as the Botanic Gardens' living collections and landscapes were developed and managed, a further man–made, semi–natural environment has influenced the inherent ecology of the area until the present day.

The initial 22 hectares of land acquired for the establishment of the Botanic Gardens in 1859 comprised approximately six hectares of 'virgin' rainforest to its eastern side and an undetermined area of fresh water swamp along its western boundary (subsequently Swan Lake). This extant area of primary lowland rainforest is one of the few remnants of its kind in Singapore and a rare example of primary rainforest reserve within the limits of a major city. Its biodiversity value is reflected in its designation as a Nature Area. This multi-layered habitat comprises over 300 species of native plants (some of which are of economic importance, such as rattans, fruit trees and jelutong), including the previously presumed extinct in Singapore (and elsewhere rare) Planchonia grandis. Three main layers of trees are present: emergent trees (45m), canopy trees (35m) and lower trees (25m). The under-storey layer comprises plants able to survive heavy shading imposed by the canopy above. More than 80% of the Rainforest's plant species are rare or endangered, not only in the Botanic Gardens, but also in Singapore. The Rainforest contains a range of tropical animals, including species that have largely disappeared from other cities in the region (due to the city environment typically being incompatible with their requirements), such as Racket-tailed Drongo, Long-tailed Parakeet, Hill Myna, Changeable Hawk-eagle, Crested Goshawk, Oriental Honey-buzzard and Reticulated Python.

It is important to note that despite some change and likely some deterioration of the former natural forest (most likely due to the drying influence of the surrounding urban environment and 'edge effects' – i.e. ecological imbalances caused by its small size) having been observed by staff, the Rainforest has nonetheless survived. The Singapore Botanic Gardens has an active programme of strengthening its natural areas with appropriate species when stock becomes available, as well as removing alien species that tend to invade its margins from the immediate surroundings. The remainder and major part of the Botanic Gardens (at the time of its acquisition) was described as *belukar*, the local term for scrubby secondary vegetation that succeeded the unsustainable cultivation of crops such as gambier and pepper in the first half of the 19th century. It seems there were also a few pre–1859 plantings of economic or medicinal value that survived Niven's development of the site (1860–1875), such as the sago palms (Character Area 1) and penaga laut (*Calophyllum inophyllum*, Character Area 2). Niven also allowed at least two other native species that were already present or regenerating to remain, namely the pulai basong (*Alstonia pneumatophora*, Character Area 1) and various tembusu (*Cyrtophyllum fragrans*), the most abundant tree species at the Botanic Gardens.

The land acquisitions in 1866 and 1879 added more fresh water swamp (which were later transformed into Cluny Lake and Symphony Lake and Eco Lake), or ground that had borne it, along the western and northern edges of the site. The 1879 area (the 'Military Reserve') had been under cultivation by Chinese occupants for fruit and vegetables before its conversion into the Economic Gardens with plantations of rubber, pineapple, etc. These latter additions are thus of lesser importance from the standpoint of their contribution to biodiversity at the time. In each case, areas that formerly bore fresh water swamp have been converted into lakes, adding a new habitat for wildlife.

The Tyersall Learning Forest (located outside but immediately adjacent to the Nominated Property) is of great biodiversity importance as it includes regenerated forest of up to 100 years of age, whose diversity positively enhances the area of extant rainforest referred to earlier. The Rainforest and Tyersall Learning Forest complement one another and aid species exchange. Both have been the subject of detailed botanical surveys during the past four years.

The Botanic Gardens is the type locality for a range of plant species collected by Cantley and Ridley from 1880 onwards and is also the type locality for the Singapore Roundleaf Bat (now lost locally, though widespread but rare in Southeast Asia). The biodiversity importance of the Botanic Gardens as a refuge for fauna is reflected in the many species found there (see various ecological surveys provided in Appendix iii of **Appendix B**). Fauna highlights include a thriving population of the Critically Endangered (in Singapore) Lesser Whistling Duck on Eco Lake and the rare snail, *Amphidromus inversus*,



69 Rainforest



70 Common Imperial (Cheritra freja friggia)



71 Lesser Whistling Duck (Dendrocygna javanica)



72 Red-Legged Crake (Rallina fasciata)

regularly recorded in the Rainforest since its discovery there in 1961. A list of 137 kinds of birds was recorded in the Botanic Gardens in 2008 (an early study of birds<sup>6</sup> allows comparisons to be made between the 19th and early 20th centuries and now) and a list of 68 species of butterflies in 2009.

The mosaic of habitats found at the Botanic Gardens (including, for example, open areas of lawn, water bodies, forest and mature trees) supports a wide diversity of fauna species. Moreover, as available habitats immediately outside the overall area of the Botanic Gardens (74 hectares) have diminished/ deteriorated through urban development, the Botanic Gardens have undoubtedly become a wildlife refuge and one that NParks is nowadays striving to connect with more distant refuges in the central water catchment reservoir area and associated nature reserves, via community greening schemes, such as that launched for Kheam Hock in 2013 (north of the site).

Staff and managers are aware of the Botanic Gardens' ecological importance and practice sustainable management methods, such as minimising the use of pesticides, encouraging the use of dead leaves as mulch (rather than removing them) and relying on the 'biological controls' on pests that the Rainforest remnants on site provide by way of what might be termed 'ecosystem services'.

# 2.b History and Development

This section provides a brief overview of British colonial botanic gardens (see **Section 3.2** for further details) followed by an overview of the Singapore Botanic Gardens' development up until the present day (including those parts of the Botanic Gardens which fall outside the boundary of the Nominated Property). A detailed chronology of the site's history is provided in Appendix iv of **Appendix B**.

# **British Colonial Botanic Gardens**

It is widely accepted that the world's first 'botanic gardens' were the 16th century university physic/ medicinal gardens of Italy. 'Modern' botanic gardens were a product of the Enlightenment, an 18th century intellectual movement which combined

*Birds in the Botanic Gardens Singapore* by N. Ridley, 1898

a consideration for the aesthetic, inspired by the landscape movement, with a new concern for rational scientific endeavour. It was now acceptable to combine beauty with science, which heralded the age of the botanic gardens (McCracken, 1997). The 18th century brought a new interest in distant lands, and the expansion of political supremacy across the globe brought a new awareness of exotic cultures, climates, flora and fauna. This growing European consciousness stirred interest in the plant kingdom and resulted in the birth of gardening. Unsurprisingly, the excitement relating to botanic gardens spread to the new colonies of the European powers.

It was not until the Victorian era that the central role of botanic gardens in advancing the interests of the British Empire was truly recognised. A surge in the number of British botanic gardens laid out in the tropics during this era ensued. These were more than merely imperial gardens, they were part of a botanical network centred on the Royal Botanic Gardens at Kew (1759, London), with even wider international ramifications. McCracken describes how 'by the time Queen Victoria ascended the throne in 1837 over 22 botanic gardens had existed at one time or another in the empire, although only about ten were still functioning. This number is small compared with the 100 or so which were operational later in the Victorian empire, yet considerably greater than the number of botanic gardens run by rival European imperial powers in their empires'. By the turn of the century (early 1900s) botanic gardens were seen as an integral part of the Empire and were arguably as vital to the prosperity of the British Empire as military power.



73 Royal Botanic Gardens, Kew – Palm House

In glorious settings, Britain's colonial botanic gardens performed the essential dual function of advancing scientific knowledge and colonial economic development. McCracken describes how 'as befitted the imperial spirit of the Victorian age, many of these British colonial botanic gardens were awe inspiring even to those used to Kew, Le Jardin des Plantes in Paris or the Schonbrunn gardens in imperial Vienna. They were, in the words of the Director of Peradeniya in 1883, "somewhat bewildering".

The British were not the only colonial power to be increasingly exploiting the commercial possibilities of botanic gardens. France was a strong rival to Georgian Britain in botanical and horticultural innovation. However, in terms of the scale of its botanical network and through the pre–eminence of Kew as a nerve centre of botanical innovation and a centre of horticultural research, Britain was undoubtedly foremost in the utilisation of botanic gardens as a tool for colonial expansion.

Whilst many British tropical colonial botanic gardens were established in South/Southeast Asia, others were laid out in Africa (e.g. Cape Town and Kampala), Australia (e.g. Sydney), Hong Kong and the West Indies (e.g. St Vincent) among other locations, with Kew acting as the great botanical exchange house of the British Empire. The British War Department and the Honourable East India Company sent seeds and plants from all over the world, creating a plant seed diaspora of unrivalled proportions. It is unsurprising therefore that the late 18th to the early 20th century represented an era of immense scientific advance in the field of taxonomy and the beginnings of economic botany as a driving force behind the British Empire.

#### **Evolution of the Singapore Botanic Gardens**

The Establishment of the Singapore Botanic Gardens (1859–1875)

The history of botanic gardens in Singapore began on Government Hill in 1819, when Sir Stamford Raffles, the founder of Singapore and a keen naturalist, planted nutmeg and subsequently laid out a botanical and experimental/economic garden there, which was later closed in 1829, following a lack of official support after Raffles' departure in 1823. The British government and major trading companies of the early 19th century encouraged the development of experimental gardens in the colonies to cultivate, research and preserve native (and non–native) plants as useful revenue–earning commercial crops.

The existing Botanic Gardens were first established in 1859 by an Agri–Horticultural Society, on a c.22 hectare bottle–shaped piece of land within the Tanglin district. The government had facilitated the acquisition of this land, having been offered in exchange a redundant nutmeg plantation in the Tanglin area, which would house the army's main barracks. The influential Chinese businessman, Hoo Ah Kay, better known by his trading name of 'Whampoa' had negotiated this deal, himself being a leading member of the Agri–Horticultural Society.

The Botanic Gardens were originally planned as pleasure gardens and used as an amenity for the enjoyment of the society's members. They were developed by Lawrence Niven from the 1860s. Niven had been the manager of a nutmeg plantation and the descendent of a well-known Scottish family of gardeners (see **Box 3**). His work at the Botanic Gardens reflected the 'English Landscape Garden Movement' that had influenced the emergence of numerous English landscape gardens and public parks from the 18th century until this period (see **Box 4**). The colonial government provided convict labour for Niven to manage and from 1866 were also contributing to his salary. Works carried out included the creation of interconnecting curving pathways and promenades, a levelled parade area for military bands to play music (known as Bandstand Hill) and the establishment of ornamental planting (these works are shown on Figure 11). Today this layout remains almost entirely intact. The northern part of the site contained approximately six hectares of primary rainforest, which



FIGURE 11

6 NOMINATION DOCUMENT DESCRIPTION 1880s PLAN OF THE SOUTHERN HALF OF THE SINGAPORE BOTANIC GARDENS

## BOX 3 LAWRENCE NIVEN'S LIFE AND WORK

Lawrence Niven (christened Laurance) was born at Barony, Lanark, Scotland on 8th January 1826. In 1841, he was living with his family at Auchindarroch Garden, Lochgoilhead. The family were gardeners by trade, evidenced both by their living at a garden estate and by the fact that other family members held senior positions at the Botanic Gardens of Glasnevin, Dublin and Hull. While Lawrence served as an apprentice gardener at Rossdhue, Loss, Loch Lomond, the estate of the Colquhons family, his education must have begun at home and likely included an awareness of the work of the English Landscape Style of design – a style which was still being followed at this time. He is also likely to have been familiar with the emerging public parks movement. It appears that Niven relocated to Singapore at age 20 in 1846 where an elder brother and sister also resided. Details of his life there are unknown prior to his marriage to Jane Newbold, daughter of the noted Colonel Newbold, a retired Indian Army Officer, who explored and wrote a history of the Malay states. They married on 27th December 1855 and would have had at least two children.

From 1860, Niven was retained by the Agri–Horticultural Society to develop the Singapore Botanic Gardens, which he did over the following 15 years. Prior to his appointment, Niven was in charge of C.R. Prinsep's nutmeg estate. A severe decline of the nutmeg crop from 1857–60 may have prompted Niven to seek alternative employment ultimately bringing him to the Gardens. Thrilled with Niven's work, the Society built him a large plantation style house in the Gardens; known today as Burkill Hall, it was built from 1867–68. The Society had taken out a loan to build the house, but was later unable to repay it, requiring the colonial government to eventually take over the 'pleasure garden'. From this point it was transformed into a typical colonial botanic garden with scientific collections and trials of potential economic crops.

Niven is credited with clearing much of Singapore Botanic Gardens of the secondary belukar growth that preceded his pleasure garden. Following the combination of the English Landscape style and the emerging style of Victorian public parks he created the band parade area in 1860/61 (now embellished by the 1930 Bandstand), laid out the curving roads and paths including Main Gate Road (1864) and excavated the serpentine Swan Lake (1866), the oldest ornamental water body in Singapore.



The Government appointed James Murton, who had trained at Kew to superintend the botanic garden created by Niven. Niven had already decided to take leave when Murton was on route to take up his appointment in 1875. Niven was taken ill at this time and travelled back to Scotland in 1876 but died soon after his arrival at Coylton, Ayrshire where he is buried.

74 Lawrence Niven



#### BOX 4 INFLUENCE OF THE ENGLISH LANDSCAPE MOVEMENT

The English garden makers and landscape gardeners of the 18th century rejected the more formal and geometric styles of garden design that preceded them. Between the early 18th century and the mid–19th century the key proponents of the English Landscape School including Bridgeman, Kent, Brown and Repton modelled, planted and embellished the large–scale private landscapes and parklands surrounding the stately homes of gentlemen throughout Britain. They created visually pleasing and informal landscapes that included gently contoured hills, serpentine lakes and artfully placed tree clumps i.e. copies of the 'ideal' or Arcadian English countryside. To a great degree it was these that inspired the idea of public parks that began to emerge in the early 19th century in English industrial towns. The latter were creating squalid and unhealthy urban slums. A mix of Victorian zeal for reform and the need to improve living and working for the inhabitants of these unplanned and rapidly expanding towns and cities of the Industrial Revolution was driving the public park movement. Prior to the creation of the first public parks, town dwellers could only find public space for recreation in zoological and botanic gardens (e.g. Birmingham 1831) and arboretums (Derby 1839) which were opening in an increasing number in the early 1800s. Some also had access to older 18th century urban 'pleasure gardens' and 'public' walks where promenading, events, drinking and music playing was common. Many of these though became established as the meeting place for pickpockets and other antisocial behaviour and were subsequently closed (e.g. Vauxhall Gardens in 1859).

The promotion of public parks between the mid–19th century and on into the 20th century reflected a desire for ideal landscapes, fully separated from the reality of the urban surroundings with opportunity for clean air and spiritual refreshment. This ideal echoes that of the 18th century private landscape garden makers and the informality of the romantic and picturesque styles was to some extent carried through to the design of Victorian public parks. The influence of well–known and popular garden designers such as J.C. Loudon (1783 – 1843) also brought more ornamental horticulture (the revival of flowers, shrubbery, wilderness planting) axial geometry, and a return to a 'gardenesque' style to the parks. The need to display plants for their own merits and the much wider range of exotic plant species made available by Victorian collectors (e.g. Nesfield (1793–1881) at Kew) made this possible. Classically the new public parks therefore often had a mix of styles combining both informality and formality.

Prior to arriving in Singapore in the 1840's Niven, as an educated man, is likely to have been aware of the principles of landscape gardening promoted in the readily available writings of Repton (1788–1818) and Loudon (1783–1843). He will doubtless have seen examples of the realisation of the public parks movement with its mix of styles. His own design for the pleasure garden in Singapore reflects this influence and knowledge. He did not have to create the landform for his design (as did the 18th century landscape gardeners) since it already helpfully existed on the site but his informal layout of paths and serpentine lake has left the unusual legacy of the English Landscape Garden movement in a tropical environment.



75 J.C. Loudon's Plan for Derby Arboretum 1839
survive today – one of only two remaining undisturbed areas of original rainforest which would have covered the entire island. Niven cleared the site of belukar (secondary vegetation), but carefully preserved the rainforest and a number of trees/palms – the extant Penaga laut (*Calophyllum inophyllum*, Botany Centre), Pulai basong (*Alstonia pneumatophora*), tembusu (Cyrtophyllum fragrans, featured on the Singapore \$5 currency note and in postage stamps) and sago palm (*Metroxylon sagu*, near Tanglin Gate) are all thought to be pre–1859 survivors.

The Botanic Gardens was extended by c.12 hectares to the north–west/west in 1866 (see image 70) and Swan Lake excavated and landscaped that same year. The Agri–Horticultural Society entered into a contract in 1867 for the construction of a residence for Niven, using borrowed funds.

This colonial plantation style bungalow, which still exists today (known as Burkill Hall), was used as the official residence of the Botanic Gardens' Superintendents and Directors up until 1969. The Society subsequently ran into financial difficulties, largely as a consequence of having built the Superintendent's house and in late 1874, handed over the management and maintenance of the site to the government in return for the settlement of its debt.



76 Map of the Gardens 1866

The Development of the Botanic Gardens under Murton's Superintendence (1875–1880)

Following a recommendation from Joseph Hooker, director of the Royal Botanic Gardens, Kew, James Murton, a Kew-trained botanist and horticulturist, assumed the role of Superintendent in 1875, having stopped en route to gain three months of tropical experience at the Peradeniya Botanical Gardens in Sri Lanka. This reflected the first step in a historic collaboration between the Kew and the Singapore Botanic Gardens, which extended the remit of the Botanic Gardens from a pleasure park to a place of cutting edge study and scientific/botanical experimentation and established Singapore Botanic Gardens as a nerve centre for plant exchange at the heart of a worldwide network of botanical gardens. The Royal Botanic Gardens at Kew, already preeminent in the 18th century as a seat of learning and botanical research, was responsible for much of the inspiration, administration and plant exchanges that drove the early development of Singapore Botanic Gardens and other gardens.



77 Burkill Hall built 1867-68



78 Bandstand Hill 1877

At the request of the authorities, Murton travelled in Peninsular Malaysia collecting material for the Botanic Gardens and soon set up a herbarium and library. He was also a driving force behind the establishment of economic gardens in the late 1870s, which later became famous for a wide range of economic crops including rubber. Having first established relatively basic economic gardens in the north–west extension of the Botanic Gardens, he subsequently laid out new economic gardens on a major land extension (c.41 hectares) to the north, granted in 1879 (see **Figure 12**).

This land extension was physically separated by Cluny Road from the earlier acquired land for the Botanic Gardens. Also begun in 1879 was the extant Palm Valley, located in a gently northward–sloping depression between the hill upon which Burkill Hall stands and the Rainforest. Today the valley displays some 220 species of palms.

In line with recommendations made by the colonial governor, Murton was charged with establishing a zoological collection in the Botanic Gardens. Animals of all kinds were donated (including tigers, monkeys, kangaroos, white eagles, a rhinoceros and a bear) and the zoo rapidly grew, enclosures being dotted around the southern part of the Botanic Gardens. However, in 1878, only three years after having been started, the zoo had to be substantially downsized, with mainly small animals retained (the tiger given to Ridley in 1895 for the zoo was retained for some time) as the funding was inadequate for such a large zoological collection which required the



79 Palm Valley and Rainforest c 1900

creation of elaborate pens for the various animals. The zoo was formally closed in 1905. The zoo has however left its mark on the landscape, for example, the marsh garden developed in 1969 to the south– west of Swan Lake, is in fact the remains of a wallow dug for a short–lived rhinoceros and planned alligator pens.

The Development of the Botanic Gardens under Cantley's Superintendence (1880–1888)

Poor financial management caused Murton to be relieved of his duties in 1880 and replaced by Nathaniel Cantley, another Kew-trained Superintendent who came to Singapore from Mauritius. Cantley's remit quickly became broader than Murton's, expanding beyond the Botanic Gardens into the Straits Settlements' forests, which the government realised were in decline<sup>7</sup>. During his tenure, Cantley focused on labelling the living collections and rationalising the buildings (removing the ad hoc assortment constructed during Murton's time and grouping all the workers' accommodation in the southern end of the Economic Gardens, where they remained until c.1974). He filled the Economic Gardens with Malaysian timber and latex producing trees, built a herbarium and library in what is now known as Ridley Hall and a plant/ exhibition house (used to display plants requiring protection and to host public flower shows and plant sales in support of the Botanic Gardens' finances).

The Botanic Gardens also assumed the role of propagating trees for planting in Singapore's streets and parks. Nurseries were established, one of which, the potting yard beside Cluny Road, survives today. A classic street tree introduced at this time was the tropical American rain tree (*Samanea saman*), raised from seed in the Botanic Gardens in 1882 and now found along many roads on both the island and in the region. In 1885, Cantley received four plants of ipecacuanha (*Carapichea ipecacuanha*), the standard drug for dysentery, for trial cultivation. Trials had previously failed in India, but success was immediate at the Singapore Botanic Gardens and within only two years the first commercial consignment appeared on the London

<sup>7</sup> Cantley was also Director of the newly formed Forest Department from 1883 – much of the surviving remnants of primary rainforest vegetation in Singapore owe their existence to Cantley and his successor Ridley



FIGURE 12 C.1918 MAP SHOWING THE EXTENT OF THE ECONOMIC GARDENS



market. Cantley's last conspicuous achievement at the Botanic Gardens was the construction of the Main (Tanglin) Gate pillars, completed in 1886 – the modern pillars have the same spacing today but are not in exactly the same location (due to the realignment of Cluny Road eastwards).

The Development of the Botanic Gardens under Ridley's Directorship (1888–1912)

In 1888, Henry Ridley (latterly one of the world's greatest botanists and plantsmen) took over as the first Director of the Botanic Gardens and succeeded in drawing international attention to the possibilities afforded by rubber production, subsequently selecting the most productive strains and inventing a revolutionary tapping technique which represented the single most important innovation in the history of the rubber industry and the economic history of Southeast Asia (see **Box 5**). Ridley came to Singapore from the Natural History Museum in London, but it is certain that his appointment was recommended by Kew's then Director Sir William Thistleton-Dyer. His interests were wide ranging, encompassing zoology, geology and botany, especially orchids. For an academic he was exceptionally focused on practical applications, inventing new methods for tapping and curing rubber and perfecting its cultivation and that of oil palm, while publishing his results and advice at the same time. For this purpose, he launched the first scientific journal in the Malay Peninsula in 1891, which the Botanic Gardens continues to publish today (albeit under a different name). Under his directorship, the Botanic Gardens entered into a new era, becoming a regional centre for understanding the flora of Southeast Asia, for forestry and for economic botany and plantation agriculture.



80 Rain tree at Nassim Gate, possibly dating from 1882

Ridley was known to fill his jacket pockets with fresh rubber seeds from the Botanic Gardens when visiting plantation managers in the Straits Settlements, hoping they would consider planting the crop which he believed was a valuable new investment. He was largely ignored until a tapioca estate owner, Tan Chay Yan, agreed to plant a modest 16 hectares with rubber at Bukit Lintang in 1895 (as stated in ICOMOS Singapore Ltd's Research Report, the rubber seeds had been given to Tan Chay Yan by his business partner, Dr Lim Boon Keng, who himself had acquired the seeds from Ridley).

By 1901, Tan Chay Yan had extended his rubber plantation to 1,200 hectares and was encouraging others to do the same – and so the Southeast Asian rubber boom began. By 1917, the Botanic Gardens had supplied and sold seven million rubber seeds from its Economic Gardens, an income that supported this part of the Botanic Gardens' work. By 1920, Malaya was supplying half of the world's demand for rubber, much of it being exported from the port of Singapore. To this day, Tan Chay Yan and his descendants have maintained a close relationship with the Botanic Gardens. Tan Chay Yan's grandson, John Tan Jiew Hoe, is a keen supporter of the Botanic Gardens.

Ridley also experimented with other crops such as oil, sugar and sago palms and latex-producing gutta trees (some White gutta specimens survive in the



81 Ridley with rubber tree

### BOX 5 SINGAPORE AND THE DEVELOPMENT OF THE RUBBER INDUSTRY

Many species of trees can be tapped for rubber. However, *Hevea brasiliensis* is the primary source of natural rubber and the only one planted commercially. Native to the South American Amazon, the sap of rubber trees is known as latex. Columbus first reported the existence of rubber in 1495 after finding West Indies natives playing with rubber balls made from *Castilla elastica*.

Several small–scale or failed attempts to establish a rubber industry in South America were begun as early as 1755. However it was not until after Charles Goodyear's breakthrough discovery of the process of vulcanization (in which rubber is treated with sulphur and heat) in 1839 that the real commercial possibilities of rubber could be realised; previously rubber products had melted in summer and frozen in winter. The new demand for rubber resulted in an Amazonian rubber boom from the 1850s to 1920s. The invention of the bicycle and the automobile greatly increased the demand for the substance. In 1900, over 40,000 tons of rubber was used each year with half of it coming from Brazil and half from Central Africa (using *Landolphia* vines). The naturally growing Brazilian rubber tree industry was difficult to manage and demand could not be met.

From 1876, scientifically managed plantation practices began to be introduced. It was in this year that *Hevea brasiliensis* rubber seeds collected from the Brazilian Tapajoz valley by Henry Wickham were first successfully cultivated in the Royal Botanic Gardens, Kew. Of the 70,000 seeds collected, 4% were successfully germinated. The resulting trees were sent to Ceylon in 1876 and Singapore and other parts of the colonial empire the following year. The saplings were the origin of the rubber plantation industry in Asia. The Brazilians could not compete.

H. Ridley, Director of Singapore Botanic Gardens between 1888 and 1912, was a major founder of the modern rubber plantation along with Wickham and Dr PJ.S. Cramer. Ridley and his colleagues' new technologies enabled the all important leap to be made from the primitive harvesting of wild rubber to the systematic production of it as a plantation crop. Brockway (1979) describes how 'by 1897 Ridley had worked out the 'wound response' method of tapping, which yielded quantities of latex without injuring the tree'. Ultimately the large–scale production of rubber led to important technological developments in many industries. Ridley's work at the Botanic Gardens culminated in many significant advances towards the perfection of rubber cultivation and the establishment of a number of new principles and methods for tapping and curing. Moreover, his work was pivotal to the development and expansion of the Malayan/Southeast Asian rubber industry.

While Ridley advocated the economic benefits of cultivating plantations of rubber trees in Singapore, few listened at first. A sea change occurred however, when Tan Chay Yan planted c.16 hectares of rubber trees at Bukit Lintang in the late 1890s. A decline in the prices yielded by coffee cultivation and an increase in the price and demand of rubber finally convinced many other planters to follow Ridley's advice. As stated by Brockway 'their windfall profits in the rubber boom of the first decade of the started a stampede to rubber planting, with large infusions of British capital raised on the London stock exchange. By 1915, Malaya had over 703,000 acres planted to the Hevea tree (Tinker 1974:33). Southeast Asia production had overtaken Amazonian wild rubber on the world market; by 1919, the Brazilian market had ceased. In 1934, during the last decade of the colonial era, over 1,090,000 tons of crude rubber was coming from British, Dutch, and French plantations in Southeast Asia, and only 14,000 tons from all other sources, including Brazil (Wolf and Wolf 1936:151)'. New innovations increased efficiency and production



82 Rubber plantation in the Economic Gardens, c.1890s

doubled every two years and by 1920, Malaysia was producing over half of the world's rubber. Cramer's work furthered the industry by identifying the best method of establishing plantations using cloning instead of seeds and of determining yield of the trees.

Only natural rubber was available until 1942. However the commercial production of synthetic rubber became feasible in 1910. As a consequence of the Second World War, the American Government oversaw further development of synthetic rubber. Intense market competition between the two types of rubber occurred in the 1950s and 1960s but in 1960 synthetic rubber surpassed natural rubber for the first time and has continued to lead the way. Most of today's natural rubber comes from plantations in Indonesia, Thailand and Malaysia, almost 60% of which is used for the tyre manufacturing industry.

Botanic Gardens today). Latex from the latter was later used to coat the first undersea cables, enabling international telecommunications. Beyond testing and introducing new crops, Ridley also carried out research relating to the monitoring and control of pests and diseases in the Straits Settlements. He carried out many field expeditions across Southeast Asia, bringing back plants for the Botanic Gardens' living and preserved collections; he built a new herbarium/library south-west of Ridley Hall, artists' accommodation in the Economic Gardens, a residence for the Assistant Curator (now known as E.J.H. Corner House) and an extension to Cantley's plant/exhibition house (for housing orchids); and instructed that a second lake be excavated (Cluny Lake) from the swamp in the 1866 north-west extension. The latter subsequently grew and shrank in size, finally being reinstated as the modern Symphony Lake in 1974. Ridley was approached by Miss Agnes Joaquim, in whose famous Tanjong Pagar garden an interesting and beautiful orchid hybrid had appeared. This, he named as Vanda 'Miss Joaquim' in 1893, now Singapore's national flower represented at the Botanic Gardens by an extensive planting comprising some 20,000 specimens densely arranged on wooden posts below the west side of the Bandstand.

The Development of the Botanic Gardens under I.H. Burkill's Directorship (1912–1925)

Ridley retired in January 1912 and was succeeded by Isaac Henry Burkill, an outstanding scientist who reinforced the Botanic Gardens' scientific team and was to be the last to preside over the Singapore Botanic Gardens as a typical tropical colonial garden. It was under his directorship that a large portion (c.35ha) of the Economic Gardens (now known as the Bukit Timah Core) was transferred for the building of the former Raffles College (Figures 6 and **13** illustrate the extent of the Botanic Gardens following the loss of most of this land). The former Raffles College was Singapore's first tertiary education institution and was constructed as part of a scheme to celebrate the centenary of Singapore's founding. It opened its doors to an initial 43 students in June 1928 and was formally opened on 22 July 1929. The College was dedicated to "the promotion of arts, science and learning and the provision of higher

education for students without distinction of sex, race, nationality or religion." After a series of mergers, Raffles College eventually became the National University of Singapore. NUS moved out of the Bukit Timah site to its current location at Kent Ridge in 1981. The site was subsequently occupied by several other tertiary institutions before being returned to NUS in 2005 and becoming its Bukit Timah Faculty of Law Campus.

A bungalow (House 6) and a garage, which survive today, were completed in 1919 and 1924–28. House 6 was originally intended to be the residence of the Economic Gardens' Field Assistant, but this position was made redundant soon after the building was completed due to the loss of the Economic Gardens. During the 1920s, five bungalows were constructed on the periphery of the present Botanic Gardens, positioned in a crescent around the College buildings, to house university staff – these survive today and are known as Houses 1–5.

In anticipation of the clear felling of trees required for the construction of the former Raffles College a proportion of the younger plantings of trees were rescued from 1918 onwards and transferred to the pre–1879 part of the Botanic Gardens, specifically to the area which is nowadays the orchid nursery (behind the National Orchid Garden). The old specimens of American and African mahoganies (*Swietenia, Khaya*), durian, Velvet Persimmon (*Diospyros blancoi*) and tamarind in and around the nursery are believed to be survivors from the original Economic Gardens. Propagations of two of the highest yielding second generation rubber trees were also made and one of these survives near the Botany Centre.



83 House 6 (Former Economic Gardens' Field Assistant's residence)



FIGURE 13 EXTENT OF THE SINGAPORE BOTANIC GARDENS IN 1925

The Development of the Botanic Gardens under Holttum's Directorship (1925–1949)

I.H. Burkill was succeeded by Eric Holttum in 1925. Holttum was also a scientist but soon developed an emphasis on horticulture. His botanical interests were varied, but ferns and orchids became a focus and in 1928 he set up an in vitro propagation unit for orchids on the upper floor of a two-storey building completed in 1922 and now known as Holttum Hall. An active orchid hybridisation programme was run at the Botanic Gardens from the 1930s onwards (see Box 6 for further information). Whilst Holttum had not invented the in vitro technique, he recognised its merits and was able to demonstrate them in his laboratory, permitting hybrids to be raised with confidence and in greater quantity, the first being named in 1932 as Spathoglottis 'Primrose'. Over subsequent decades the technique was perfected and soon led to a new industry in Singapore and eventually in various other Southeast Asian countries. Orchid breeding at the Botanic Gardens became an important activity and resulted in 1956 in the establishment of a unique programme of 'VIP Orchid Namings', the first of more than 190 being Aranthera 'Anne Black', after Lady Black, the colonial governor's wife. Visitors to the Botanic Gardens can see elements of the in vitro laboratory-based propagation technique through a series of windows on the ground floor of the Botany Centre (completed in 2006) and living specimens in the National Orchid Garden (developed in 1995). The Botanic Gardens' orchid specialists today attempt on average 1,000 new hybridisations each year.

Holttum's contribution was in no way restricted to orchids. Ferns, bamboo and gingers were his other interests and he is credited with popularising two of the most commonly seen plants in Singapore's parks, gardens and road bridges, namely the frangipani (various *Plumeria* species) and *Bougainvillea*. Both have spectacular large–scale plantings in the Botanic Gardens. The following landscape/built features, which survive in the Botanic Gardens today were developed under Holttum's directorship: the Sundial Garden in 1929 (where it is thought Cantley had planted roses in 1882)<sup>8</sup>, the formal Bandstand structure (1930), water lily tanks at the base of the steps down to the Plant House Garden (1932) and the pergola (1935) adjacent to the Sun Garden.

8 Four lily ponds and Grecian statues were added in the 1970s and 2000 respectively

Holttum and his Assistant Director, E. J. H. Corner (appointed 1929), remained in the Botanic Gardens for the duration of the Japanese occupation during World War II. The British Governor, Sir Shenton Thomas, had persuaded the commander of the Japanese forces that the Botanic Gardens and museum collections should be preserved and although the two countries remained at war the Botanic Gardens' senior scientists were allowed to continue their work under the direction of an imposed but benevolent Japanese botanist, Professor Kwan Koriba. What happened during the 1942-1945 occupation is not well recorded beyond the statements in Corner's The Marquis and the briefest of post-war Director's annual reports (1947). One interesting development during the occupation was the construction of two flights of brick steps leading down from the Lower Ring Road to the Plant House Garden by Australian Prisoners-of-War.

The Botanic Gardens somewhat struggled after the war, as many of its best gardeners had died building the Burma–Siam railway and talent recruitment was limited by the British colonial rule and localisation of the public service. Amongst the few developments in



84 Sundial Garden 1959



85 Holttum laboratory 1958

### BOX 6 ORCHID PROGRAMME AT THE SINGAPORE BOTANIC GARDENS

The Singapore Botanic Gardens has registered over 560 orchid hybrids in the past 85 years – no other botanical institution in the world runs a comparable programme.

The first natural hybrid of Singapore, the *Vanda* 'Miss Joaquim' (a cross between *Vanda teres* and *Vanda hookeriana*) was discovered in 1893. It was an important precursor to the establishment of the Singapore Botanic Gardens' orchid hybridisation programme and the region's orchid industry. Richard Eric Holttum, who arrived at Singapore Botanic Gardens in 1922, started an ambitious plan to produce free–flowering orchid hybrids for the lowland tropics. His vision sprang from observing the prolific habit of *Vanda* 'Miss Joaquim' and this led to his developing a special hybridisation programme. He began producing exotic hybrids by making seemingly 'wild' crosses, not only using species within a genus, but also between genera, and his efforts were rewarded with the creation of numerous intra– and inter–generic hybrids.

Early hybrids that became important in the orchid cut–flower industry include a bigeneric hybrid *Aranthera* 'James Storie' (*Arachnis hookeriana x Renanthera storiei*). Registered in 1939 it was the earliest intergeneric hybrid created by the Singapore Botanic Gardens and the first *Aranthera* ever registered. The *Arachnis* 'Maggie Oei', a cross made by John Laycock between *Arachnis* hookeriana and *Arachnis flos–aeris*, first flowered in 1936 and dominated the orchid cut–flower market for the next thirty years. It also became the symbol for Singapore orchids. The *Aranda* 'Deborah' (*Arachnis hookeriana x Vanda lamellata*), the second registered *Aranda* in the world, and the Singapore Botanic Gardens' first, was named for Holttum's daughter. Holttum's friends and fellow orchidists John Laycock and Emile Galistan assisted with the breeding programme, contributing plant materials and knowledge. Some of the hybrids produced from this collaboration became basic materials for the infant orchid industry in the 1950s and 1960s.

In the 1980s, after spending over 30 years leading orchid hybridisation, the Botanic Gardens began to share the responsibility of creating new hybrids with local breeders who soon came to dominate the scene by producing several outstanding cut–flower hybrids. Exports of hybrids brought in S\$13 to S\$16 million annually during the late 1970s and early 1980s. Singapore Botanic Gardens continued to mass breed hybrids for landscaping, horticultural shows, the nation's VIP orchid naming programme and the cut–flower industry. More recently, Singapore Botanic Gardens has focused on improving the colour and quality of the hybrids, improving scent and breeding potted–plant orchids for people living in apartments.

During their visit to Singapore in autumn 2012, the Botanic Gardens honoured Britain's Prince William and Catherine, Duchess of Cambridge by naming a new orchid the *Vanda* 'William Catherine' for them. As part of the Gardens' VIP Orchid Naming programme, the couple joins nearly two hundred VIPs and celebrities that have been similarly honoured since 1956. The first VIP Orchid was Arantha 'Anne Black' named for Lady Black, the former colonial governor's wife.



86 Dr Yam Tim Wing pollinating orchids at the Orchid Nursery



the Botanic Gardens that are recorded is an avenue of Caribbean royal palms (*Roystonea oleracea*), planted along Office Gate Road in 1950 and now towering above a modern pergola. The Orchid Enclosure established during the 1950s by Purseglove (1954–1957) (and removed in 1995) was an important precursor of the National Orchid Garden. The 'Nature Reserves Ordinance' of 1951 placed some 3,250 hectares of land under the charge of the Botanic Gardens, 'set aside for the purpose of the propagation, protection and preservation of the indigenous fauna and flora of the Colony'. This included the Bukit Timah Reserve, nowadays administered as a Nature Reserve by the NParks Board, of which the Botanic Gardens is a part.



87 Brick Steps, made by Australian Prisoners of War during the 1940s

The Development of the Botanic Gardens under Humphrey Burkill's Directorship (1957–1969)

After various changes of directors, Humphrey Burkill (the son of I.H. Burkill, born in Burkill Hall), was appointed in 1957. In that same year Malaya was granted independence and the following year the British Parliament elevated the status of Singapore from colony to state, providing new local elections. Subsequently, between 1963 and 1965, Singapore formed an integral part of the Federation of Malaysia. After separation from Malaysia in 1965, Singapore became the Republic of Singapore.

In relation to developments in the Botanic Gardens, the water feature in the centre of the Plant House Garden quadrangle was begun in 1957 and over the following decade the herbarium building was renewed and enlarged, a large tea kiosk (now removed) built in Swan Lake's vicinity (Character Area 1) and the Raffles Hall (now known as the Raffles Building) constructed to house student accommodation (NParks' public service counter is now located within part of the building). Little else of note happened to the Botanic Gardens' physical structure until the 'greening' of Singapore was initiated in the 1960s.

A series of noteworthy large–scale public events, in the form of concerts and shows (referred to as the people's cultural concerts), took place across Singapore, including in the Botanic Gardens between 1959 and 1964. These had been organised by the Ministry of Culture and were opened by Prime Minister Lee Kuan Yew in front of an audience of 22,000. These celebrations were partly aimed at promoting racial harmony in Singapore and at encouraging unity among the people of Singapore and the development of a national culture as the island manoeuvred towards independence (see **Appendix E** for further information).

The Singapore Botanic Gardens revised its mission during the 1960s in response to the launch of the former Prime Minister Lee Kuan Yew's tree planting campaign in 1963 and 'Garden City' vision in 1967. Its regional and international work in taxonomic research was temporarily de-emphasised. Expertise and resources for the campaign resided in the Botanic Gardens, the focus of which was thus redefined from that of a largely research-orientated organisation to one that would spearhead and be the driving force behind the national 'greening' effort. This, in a sense, was a repeat of Cantley's role in the 1880s. In support of this, the area subsequently occupied by Symphony Lake (1974) was turned into a large nursery ground. To meet the need for trained personnel to maintain the greenery, the School of Ornamental Horticulture was opened in the Botanic Gardens in 1972 and housed in Burkill Hall, which offered a Diploma in Ornamental Horticulture and Garden design, the first of its kind in Southeast Asia. The new diploma was modelled on the Diploma in Horticulture established at Kew in 1963. Over the following 20 years the greening programme matured and Singapore gained an international reputation for its clean and green environment. Through the development of a world–class educational programme, the Botanic Gardens was able to achieve its mission to provide the botanical and horticultural expertise needed to transform Singapore into the Garden City vision. Key industry professionals who trained at the Botanic Gardens include, for example, J. Tan (President of the Landscape Industry Association

of Singapore), Mahendran Chakrapani (Managing Director of Urbanscapes Pte Ltd) and R.P. Jickky (Director of Tropical Environment Ptd Ltd).

The greening of Singapore did not just focus on trees. It also coincided with an expansion of orchid breeding and commercial production, once again led by the Botanic Gardens and its Kew–trained chief administrator, Arthur George Alphonso, during whose tenure as Botanic Gardens Chief administrator (1970–1976) the *in vitro* laboratory facilities were augmented and moved from the upper floor of Holttum Hall. His influence continued after retirement when he was re–employed for two years as 'Senior Curator' in charge of Orchid Breeding.

During the late 1960s/1970s a number of trees were planted/transplanted, including in the southern Tanglin Core, where tall–growing native and Southeast Asian rainforest *Dipterocarps* (*Hopea* spp.) were placed to hide the city's expanding high–rise buildings.



88 Training in the Botanic Gardens during the 1960s

# The Development of the Botanic Gardens between 1970 and 1988

Chew Wee Lek was appointed Director in 1970. Following his premature resignation the role of director ceased until the late 1980s. Through the 1970s the Botanic Gardens' public facilities and landscape were upgraded as it assumed the role of a public park focused on local amenity needs. A second lake (now known as Symphony Lake) was created in 1974 (where Cluny Lake had previously been sited) and various new garden features installed such as a Japanese Garden, plant houses for cacti/ succulents/temperate species (in cooled glasshouses) and a miniature waterfall. With the exception of Symphony Lake, these improvements were later swept away following major redevelopments which formed part of a new Masterplan for the Botanic Gardens (NParks' Masterplan).

A range of important behind-the-scenes enhancements to science and horticultural capabilities however took place during the 1970s. This included the expansion of plant entomology, pathology and nursery facilities, especially in support of a unit charged with the search for, experimentation with and introduction of new plants to Singapore's parks and gardens. In 1976 the Botanic Gardens became the Parks and Recreation Department of the Ministry of National Development and its success was measured in terms of its advancement of horticulture in Singapore. For example, in the fiscal year 1979/80 the Botanic Gardens was responsible for planting 56,000 ornamental trees, 10,000 fruit trees and 400,000 shrubs; a feat maintained over a decade until the ministry parcelled out some of these activities to other new branches supplementary to the Botanic Gardens. By then, the greening of the island through the Garden City vision had been substantially realised, though its originator, Minister Mentor Lee Kuan Yew, has continued to publicly emphasize its importance well into the 21st century (in 2013, NParks celebrated the 50th anniversary of the greening movement with an exhibition in the Botanic Gardens). Regional and international taxonomic research led by the Botanic Gardens' staff resumed again in the 1980s.

In 1983, some 60 years after the annexation of the major part of the Economic Gardens, c.13 hectares of that land was returned to the Botanic Gardens and the development commenced of what would later be called the Bukit Timah Core. This parcel of land soon included a large hard-edged pond, a new arboretum, footpaths, rest areas and a modern innovation - the provision of jogging tracks for the benefit of office-bound Singaporeans in need of physical exercise. Back in the historic southern end of the Botanic Gardens a rose garden was installed in 1985 between the Bandstand and the Sundial Garden, near to where Cantley had planted roses a hundred years before. While orchid breeding continued, the Botanic Gardens also hosted orchid shows for the Orchid Society of Southeast Asia and gained awards for its own hybrids, such as Dendrobium 'Margaret Thatcher' (1987). By the late 1980s, the Botanic Gardens was about to undergo major redevelopments and enter what can be termed its 'modern phase'.

> singapore botanic gardens 69

Dr Kiat W. Tan joined the Singapore Botanic Gardens' senior staff in 1983 from the Marie Selby Botanical Gardens in Florida, where he was an accomplished orchid specialist and Director of the Museum of Botany and the Arts. His role at the Botanic Gardens began with an overhaul of its orchid breeding programme, focusing on high quality orchid hybrids with commercial value. It was during this time that the Botanic Gardens' role in the greening of Singapore started to be gradually de–emphasised.

The Development of the Botanic Gardens under Dr Tan's (1988 – 1996) and Dr Chin's (1996– 2011) Directorships

In 1988 the role of Director was reinstated and Dr Tan appointed. The following year, Dr Tan was given funds to develop a Masterplan that would enable the realisation of his new vision for the Botanic Gardens (see **Box 7** for further information). Perhaps for the first time, 130 years of somewhat ad hoc development was rationalised in an overall plan and most of the additions of the 1950s to 1980s replaced by new landscape features. Under Dr Tan's directorship the Singapore Botanic Gardens regained its status as a premier institution for tropical botany and horticulture, whilst also fulfilling its role of attracting and engaging visitors.

With these improvements Dr Tan's revitalisation of Singapore Botanic Gardens drew to a close. Dr Chin See Chung took over the role of Director of the Botanic Gardens in 1996, overseeing some of the developments discussed in Phase 3 above, besides continuing the Botanic Gardens' traditional roles in research, education and conservation. In 1999 the School of Horticulture closed at the Botanic Gardens. The Diploma in Ornamental Horticulture



89 Botany Centre, opened in 2006

and Garden Design was taken over by the Ngee Ann Polytechnic, but practical work experience continues to be offered at the Botanic Gardens. Around 12 hectares of land was added to the Bukit Timah Core from Singapore's Management University in 2003. An additional 8.6 hectares were added to the Singapore Botanic Gardens in 2009 in the form of the 'Tyersall Learning Forest' to the south-west of the existing Botanic Gardens.

The Development of the Botanic Gardens under Dr Taylor's Directorship (2011 – present)

The Botanic Gardens has continued to be developed under the directorship of Dr Nigel Taylor, who came to Singapore from the Royal Botanic Gardens, Kew, where he was Head/Curator of Horticulture and Public Education (1995–2010) and spokesperson on the Kew Gardens' history.

Under his directorship a Healing Garden (2011) and a Fragrant Garden (2013), which replaced derelict university out-buildings, have been laid out on land which once formed part of the Economic Gardens and later the former Raffles College grounds. A Heritage Museum (2013) has been established in Holttum



90 National Orchid Garden, opened in 1995

### BOX 7 1990 MASTERPLAN AND ITS IMPLEMENTATION

The Masterplan was delivered over three phases of development carried out from the 1990s to the present day. Excellence in botanical research and conservation, education programmes and the preservation of the cultural heritage of the Botanic Gardens were all essential parts of the Masterplan, which remain at the core of the Botanic Gardens' current vision and mission to 'connect plants and people'. Works were identified within three core areas (known as the Tanglin, Central and Bukit Timah Cores). Key works included:

### Phase 1:

- Earth moving to re-shape parts of the Central and Bukit Timah Core areas. The hard edge of the pond there
  was removed and expanded to form a naturalistic lake (located outside the boundary of the Nominated
  Property).
- Removal of Cluny and Dalvey public roads, which bisected the Botanic Gardens.
- The establishment of the Plant Resource Centre (1995, located outside the boundary of the Nominated Property).
- Heliconia Walk (1997/98), the partly weather–proof Sun Garden (1994, re–landscaped 2004) and the Bonsai Garden (2005).
- The National Orchid Garden (NOG) (1995) (including the ticket office, misthouse and bromeliad structure).
   The ground floor of Burkill Hall was turned into an interpretation space in 1995 and a cool house added to the north–east of the hall in 2004.
- A new stage on Symphony Lake's island (1995, replaced in 2005).
- A new gateway (Nassim Gate) with a visitor centre and vehicle parking (1998).
- NParks' Headquarters (1998).

### Phase 2:

- The Ginger Garden (2003) and Halia restaurant complex (2001).
- The Evolution Garden (2005).
- The Jacob Ballas Children's Garden (2007, located outside the boundary of the Nominated Property).
- Key enhancements benefiting the Botanic Gardens' collections and Rainforest e.g. trees fitted with lightning conductor copper cables (fitted to over 180 trees) and replacement of paths in the Rainforest with raised boardwalks (allowing biological interconnections across the entire Rainforest).
- Improvements to visitor comfort, such as better path surfaces and more toilets, seating and shelters.

### Phase 3:

- The Botany Centre complex (2006). This involved the inclusion of a small parcel of land, Cluny Road having been moved slightly to the east thus accommodating a heritage penaga laut tree (*Calophyllum inophyllum*).
- New pillars at the Main Tanglin gateway.
- The slope down from the Herbarium Ring Road to the gateway was planted with *Saraca* trees, arranged along a stream criss–crossed by a winding path.
- New toilets and shelter area by Holttum Hall.



<sup>91</sup> Redevelopment masterplan 1990

Hall and a temporary building immediately south of it, which houses a rolling programme of exhibitions. Enhanced interpretation of the Gardens' heritage is now also in place. A new MRT station along the Circle Line, named Botanic Gardens, was opened in October 2011 in the north-western corner of the Botanic Gardens, outside of the Nominated Property.

It brings visitors from the station precinct (which is a garden in itself) through into the Trellis Garden, planted with a wide variety of climbers. A Foliage Garden, also located outside of the Nominated Property, was opened to the public in 2013.

Some further developments are planned, mostly outside of the Nominated Property, and are described in Section 4b. The conservation of the Botanic Gardens' cultural and natural heritage features continues to be central to its future management. A key aspect of the Botanic Gardens' work, which largely goes undetected by visitors, is the steady acquisition of endangered plants (especially tree species) by the Botanic Gardens' staff, especially from



92 Heritage Museum housed in Holttum Hall



93 Heritage interpretation

the Southeast Asian region. These are sometimes planted in the Rainforest or raised in the Botanic Gardens' nurseries in the hope that they can be reintroduced to the wild one day, or at least their genetic resources conserved *ex situ* for as long as possible. Behind–the–scenes nursery facilities are undergoing refurbishment and enhancement in support of such work.

# Extant Historic Features of the Botanic Gardens as a Cultural Landscape

The Nominated Property contains an assemblage of extant historic landscape features, buildings and structures that, as an integrated whole, contribute to its heritage significance as a cultural landscape. They also represent the different eras of the Botanic Gardens' development as a British tropical colonial botanic garden, between 1859 and 1958. These are shown on **Figure 14** and listed in chronological order in **Table 2** (with landscape and built elements grouped separately). The date, current state of conservation (defined as Good, Fair and Poor<sup>9</sup>) and relevant statutory protective designation(s) of each feature is also provided in this table<sup>10</sup>. Further information about each feature can be found in the preceding two sub–sections.

<sup>9</sup> Further information is provided in Section 4

<sup>10</sup> Further information is provided in Section 5 including the definition of each statutory designation referred to in Table 01



FIGURE 14 EXTANT HISTORIC FEATURES

Name of Feature	Date	State of Condition	Supplementary Information	Statutory Protection/ Designation
Landscape Features				
Rainforest	Pre 1859	Fair	Suffers from "edge effects" and needs constant attention to reduce and, ideally, eliminate invasive weed species that enter around its margins, and to control the rampant growth of lianas that thrive in the disturbed areas, where ecological balance is lacking. Heritage and tall trees are protected by lightning conductors.	Falls within a National Park and Tree Conservation Area
Path/previous road layout in southern part of the Botanic Gardens	1860s	Good	N/A	Falls within a National Park
Bandstand Hill	1860/61	Good	Bandstand erected in 1930, some modern planting located around its base.	Falls within a National Park and Tree Conservation Area
Tanglin Entrance	1864	Good	Main historical entrance still present albeit posts and gate having been replaced. Spacing of the four new gate posts aligned to match the spacing of those of the original Main Gate but gateway not in the exact historic location since Cluny Road has been slightly re–aligned.	Falls within a National Park
Swan Lake (and island planting dated 1891) and surroundings	1866	Fair	Earliest extant designed/ornamental water body in Singapore.	Falls within a National Park and Tree Conservation Area
Remains of rhino wallow incorporated into the Marsh Garden	1870s (Marsh garden, 1969)	Good	N/A	Falls within a National Park and Tree Conservation Area
Palm Valley	1879	Good	A small part of Palm Valley now sits within the National Orchid Garden. Used as a venue for weekend concerts. Some recurring problems with rhinoceros beetle and other pests attacking the palms.	Falls within a National Park and Tree Conservation Area
Potting Yard Area	1880s	Good	Existing buildings dated 1997–2009.	Falls within a National Park and Tree Conservation Area

### TABLE 2 EXTANT HISTORIC FEATURES

Name of Feature	Date	State of Condition	Supplementary Information	Statutory Protection/ Designation
The Dell	1882	Good	Character largely retained although this area has undergone various modifications.	Falls within a National Park and Tree Conservation Area
Sundial Garden	1929	Good	Four rectangular tanks for water plants added in 1971 and classical statues in 2006.	Falls within a National Park and Tree Conservation Area
Brick Steps west of Plant House Garden	Early– mid 1940s	Good	The steps which descend to the Plant House Garden from the Lower Ring Road were made by Prisoners of War held at Changi Prison during the Japanese occupation (1942–45).	Falls within a National Park
Plant House Garden	1950s	Good	First laid out in 1882. Some remnants (coral rock walls) incorporated into the current display garden (which is on the same footprint as the original Plant House Garden). Structures date from 1954 to 1958.	Falls within a National Park and Tree Conservation Area
Symphony Lake, located in Cluny Lake's historic location	1974	Good	Cluny Lake, excavated in 1891, occupied part of the location where Symphony Lake was later created.	Falls within a National Park
Arrow emerging from Symphony Lake	1974-76	Good	Marks the location of a temporary station for the observation of terrestrial magnetism set up in the Gardens in 1914.	Falls within a National Park
Historic planting	Various	Overall good	Includes a number of veteran trees (some pre-dating the establishment of the Gardens in 1859) and historic plant collections such as palms, frangipanis and orchids. The clump of tiger orchid ( <i>Grammatophyllum</i> <i>speciosum</i> ) by the former junction of Office Gate Road and Main Gate Road, for example, was originally planted in 1861. Heritage and tall trees are protected by lightning conductors.	Falls within a National Park and Tree Conservation Area

Name of Feature	Date	State of Condition	Supplementary Information	Statutory Protection/ Designation
Buildings and Structures				
Chinese graves	1842, 1881 and unknown date	Good	N/A	No designation
Gazebo 1 (Swan Lake)	1850s, brought to the Botanic Gardens in 1969	Good	Roof replaced following damage by falling tree.	Conserved structure
Burkill Hall	1868	Good	Renovated during the 1990s.	Conserved building
Ridley Hall	1882	Good	Rear section used as short-term accommodation for visiting scientists (from 2013) following repair of termite damage.	Conserved building
E.J.H. Corner House	1910	Good	N/A	Conserved building
House 6, 'Field Assistant's House'	1919	Fair	N/A	Conserved Building
Holttum Hall	1921	Good	Houses the Heritage Museum exhibition (2013) following repair of termite damage.	Conserved building
Houses 1–5	1924–28	Good	N/A	Conserved buildings
The Garage	1924–28	Fair	Termite damage and leaking roof issues scheduled to be addressed in 2014.	Conserved Building
Sundial Garden Structure	1929	Fair	Refurbished 2004/05.	No designation
Bandstand	1930	Good	Roof renovated in 2012.	Conserved structure
Low brick wall south of the Bandstand	1937	Good	Renovated in 2012.	No designation
Pergola by Sun Garden	1935	Good	Rebuilt 1957.	No designation
Raffles Hall/ Building	1958	Good	N/A	Conserved building
Gazebo 2	Unknown	Good	N/A	No designation

### **Lost Historic Features**

Since its opening in 1859, the site has been subject to a number of changes relating to its extent/ boundary and internal features. The Botanic Gardens, which originally included c.22 hectares of land, was extended by c.12 hectares in 1866 and by a further 41 hectares in 1879. Its size was subsequently reduced from 75 hectares down to 40 hectares in the 1920s with the annexation of land for the former Raffles College. Approximately 25 hectares of land was returned to the Botanic Gardens by 2006 and 8.6 hectares added to the south–west, the entire Singapore Botanic Gardens now totalling c.74 hectares. 49 hectares of the Botanic Gardens fall within the Nominated Property.

A number of landscape/built features have come and gone during the Botanic Gardens' different phases of development. Key lost/removed features are set out in the **Table 3** below. It is important to recognise that botanic gardens are dynamic and living landscapes, where change is not only inevitable and continuous but also integral to their history and ability to remain relevant in catering to the needs and demands of visitors as well as working scientific staff.

Date and description of lost feature	Date feature was lost
Ornamental planting beds laid out by Niven in the 1860s.	1875 onwards.
Croquet lawn on the side of the Bandstand Hill laid	Likely to have become Cantley's Rose Garden in 1882,
out in the 1860s.	which was subsequently replaced by the Sundial
	Garden in 1929 (which itself was later modified).
The Agri–Horticultural Society's orchid house,	Mid 1870s to make way for carnivore cages.
constructed during the 1860s.	
Murton's Office (likely to have housed the	1880s.
herbarium), orchid house and coolie lines/	
accommodation – erected during the 1870s south	
of Bandstand Hill.	
Zoo enclosures (e.g. monkey house, aviary, kangaroo	Gradually removed from 1878 and zoo closed in
and emu pens and carnivora house were dotted	1905.
around the Botanic Gardens) and 200 Keeper's	
mid late 1970s	
Murtan's initial Economic Cardon (located in the porth	1880s (when the Economic Cardon was laid out on
west extension) and cut flower beds (early 1870s)	the newly acquired north extension)
Diant/Exhibition House completed in 1995 and	Both those structures underwant extension.
orchid house constructed as an appear to the Plant/	alterations and had been largely removed by the 1950s
Exhibition House in 1889	alterations and had been argely removed by the 1950s.
Herbarium/Library building south of Holttum	2001/02
Hall The first building was completed in 1905 and	2001/02.
replaced by a two-storey building (in the same	
location) in 1930. This building gained an annex	
in 1954 and an extra floor in 1964. Its modern	
replacement is now underground.	
The majority of the Economic Garden/Arboretum	1920s (when most of the land on which the
(which included plantations of various economic	Economic Garden stood was annexed for the
crops) and some of its associated structures	development of the former Raffles College) (some
(nursery/propagation structures, offices, staff	trees survive).
accommodation) located in the northern extension.	

### TABLE 3 LOST HISTORIC FEATURES

Date feature was lost
N/A
Closed to traffic in 1989 and removed 1990 (which
improved the visitor experience).
1990s.
Removed or converted to other uses as part of
NParks' 1989 Masterplan proposals for the Botanic
Gardens (carried out up until the present day).

# Relevance of the Botanic Gardens to Singapore's Social and Cultural History

The Site forms part of Singapore's social and cultural history, etched in the memories of generations of visitors and providing a continuous sense of place and identity in the changing landscape and psyche of the islanders. The great majority of Singaporeans visited the Botanic Gardens when they were children and have continued to do so throughout their adult lives. Singapore's current Prime Minister, Lee Hsien Loong, recently spoke about the memories he associates with the Botanic Gardens, describing how:

'As a child my parents would bring me here for outings. Later, when I was a young man courting my wife-to-be, we would come here for walks and talks. Then when we had kids, our whole family would come and enjoy ourselves here - jogging in the evening, carrying lanterns during Lantern Festival around the lake at night, or playing with the Swiss Ball Fountain. The children have grown up but my wife and I still come for walks here regularly for the greenery and the waters. And I know that many Singaporeans have similarly happy memories of this place.'

Certain cultural traditions in Singapore are associated with the Botanic Gardens such as using it as a venue for introductions associated with arranged marriages (information gathered through oral history) and as a venue for celebrating momentous occasions. The choice made by Lee Kuan Yew in 1959 to launch multi–cultural celebrations (aimed at inspiring and establishing a national culture and better racial integration) and deliver his opening speech at the Botanic Gardens (to an audience of 22,000) (see **Appendix E**), reinforces the value which has long been associated with the Botanic Gardens in relation to community and ethnic cohesion in Singapore and multi– cultural interchange. These celebrations were a key milestone in relation to the birth of Singapore as an independent nation and the rise of a new culture.



94 Former Prime Minister Lee Kuan Yew Address at the People's Cultural Concert held at the Botanic Gardens in 1959

Singaporeans and foreigners alike remain deeply attached to the Botanic Gardens and appreciate it for what it offers culturally, socially and personally, including its contribution to:

- Fostering community cohesion and social ties.
- Providing a strong link to Singapore's past and continued development.
- Providing a place for daily informal and formal recreation (e.g. play, sport/exercise, quiet contemplation, picnicking and attendance at events – especially musical performances, a tradition since c.1860<sup>11</sup>).
- Providing a meeting place/somewhere to socialise, open to all, regardless of ethnic origin, age or gender.
- Imparting educational messages (through formal and informal means).
- Access to nature.
- Forging important memories.
- The celebration of momentous occasions. The Botanic Gardens is, for example, a favourite venue for wedding photographs.

Photographs of the Botanic Gardens being used by the local community and foreign visitors for a variety of purposes are provided overleaf.

# Contribution of the Botanic Gardens to the Greening of Singapore

The Botanic Gardens played an instrumental role in the morphing of Singapore into a Garden City. Following the launch of the former Prime Minister Lee Kuan Yew's tree planting campaign in 1963 and 'Garden City' vision in 1967, the Singapore Botanic Gardens revised its mission. Its regional and international work in taxonomic research was temporarily de–emphasised to allow the Botanic Gardens to spearhead the greening movement and provide the expertise and resources needed to accomplish the greening vision. Plants suitable for planting across the island were grown and distributed from the Botanic Gardens and training provided for those who would ultimately maintain the greenery.

Over the following 20 years the greening programme matured and Singapore gained an international reputation for its clean and green environment. Through the development of a world class educational programme, the Botanic Gardens was able to achieve its mission to provide the botanical and horticultural expertise needed to transform Singapore into the Garden City vision (see **Box 8**).

Whilst the Botanic Gardens no longer acts as a nursery and central horticultural training centre for the greening of Singapore, it continues to epitomise the 'City in a Garden' movement and its vision. It also continues to play an important educational role through the delivery of a varied educational programme aimed at connecting people and plants and increasing children and adults' awareness, appreciation and knowledge of plants, nature and environmental conservation. The Botany Centre frequently hosts exhibitions and professional training courses led by CUGE. Also, whilst the Diploma in Ornamental Horticulture and Garden Design moved to the Ngee Ann Polytechnic, students still complete part of their practical work at the Botanic Gardens.

The Botanic Gardens remains central to the propagation and re-introduction of native orchids and gingers as part of the island-wide greening programme (which includes objectives to restore natural habitats and reinforce Singapore's biodiversity). Staff also work closely with different departments within NParks, which has taken on the role of spearheading the greening of Singapore. For example, proposals, trials and already implemented methods for more sustainable practices at the Botanic Gardens (developed by the Gardens' staff) will shortly be showcased to the rest of NParks and to Singapore's horticultural industry. The decision to locate NParks' headquarters at the centre of the Singapore Botanic Gardens echoes the enduring link between the Botanic Gardens and the greening movement.









- 95 Exercise group
- $96 \quad \text{Jogging in the Botanic Gardens}$
- 97 One-off mass wedding event in 2009
- 98 Wedding photography is very popular in the Gardens
- 99 Visitors enjoying the National Orchid Garden
- 100 Watching a concert on the Symphony Stage
- IOI Guided tour and children's treasure hunt
- 102 Bandstand performance in 1957
- 103 Workshop in plant research

























- 104 Easter holiday makers
- 105 Hari Raya Puasa celebrations
- $106\quad$  People strolling on the first day of the Chinese New Year, Year of the Rooster
- 107 New Year Holiday Crowds
- 108 A father and son, Mr Goh Seng Fong and Mr Goh Hin Ngim, visiting the Gardens in the 1980s
- 109 People doing their early morning exercises
- IIO Chinese New Year celebrations and children feeding the monkeys



### BOX 8 GREENING OF SINGAPORE

In 1963, the then Prime Minister Lee Kuan Yew began to put in place his vision of Singapore as a tropical garden city, a remarkable concept of improvement for a rapidly developing city. He sought to make the city a Southeast Asian oasis, attractive to investors and tourists and an improvement for Singaporeans themselves. Lee Kuan Yew oversaw the planting of millions of trees in order to raise morale and give citizens pride in their surroundings. An annual Tree Planting Day was launched in November 1971. City–wide redevelopment and extensive landscaping have dramatically and successfully transformed Singapore into a modern green city which is unique in Southeast Asia. 2013 marks 50 Years of the remarkable Greening Singapore programme.

The Singapore Botanic Gardens played an instrumental role in morphing Singapore into a Garden City by lending its expertise towards the overall greening of the nation and growing the necessary plants and trees. Over the following 20 years the greening programme matured and the city gained an international reputation for its clean and green environment. A large portion of the Botanic Gardens (subsequently to be Symphony Lake) was used as a plant nursery. The School of Ornamental Horticulture was opened in the Botanic Gardens in 1972 and housed in Burkill Hall. A contemporary focus for researchers at the Botanic Gardens includes re-establishing Singapore's native biodiversity. Today almost 50% covered by greenery and rich in biodiversity, Singapore is evolving from the Garden City to a City in a Garden. Continued streetscape and beautification efforts seek to further green roads and more recently, high–rise developments using balconies and sky terraces. The ultimate goal is for Singaporeans to have gardens inside their homes as well as outside.

Tree Planting Day is just one element of an annual Clean and Green Week, first launched in 1990, to maintain green consciousness and increase awareness of recycling, green consumerism, reducing litter and other environmental issues. The creation of new parks including those with a greater diversity of character remains a priority for the NParks (the agency responsible for greening) and Singapore, as does improving the amenities and facilities of existing parks and providing greater access to them. The headquarters of the NParks is located within Singapore Botanic Gardens. The Botanic Gardens has always been and continues to be an accessible and primary recreation destination for city residents and visitors in the parks and green network open space.

NParks continues to introduce more themed parks; the overall aim is to provide everyone with a favourite green spot, catering to various lifestyle preferences. The recently opened, 250–acre Gardens by the Bay features themed vertical gardens and conservatories including those focused on Singapore's three main ethnic groups and colonial past. Work on a 300km island–wide Park Connector Network continues with the aim to have the island's compact urban landscape linked by 2015. Education and engagement with the public continues to evolve, such as with the establishment of the Community in Bloom movement in 2005. This hand-on approach has resulted in the development of gardens in spaces such as housing estates, hospitals and factories, as well as providing channels for the strengthening of communities. 2013 is the fifth consecutive year that NParks has supported Green Wave, a worldwide campaign to educate children and youth about the importance of protecting our natural environment. This year saw a record 237 schools plant the highest number of trees to date, 630 of them, within their compounds.



III Green street and 'Sky Park'

The modernisation of some cities in Southeast Asia has used green urbanism principles as a key goal for redevelopment. Other major tropical cities including Kuala Lumpur, Manila and Bangkok have seen the many benefits (social, economic, tourism etc.) associated with the greening of Singapore and aspired to similar goals. New cities such as Putrajaya (the 'garden and intelligent' federal capital of Malaysia begun in the 1990s) have also learned from Singapore's success; with Putrajaya having planned and implemented environmental capital and sustainable principles. Approximately 40% of the new city is reserved for open spaces, wetlands and green landscapes. Unlike Singapore where redevelopment and transformation was necessary, Putrajaya, as a new city, could plan such an approach from the beginning.

# JUSTIFICATION FOR INSCRIPTION

lational Orchid Garden



3.0 JUSTIFICATION FOR INSCRIPTION

### 3.1.a Brief Synthesis

### British Tropical Colonial Botanic Garden to Modern National Botanic Garden

The Singapore Botanic Gardens, originally laid out in the 1860s, is a green lung in the midst of rapid and extensive urban development. In addition to its botanic excellence today, the continued presence of the Botanic Gardens has provided generations of Singaporeans and visitors alike with a sustained sense of place and anchor to the island's local cultural history.

Singapore Botanic Gardens is an exceptional example of a 'British tropical colonial botanic garden', which emerged during the 19th century period of global expansion, exploration and colonisation. As one of the British Empire's key colonial botanic stations, within the global network that radiated out from Kew, the Singapore Botanic Gardens formed a vital capital asset, transforming knowledge into profit and power for Great Britain. The Botanic Gardens, which originated as 'pleasure gardens' (1860-1874), assumed a pre-eminent role in the promotion of economic botany in the Malay Peninsula and Straits Settlements administration during the late 19th and early 20th centuries. The Gardens bears exceptional testimony to the history of British colonial botanic gardens and to the 19th century colonial legacy of economic botany. This is evidenced in its cultural landscape that has high levels of authenticity and integrity, its crucial role as a key node within the Empire's global network of botanical gardens and its role as a significant centre for the exchange of plant research and specimens.

Successive waves of British botanists, many Kewtrained, were appointed Superintendent or Director of the Singapore Botanic Gardens. They brought with them their unique cultural traditions and specialist horticultural knowledge and practices, which had a major influence on steering the Gardens' early direction and continued work . Their exceptional devotion to empirical study, research, specimen and data collecting, as well as experiments on key plants such as rubber and ipecacuanha, carried a world-wide impact. Some of the extant historic buildings in the Gardens, which formerly provided accommodation or offices for these men, are important reminders and links to their bygone presence and efforts.

The evolution and sustained preservation of the Botanic Gardens reflects the changing shift in attitudes regarding the role and functions of botanic gardens worldwide and throughout Southeast Asia. The assemblage of historic landscape features and buildings, and conserved lowland primary rainforest, in combination richly illustrate the development and mixed role of the Botanic Gardens during the period of British colonisation. These, together with the more recent interventions since Singapore's independence, respect the cultural heritage of the Gardens, and continue to support the very significant scientific, educational, cultural and recreational role and offer of the Botanic Gardens in the modern city-state of Singapore. Today very large numbers of Singaporeans continue to regularly visit and are deeply attached to the Botanic Gardens, appreciating its landscape and amenities in a variety of ways.

### Unique Contribution to the Economic and Social Development of the Region through Plant Transfer and Research

The Singapore Botanic Gardens' landscape today bears testimony to the long–lasting history of and unique contribution of plant transfer and research to the economic and social development of the region. Nowhere in the British colonies were the effects of economic growth and discoveries more felt than at Singapore Botanic Gardens. The pioneering work carried out there in the 1880-90s on rubber cultivation and tapping techniques set in place the foundation of the early 20th century rubber boom. By 1917, the Singapore Botanic

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Gardens had supplied over seven million rubber seeds and encouraged plantation owners across the Malay Peninsula to grow rubber instead of other tropical crops. From Singapore, rubber cultivation spread rapidly across Southeast Asia, soon overtaking Brazil to become the primary producer of natural rubber. Enabling and fuelled by the transport revolution, rubber trade drew enormous revenues which underpinned the region's early economic prosperity and gave it a significant place in the world commodity trading markets.<sup>12</sup> As stated by Brockway (1979) 'between the two world wars, Singapore was the rubber capital of the world'. 76% of natural rubber in the world is produced in Southeast Asia today<sup>13</sup>, and Singapore remains at the heart of the primary market.

Without the work carried out in the Singapore Botanic Gardens it is unlikely that the great developments in the automobile, aviation, textiles and numerous other

13 International Rubber Study Group (2012). The Rubber Statistical Bulletin.

industries, which relied on the mass production of natural rubber, would have taken place. This is also true in relation to telecommunications via undersea cables covered in white gutta latex, the cultivation of which was tested at the Singapore Botanic Gardens. The Botanic Gardens also led the way in collecting, growing and distributing other promising economic crops throughout the tropics, including coffee, oil palm, ipecacuanha, sugar cane, pineapple and fibre plants. (**Figure 16** illustrates where these originated).

In addition, the orchid breeding/hybridisation work carried out at the Botanic Gardens during the first half of the 20th century laid the foundation for the establishment of the orchid cut-flower industry in Southeast Asia and around the world.

### Well-Defined and Preserved Cultural Landscape

The Singapore Botanic Gardens has a well– defined cultural landscape, which includes a rich variety of historic landscape features that clearly demonstrates the evolution of the Botanic



FIGURE 16 THE TRIALLING OF CROPS: INTRODUCING NEW CROPS TO SOUTHEAST ASIA

<sup>12</sup> Thomson, G. (1977) Singapore Rubber Centenary, 1877-1977. Singapore Rubber Centenary Committee.

Gardens since its establishment in 1859. Unusually it preserves within its historic core the original landscape layout, as designed in the 1860s for the initial pleasure gardens (as illustrated on **Figure 15** on page 84). This layout reflects the English Landscape Movement, its subsequent influence on Victorian public park design and a response to the topography of the site. The Tanglin core in the southern part of the Botanic Gardens represents one of the most authentic and unchanged examples of original design among British colonial botanic gardens in South and Southeast Asia, which is unusual among botanic gardens of the era.

The Botanic Gardens' living collections contain a number of veteran trees, many of which are over 100 years old. Uniquely, Singapore Botanic Gardens is the only city botanic garden in the eastern hemisphere to include a tract of primary, lowland, equatorial rainforest within the original boundaries of the Gardens, thus preserving in some small part the ecological heritage of Singapore. The Rainforest provides a reminder of Singapore's natural heritage before development changed the island forever, and is of immense importance from a conservation point of view. It contains trees native to Singapore which are now rare specimens as a result of deforestation, both locally and in the region. Ancient giant Dipterocarps of unparalleled size on the island can be found growing in the Rainforest and overall 60% of the plants contained within it are considered rare in Singapore. Furthermore, 10 species considered at one point to be extinct, were rediscovered within the Rainforest area and now represent the only remaining specimens in Singapore.

The presence of historic landscape features such as Palm Valley (laid out in 1879), The Dell (1882) and the Sundial Garden (1929) reinforces Singapore Botanic Gardens' heritage significance as a cultural landscape.

The ensemble of historic buildings which contribute to the cultural landscape of the Botanic Gardens includes 12 Conserved Buildings (built between the 1860s and 1950s). Five were erected for use as residential and administrative buildings for the Botanic Gardens' senior staff and seven for use by staff and students from the former Raffles College. Whilst ten are bungalows, their architecture varies, showcasing different aspects of the architectural history of Singapore and of historic bungalow styles (including the Black and White and Art Deco styles). Extant bungalows from this era are now very rare in Singapore. Only 10% of the original black and white bungalows which housed the colonial residents are still in existence. No other South or Southeast Asian botanic garden can claim to have such eminent and rare examples of their region's architectural heritage within a largely unchanged setting. Two structures, the Bandstand and Swan Lake Gazebo, are Conserved Structures.

# Leading Scientific Institution of Tropical Botany and Horticulture

Since 1875, the Singapore Botanic Gardens has continued to be a leading centre in plant science, research and conservation in Southeast Asia. Today, it is internationally recognised as a leading institution of tropical botany and horticulture. Its library and herbarium collections serve as an important reference centre for research on the region's flora for botanists from around the world. The herbarium and associated collections are distinguished both in the region and globally because of their particular contribution to tropical biodiversity research and inventorying, more specifically within the Malay Peninsula. No other herbarium in South or Southeast Asia can claim to contain collections of such quality or comprehensiveness in the original landscape within which they were established. The Botanic Gardens' herbarium can be singled out as having been fundamental to, and still continuing to play a key role in the compilation of the only welldocumented Flora of Peninsular Malaysia in super rich everwet Southeast Asia (where few tropical floras have ever been completed). In a growing scenario of land use changes and increasing conservation concerns it is important to underline how the scientific organisation of the Malaysian flora and its continuing update relied and continues to rely on major specimen archival facilities such as those provided by the Singapore Botanic Gardens. Additionally, the seminal publications on Malaysian flora are largely based on resources from the Singapore Botanic Gardens and many are written by staff from the Botanic Gardens. The site represents the cradle of breeding science for orchid

hybrids in Asia, first initiated at the Botanic Gardens in the 1920s–1930s with formal orchid breeding programmes continuing to this day.

The Botanic Gardens' wide–ranging collections are invaluable. The living collections, which partly embody the Botanic Gardens' historic development, shape its public appearance and play an important role in the site's scientific and conservation functions, include 36,400 plant accessions and 9,021 taxa. *In vitro* collections include 92,000 micropropagation plantlets. The preserved collections held in the herbarium include 750,000 plant specimens (8,000 of which are type specimens), 6,000 fungal collections and 6,200 spirit accessions. The Library and archive hold 28,000 books, 300 journal titles, 214 maps, 1,307 photographs, 2,000 paintings/ illustrations as well as DVDs, microfiches, microfilms and unpublished manuscript material.

### Integral Role in the Social History of Singapore

The Botanic Gardens has played an integral role in the social history of Singapore, providing a backdrop for the lives of its residents, both past and present, and a continued sense of place and identity. Singaporeans deeply cherish the Botanic Gardens, which they visit for everyday recreational purposes as well as to celebrate momentous occasions and personal milestones in their lives. In 1959, the Botanic Gardens was specifically picked as the venue to launch multi-cultural celebrations aimed at inspiring and achieving social harmony and racial integration in Singapore prior to its independence. These were opened at the Botanic Gardens by then Prime Minister Lee Kuan Yew, in front of an audience of 22,000. This was a key milestone in relation to the birth of Singapore as an independent nation and the development of a national culture.

### Instrumental in the Greening of the City

The Singapore Botanic Gardens was and continues to be instrumental in the greening and transformation of Singapore into a 'Garden City/ City in a Garden', successfully implementing the former Prime Minister Lee Kuan Yew's vision and 'Garden City' programme that started in the 1960s. The Botanic Gardens provided the expertise, skills and resources needed to implement the vision and continues to contribute through its plant research, education and conservation work. The knowledge and resources provided by the Botanic Gardens enthused and empowered the people of Singapore to take an active role in the greening of their city, fostering a sense of pride and ownership within its citizens. It can be said that the Botanic Gardens' involvement in the greening of Singapore dates as far back as the 1880s, when, under Cantley (the Superintendent of the Botanic Gardens at the time), the Botanic Gardens assumed the role of propagating trees for planting in Singapore's streets, parks and natural areas.

### **Attributes of Outstanding Universal Value**

A summary of the key attributes that together convey the proposed Outstanding Universal Value of the Singapore Botanic Gardens, and which need to be protected, managed and monitored, is provided in **Box 9**.

### 3.1.b Criteria under which Inscription is Proposed

The Singapore Botanic Gardens is proposed for inscription on the World Heritage List under Criteria (ii) and (iv) of the World Heritage Convention.

### Criterion (ii) – "Exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town planning or landscape design".

The Singapore Botanic Gardens has been a prominent centre for plant research in Southeast Asia since the 19th century. It continues to play a leading role in the interchange of ideas, knowledge and expertise in tropical botany, agricultural economy and horticulture and represents an important reference centre for botanists all over the world. The Botanic Gardens has gained international recognition for starting and maintaining traditions in plantation agriculture, natural history, biodiversity science and conservation in the region and has also played a pivotal role in the greening of Singapore, which influenced town planning in other cities in Southeast Asia.

### BOX 9 ATTRIBUTES OF OUTSTANDING UNIVERSAL VALUE

### 1.) The Botanic Gardens' role as a leading centre in plant science and conservation, which has been a key function for the site since the late 19th century.

Areas of focus have included:

- Plant exchange and economic botany, associated with colonial plantation crops.
- Plant breeding/ornamental plant research.
- Plant taxonomy and systematic botany.
- Biodiversity and plant conservation.
- Capacity building and collaborative work the Botanic Gardens continues to endeavour to share its knowledge and skills widely and encourage collaborative research.

### 2.) The well-defined multi-layered cultural landscape, which includes a rich assortment of historic features and clearly demonstrates the site's evolution.

This includes:

- The site's original 1860s pleasure garden layout, an unusual landscape design in the tropics (containing interconnecting curving pathways and promenades, a levelled parade area for military bands to play music and a pocket of primary lowland rainforest. It also includes Swan Lake, created in 1866).
- Other historic landscape features including heritage trees, heritage plant collections (e.g.
   Frangipani collection), Palm Valley (1879), The Dell (1882), the Sundial Garden (1929) and brick steps constructed during the Second World War.
- The ensemble of surviving historic buildings and structures (e.g. Burkill Hall and the bandstand).

### 3.) The invaluable living and preserved plant collections, which underpin the site's scientific, conservation, educational and recreational functions.

### These consist of:

- The living collections which include 36,400 plant accessions which represent 226 plant families; 1,739 general; 6,544 species and 9,021 taxa. A number of accessions pre-date the Gardens' establishment and some are rare. The site also has genetic collections.
- The preserved collections, housed in the internationally accredited Herbarium, which include 750,000 dried paper mounted plant specimens, of which 8,000 are type specimens; 6,000 fungi specimens and 6,200 plant/fungi specimens preserved in alcohol.
- The bibliographic and visual reference collections, housed in the library and archive, which include 28,000 books/pamphlets, 300 journal titles, 2,000 paintings/ illustrations.

# 4.) The site's key contribution to the development of Singapore's identity and social development.

- The continued presence and survival of the Botanic Gardens conveys a strong sense of place and identity to Singaporeans.
- The site provides a cherished and popular flagship green space and visitor attraction, which continues to foster community cohesion and cultural and social ties in Singapore.

### 5.) The site's key contribution to the greening of Singapore, which has influenced town planning in other cities across the world.

- The Botanic Gardens was central (in a practical, training and research capacity) to the delivery of Lee Kuan Yew's 'Garden City' (now 'City in a Garden') vision.
- Today it plays a central role in providing expertise and plant material for in situ conservation efforts in Singapore; it delivers important educational activities and also remains a key component of Singapore's green infrastructure network.

## Development in Economic and Ornamental Plant Research

As one of the most important 'Nurseries of the Empire' during the expansion of the British Empire, the Singapore Botanic Gardens has played a critical role in facilitating the interchange of ideas and technologies integral to the production of economically important plants. This interchange has spurred important developments in many industries and has thus exerted a profound influence on the economic and social development of the region. In particular, the Botanic Gardens' contribution with respect to latex-producing crops (rubber especially) and ornamental plants has left an indelible mark on the world. This interchange of ideas is today reflected partly in the Botanic Gardens' living collections (which contain 21 trees originally planted as part of the Economic Gardens and a vast array of orchids) and partly in its built features (Ridley Hall and Holttum Hall each respectively once housed Ridley and Holttum's offices and laboratories).

The Botanic Gardens continues to operate a specialised orchid breeding programme and is hosting a new rubber plantation for research and genetic conservation purposes from 2014.

The Botanic Gardens revolutionised the commercial rubber industry in Southeast Asia. From the Botanic Gardens, H. Ridley, Director (1888-1912), conducted extensive research on the crop. Through his discerning selection of higher-yielding rubber strains, Ridley (with support from the Botanic Gardens' staff) perfected the cultivation of rubber. This, together with the new, trend-setting principles and methods for tapping and curing rubber, which Ridley had established<sup>14</sup>, facilitated the success of the rubber industry and transformed the landscape and economy of Southeast Asia<sup>15</sup>. The widespread supply and use of rubber ultimately led to important technological advancements in several industries (e.g. automobile, aviation and textiles), with farreaching global impact. Harvey Firestone, son of the founder of the Firestone Tire and Rubber

Company, once stated: 'it was not until 1898 that any serious attention was paid to plantation development. Then came the automobile and with it the awakening on the part of everybody that without rubber there could be no tires, and without tires there could be no automobiles'<sup>16</sup>. Indeed, natural rubber plantation farming and new tapping techniques facilitated the mass production of pneumatic tyres and automobiles and technological advancements associated with this industry. Third generation saplings can be found growing in the Botanic Gardens today (by the Botany Centre), providing a link to rubber trees originally planted by Ridley.

By 1917 Ridley's persistent promotion of rubber as a valuable investment for plantation owners had led to seven million rubber seeds being supplied and sold from the Botanic Gardens' Economic Gardens. A great proportion of this went to Malaya, for whom rubber production is felt to have made one of the greatest contributions to prosperity. Today, the Southeast Asian share in natural rubber area is three quarters of the global area<sup>17</sup>. Ridley also experimented with latex–producing gutta trees (Gutta percha, White gutta). Latex from the latter was later used to coat the first undersea cables, enabling international telecommunications.

Another key plantation crop promoted by Ridley was oil palm (*Elaeis guineensis*). In a seminal paper published in 1907, Ridley praised the economic potential of the palm which unmistakably created a demand for seed. Although it appears that no commercial plantation of any size was ever attempted in Singapore itself, from 1917 onwards oil palm plantations were being established in the Malay Peninsula where business grew steadily before expanding exponentially from the 1960s. Plant trials of Ipecacuanha (Carapichea ipecacuanha, the standard drug for dysentery), which had previously failed in India, were successful at the Singapore Botanic Gardens during the mid-1880s; within only two years the first commercial consignment appeared on the London market.

<sup>14</sup> Brockway (1979) describes how 'by 1897 Ridley had worked out the 'wound response' method of tapping, which yielded quantities of latex without injuring the tree'.

<sup>15</sup> Various articles from The Gardens' Bulletin Straits Settlements; Wong, K.M. (2012) 'A hundred years of the Gardens' Bulletin, Singapore', Gardens' Bulletin Singapore, 64 (1), 1-32; Purseglove, J.W. (1957) 'History and functions of botanic gardens', Trop. Agricultural. Trin., 34 (3), 165-189.

<sup>16</sup> Zephyr, F and Aldo, M. (2010) 'The International Natural Rubber Market 1870-1930'. Economic History Services online.

<sup>17</sup> International Rubber Study Group. (2012) The Rubber Statistical Bulletin.

Orchids have been associated with the Botanic Gardens since its establishment (a giant tiger orchid, planted in the Gardens in 1861, can still be found growing in its original location). However, it was not until the late 1920s, under the Directorship of Eric Holttum, that the Botanic Gardens' active orchid hybridisation programme was launched. In 1928 Professor Hans Burgeff of Wurzburg showed Holttum a new method of asymbiotic orchid seed germination<sup>18</sup> (now known as in vitro propagation), which led to Holttum setting up an orchid seedling culture laboratory in Holttum Hall. There he conducted many experiments, and, by the end of 1929, he was able to demonstrate the merits of this new technique, which allowed him to raise hybrids with confidence, efficiently and in greater numbers. Following his initial success with hybridisation, Holttum refined the objectives of the breeding programme, having realised that further improvements could be made on free-flowering cutflower hybrids in terms of colour, texture, form and growth rate. Instead of focusing on free-flowering hybrid plants for gardens, the emphasis shifted to the production of cut-flower hybrids for commercial cultivation. As a result, hybrids such as Aranda 'Deborah', Aranda 'Hilda Galistan', Spathoglottis 'Primrose' and Dendrobium 'Tan Chye Siam' were created, which became either successful parent plants for hybridisation or commercially important cut-flowers for export. Holttum laid the foundation for the establishment of the orchid cut-flower industry in Southeast Asia and around the world.

Today the Singapore Botanic Gardens is recognised as the cradle of breeding science in Asia for orchids, with hybrids produced by the breeding programme in modern laboratories having regularly gained international recognition. The Botanic Gardens has registered more than 560 hybrids in the past 85 years, an unrivalled accomplishment among botanic gardens across the world. Whilst private breeders have now taken the lead in developing hybrids for the cut-flower industry, several of the hybrids bred by the Botanic Gardens are still being exported as cut flowers (e.g. Aranthera Anne Black, Aranda Majula and Oncidium Goldiana). The Botanic Gardens now focuses on breeding hybrids for landscaping, horticultural shows and Singapore's VIP orchid naming programme.

**Biodiversity and Conservation Research** 

The importance of research linked with the herbarium has led to the Singapore Botanic Gardens being recognised as forming a vital part of Southeast Asia's backbone for biodiversity and conservation sciences. Research carried out by the Botanic Gardens' staff and visiting specialists, in wellequipped modern buildings, has and continues to contribute to both the botanical understanding of the Malay Peninsula as well as that of the Southeast and East Asian regions. The Singapore Botanic Gardens collaborates with all institutions worldwide that maintain active research programmes relating to the study of the spectacularly rich flora of the tropical and subtropical regions and since its establishment has developed scientific relationships across the globe. This has led to an on-going interchange of ideas, transfer of technology and capacity building, which has contributed to advances in scientific understanding and biodiversity conservation in Singapore and elsewhere in the world.

A wide range of internationally important and influential papers, key works and reference books have been written by botanists, some of world renown, working at the Singapore Botanic Gardens or heavily relying on resources found there. Examples include: Flora of the Malay Peninsula by Ridley (1922– 25), A Dictionary of Economic Products by Burkill (1935), Wayside Trees of Malaya by Corner (1940, 1952 and 1988), The Durian Theory by Corner (1949, 1954), Angiosperm Flora of Singapore Project by Tan, Chua and Turner (1995) and Begonias of Peninsular Malaysia by Kiew (2005). The work of the Botanic Gardens' current researchers continues to contribute to scientific publications and floras of the region.

The Botanic Gardens' tradition of widely disseminating information and supporting scientists outside of Singapore is still prevalent today. Publication of the Botanic Gardens' research and advice dates back to 1891, when the Botanic Gardens launched the first scientific agricultural journal in the Malay Peninsula, but the interchange of ideas between the Singapore Botanic Gardens and other botanical institutions (including the Royal Botanic Gardens, Kew and a number of British and non–British gardens) in relation to their operation/management and botanical/ agricultural/horticultural activities had been taking place from the onset (1870s).

18 Originally developed by Professor Lewis Knudson

### **Development in Town Planning**

The Singapore Botanic Gardens played a pivotal role in the greening of Singapore, which has influenced town planning in other cities across the world. Singapore's Garden City journey began in 1963, when then Prime Minister Lee Kuan Yew planted a mempat tree (Cratoxylum formosum), signifying the start of the greening campaign. In response to the launch of the tree planting campaign in 1963 and 'Garden City' vision in 1967, the Singapore Botanic Gardens partly revised its mission to spearhead the greening movement by providing the expertise and resources needed to accomplish this vision (e.g. through the provision of plant material, the establishment of the School of Ornamental Horticulture and research into plant health and new species introductions). Indeed, the Botanic Gardens has contributed significantly to Singapore's transformation into a Garden City through its work in plant research, education and conservation. Staff at the Botanic gardens also published useful guides including a Guide to Tree Planting published in 1963 by A. G. Alphonso<sup>19</sup>.

Whilst the Botanic Gardens no longer acts as the nursery for the greening of Singapore and is no longer home to the School of Ornamental Horticulture, it continues to work closely with different departments within NParks, which has taken on the role of spearheading the greening of Singapore.

The Botanic Gardens also plays a central role in the propagation and re-introduction of native orchids and gingers as part of the greening programme. Through the delivery of a wide-ranging educational programme, the Botanic Gardens plays a central role in enhancing community awareness and participation in relation to plants, nature and the greening of the island. The decision to locate NParks' headquarters (the government board spearheading the greening of Singapore) at the centre of the Singapore Botanic Gardens echoes the enduring link between the Botanic Gardens and the greening movement. A range of professional training courses, led by the Centre for Urban Greenery and Ecology (CUGE, based in House 1), take place at the Botanic Gardens, including an

international executive programme focused on the greening of Singapore. This programme has been attended, for example, by delegates from Angola, Brunei, China, India, Japan, Korea, Malaysia, Mauritius and Turkey.

Singapore's 'City in a Garden' town planning and greening approach has been a source of inspiration for a number of other Southeast Asian existing and planned cities.

### Criterion (iv) – "Be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history".

The Singapore Botanic Gardens is an outstanding example of a British tropical colonial botanic garden and the best preserved of its kind. This cultural landscape demonstrates its different stages of development since 1859 through its layout<sup>20</sup>, extant historic landscape and built features and its uses and functions. The evolution and sustained preservation of the Botanic Gardens reflects the changing shift in attitudes regarding the role and functions of botanic gardens worldwide and throughout Southeast Asia. The assemblage of historic landscape features and buildings and conserved lowland primary rainforest in combination, richly illustrate the development and mixed role of the Botanic Gardens during the period of British colonisation. These, together with more recent interventions since Singapore's independence, which respect the cultural heritage of the Gardens, continue to support the very significant scientific, educational, cultural and recreational role and offer of the Botanic Gardens in the modern citystate of Singapore.

### **Development of the Landscape**

The Botanic Gardens' rainforest is a reminder of the vegetation which would once have covered the island, whilst its 1860s layout (in the southern part of the Botanic Gardens) illustrates an unusual style of landscape design in the tropics, namely a British inspired pleasure garden. The pleasure garden layout by Niven, which was inspired by a combination of the

20 The layout has left the unusual legacy of the English Landscape movement in a tropical environment.

<sup>19</sup> This reinforces the Botanic gardens' involvement in the greening movement from its inception.

topography of the site and the English Landscape style and Victorian public park layouts, broadly survives intact. Such landscapes are rarely seen near the equator, being typical of the temperate regions. Veteran trees growing in the northern part of the site as well as House 6 (the former field assistant's house) echo the former presence of Economic Gardens, whilst displays of orchids remind visitors of the Botanic Gardens' continued internationally significant work with this plant family.

### **Ensemble of Historic Buildings**

The Singapore Botanic Gardens contains surviving buildings, which represent notable stages in the development of colonial architecture in Singapore. Burkill Hall (1868), is not only the oldest surviving building in the Botanic Gardens but is also a good and rare survival of a plantation style Black and White Singapore bungalow. Similarly E.J.H. Corner House (1910), although more modest in scale, is also a typical example of a Black and White bungalow executed to a high level of craftsmanship and detail of climatically sensitive design.

The ensemble of historic buildings in the Botanic Gardens bears witness to the different stages of the evolution and functions of the Botanic Gardens and as a whole contributes to the significance of the cultural landscape. The buildings are strongly linked to a tradition of providing housing for officials and administrators during the colonial era. Whist Burkill Hall and E.J.H. Corner House were constructed as residences for the Botanic Gardens' Superintendents, Directors and Assistants, Ridley Hall (1882) and Holttum Hall (1921) were constructed as administrative buildings (offices, laboratories and the library/herbarium). These buildings provide important reminders and links to the bygone presence and efforts of a great number of botanists; including a number of British Kewtrained botanists who had a major influence on steering the Gardens' early direction and whose work carried a world-wide impact.

Houses 1–5, on the other hand, were built during the early 1920s to provide accommodation as well as offices for academics working in the former Raffles College, Singapore's first tertiary college, developed on land which had previously formed part of the Botanic Gardens. House 6 and the Garage were built in 1919 and 1924–28, serving as the residence of the Economic Gardens' Field Assistant and parking space for College professors. The Raffles Hall/Building was built in the 1950s as halls of residence for College students. Apart from the latter, the historic buildings in the Botanic Gardens were modest and domestic in scale with locations that were convenient for the operational requirements of the gardens at the time. Today, with a range of different functions, they remain an essential part of the Botanic Gardens' landscape as well as providing evidence of its evolution.

### **Colonial Beginnings to National Identity**

The Botanic Gardens was and continues to be integral to Singapore's heritage and development as a nation. The Botanic Gardens illustrates significant stages in human history, both in relation to British colonisation and the history of Singapore. Its landscape today bears important testimony to the long-lasting history and unique contribution of the Site to the regions' economic, social and scientific development. Both the British and subsequently the Singapore Government made concerted efforts to preserve this cultural landscape, which provides a continuous and essential sense of place and identity for Singaporeans. Alongside its sustained scientific, educational and recreational roles, the Botanic Gardens played and continues to play an important role in fostering community cohesion and cultural and social ties in Singapore. The Botanic Gardens has, for example, continuously provided musical entertainment and concerts for visitors and users, from the original military bands playing on the parade ground in the 19th century to the current concerts at Symphony Lake. Unusually, music was often played by the light of the moon in the 19th and early 20th centuries.

### 3.1.c Statement of Integrity

The Operational Guidelines require that the integrity of the Nominated Property be demonstrated. The Guidelines state that integrity is a measure of the wholeness and intactness of the cultural heritage and its attributes.

### Completeness

The Nominated Property includes the complete range of surviving elements necessary to express its Outstanding Universal Values as an exceptional example of a British tropical colonial botanic garden in Southeast Asia; an integral element of Singapore's heritage and development as a nation; and an illustration of interchanges of values connected to ideas, knowledge and expertise in tropical and economic botany and horticulture.

It encapsulates all the key elements that bear witness to the historic development of the Botanic Gardens' landscape and the Site's continued scientific, educational and recreational functions.

The proposed World Heritage Site boundary includes:

- The original extent and associated layout of the original Botanic Gardens, developed during the 1860s as pleasure gardens with a purposefully conserved area of primary rainforest and various original Heritage Trees located outside it.
- The land annexed to the Botanic Gardens in 1866, which contains key heritage features such as Swan Lake, Burkill Hall and Palm Valley.
- Part of the original northern extension of the Botanic Gardens (Economic Gardens, 1879) which contains heritage features such as trees originally planted in the Economic Gardens, the Field Assistant's house (House 6) and Chinese tombs (dated 1842–81, which provide a link with the previous land owners).

- Buildings which testify to the site's important role in the interchange of ideas, including Holttum Hall, which housed Holttum's *in vitro* orchid propagation unit; and Ridley Hall – the Botanic Gardens' earliest administrative building (originally constructed to house the Herbarium and Library collections but later used by Ridley as his office and laboratory).
- The living, preserved, genetic and bibliographic/ visual reference collections.

### **Adequate Size**

Detailed consideration has been given to determining the size of the Nominated Property. The boundaries have been drawn to ensure the complete representation of the range of landscape and built features and processes which convey the property's significance (as discussed in Sections 3.1b and 3.1.c – completeness).

While the Nominated Property's boundary could be extended further to the north and south–west to include the entirety of the Singapore Botanic Gardens' extent, these areas contain no features of importance that are not already represented adequately. The land to the north (known as the Bukit Timah Core) was given back to the Botanic Gardens over the period 1985–2005, whilst the land to the south–west (known as the Tyersall Forest) was added to the Botanic Gardens in 2006 and is currently under development.

### Adverse Effects of Development/Neglect

The Nominated Property benefits from a rigorous and well–resourced regime of maintenance and control for its soft/hard landscape features. This is also true for the site's built features, although these would benefit from being inspected on a more regular basis.

The Masterplan (devised in the late 1980s/early 1990s) introduced new features/facilities in the Botanic Gardens (e.g. the Healing Garden and Botany Centre), required to meet 21st century recreational, educational and scientific needs. These were carefully designed and located in order
to preserve the Botanic Gardens' cultural heritage, avoiding impact on their fabric and/or setting.

The legal duties placed upon the Nominated Property provide additional assurances against neglect and negative impacts from development. Some of these have been in place since the mid– 1980s.

### Condition

The physical fabric of the Nominated Property is in good condition and the processes of deterioration well controlled through measures such as termite inspections, building restoration, successive planting and regular site inspections by members of staff.

All the historic elements that are needed to understand the core of the cultural landscape of the Botanic Gardens (i.e. landscape design layout, historic buildings, veteran trees, remnants of Economic Gardens and primary Rainforest tract) remain intact. The continued presence of the Herbarium, Library and research laboratories bears testimony to continued use of the Botanic Gardens for scientific research.

### **Summary Statement of Integrity**

The Nominated Property includes within its boundary all elements necessary to express its Outstanding Universal Values. Its completeness is represented by the range of landscape features, buildings and structures most closely associated with the Singapore Botanic Gardens as a British colonial botanic garden. The layout and ensemble of landscape, buildings and structures included in the Nominated Property have high integrity, being in good condition and having survived virtually intact. The physical fabric of the property largely has not suffered from adverse effects of developments or neglect, with inappropriate changes controlled through statutory protection and management measures. In addition, late 20th century changes reflect the on-going development of the historic use of the Nominated Property and its role in public education. They do not significantly dilute the cultural landscape, strong sense of place or traditions that endure at the Singapore Botanic Gardens.

### 3.1.d Statement of Authenticity

Singapore Botanic Gardens has and continues to be a working scientific institution, a place of learning and a hugely popular public amenity and visitor attraction. Whilst the Botanic Gardens' layout has evolved and been refined over the last 150 years, with some buildings and landscape features having been removed to make room for improved facilities or new attractions, the cultural and natural heritage features central to the expression of the site's Outstanding Universal Values have been preserved.

The Operational Guidelines require that properties nominated under criteria (i) to (vi) must meet the conditions of authenticity. The conditions of authenticity set out in the Guidelines that are relevant to the Singapore Botanic Gardens are discussed with respect to the following attributes:

- Form and design
- Materials and substance
- Use and function
- Traditions, techniques and management systems
- Location and setting
- Intangible heritage

### Form and Design

Since the establishment of the Botanic Gardens in 1859, its extent has expanded and contracted and some of its display collections and built features have changed. However, overall the Botanic Gardens has retained all attributes necessary to express its Outstanding Universal Value. This pattern of change, growth and development is integral to the history of all botanic gardens and their ability to remain relevant in catering to the needs and demands of visitors as well as working scientific staff. Careful maintenance and management has enabled the intended form and design of different components of the Botanic Gardens to be retained. It is recognised that inappropriate changes to management and maintenance regimes could erode the design intention of the Nominated Property.

Key extant historic features which reflect authenticity of design and form include:

- The landscape layout in the southern part of the Botanic Gardens – reflects accurately the original 'pleasure garden' design of the 1860s laid out by Niven. This includes the original undulating land form, Swan Lake (1866, the oldest ornamental water body in Singapore) and serpentine path layout radiating from the Bandstand Hill area.
- The primary rainforest tract : predates the Botanic Gardens and was purposefully retained by the Agri–Horticultural Society and subsequent governments.
- Palm Valley: established in 1879.
- The Potting Yard area beside Cluny Road : survives from the 1880s when the Botanic
   Gardens assumed the role of propagating trees for planting in Singapore's Forest reserves, streets and parks. The presence of nurseries and propagating facilities was and continues to be central to the work and functionality of the Botanic Gardens.
- Burkill Hall (1868), Ridley Hall (1882), E.J.H. Corner House (1910) and Holttum Hall (1921): bungalows built to serve as administrative or residential houses for senior Botanic Gardens staff. Whilst their function has now changed, they all broadly retain their original design, form and key characteristics. Burkill Hall represents a good and rare example of a plantation-style black and white Singapore/Straits Settlement bungalow. E.J.H. Corner House, albeit being relatively modest, is a typical example of a black and white bungalow executed to a high level of craftsmanship. Ridley Hall is the Botanic Gardens' earliest administrative building and is of an architecture characteristic of the Early Bungalow. Holttum Hall is the only building in the Botanic Gardens which displays a distinctly European style, though still incorporating features of the Singapore/Straits Settlements Bungalow.

- House 6: completed in 1919, was used as the residence of the Economic Gardens' Field Assistant. It is a modest building, which generally retains its original layout and appearance (its overhanging sun-shading was however possibly added in the 1950s). House 6 illustrates a transition from the traditional 19th century colonial bungalow epitomised by the black and white houses of Singapore to the later Public Works Department housing influenced by the prevalent Art Deco style in England.
- The Sundial Garden: laid out in 1929 under Holttum's directorship. Its water tanks were added in the 1970s and the corner statues in c.2006. The Botanic Gardens' general layout is evident and its sundial, designed by Holttum's wife, remains. In relation to the designed landscape, it is recognised that the Sundial Garden does not fit in very well with the rest of the Botanic Gardens due to its more formal design, but is an extant historic feature dating back to 1929, which is also popular with visitors.
- The pergola by the Sun Garden: completed in 1935 (rebuilt 1957).
- The Bandstand: erected in 1930 to provide formal shelter for bands playing on the parade ground (on Bandstand Hill, laid out in the 1860s).
   The Bandstand was used continuously for concerts from c.1860 up until the 1980s and was used again in 2013.
- The brick steps which descend to the Plant House Garden – constructed during World War II with bricks made by allied prisoners of war from Changi prison.
- Whilst Symphony Lake dates back to 1974 it was excavated where a lake once stood. This lake, Cluny Lake, was excavated in 1891.
- Historic planting of varying ages: includes a number of veteran trees (some pre-dating the establishment of the Gardens) and historic plant collections (such as palms, frangipanis and orchids) as well as individual plant specimens (such as the clump of tiger orchid by the former junction of Office Gate Road and Main Gate Road, planted in 1861).

### **Materials and Substance**

The Nominated Property comprises both structural and non-living features as well as living vegetation, in all its many forms. The ephemeral nature of plants makes the Singapore Botanic Gardens a dynamic living cultural landscape where change is inevitable and continuous. All plants have finite lives and at some stage a decision to remove or replace them is unavoidable. Life cycles vary enormously which has resulted in a range of plants found in the Singapore Botanic Gardens today which predate the Botanic Gardens' establishment - these include trees in the Rainforest as well as 13 other trees located across the site. 21 trees and seven oil palms are believed to form part of the legacy of the Botanic Gardens' role as a colonial economic garden and third generation rubber tree saplings have been planted by the Botany Centre.

The avenue of Sealing Wax Palms (Cyrtostachys renda) was established in 1905; the legumes by Swan Lake in 1889; the large clump of Nibung Palm north of Holttum Hall in 1878; and the Gigantochloa ridleyi bamboo in Palm Valley in the early 20th century. In light of the dynamic nature of the Botanic Gardens and its sensitivity to change, careful maintenance, planning and renewal (cyclical replacement of vegetation) has been central to its management since its inception. This has resulted in much original plant material being preserved – either through the retention of the plant itself or through propagation and renewal using descendants of the original plant material or the same species from another stock. The history of development and change at the Nominated Property, integral to its cultural value, has also resulted in some new plant species being introduced. Altogether a sense of continuity between past and present in terms of the character and setting of the Botanic Gardens has been successfully preserved.

The Botanic Gardens' hard landscape components (e.g. paths, bins, benches, lighting) are, for the majority, made up of contemporary materials. The climatic conditions pertinent to the Botanic Gardens as well as the general wear and tear associated with the Site being a public attraction have resulted in these components needing to be replaced. Wherever possible these have been replaced with items made of the same material or modern materials replicating their original material/style. However, the Botanic Gardens' paths have generally been resurfaced using modern materials.

On balance extant historic buildings and structures retain much of their original fabric:

- Burkill Hall (1868), Ridley Hall (1882), E.J.H.
   Corner House (1910) and Holttum Hall (1921)
   have each been restored. This was generally
   sensitively achieved, using appropriate materials
   and techniques maintaining original features
   and character. E.J.H Corner House would
   benefit from modern additions, such as the glass
   enclosures around the verandas, being removed.
   The tegular ceiling boards in Ridley Hall detract
   from the buildings historic character.
- Most of the original materials of the external envelope of Houses 1–5 have been maintained and some key internal features retained, such as the staircase in each house and some doors, windows, internal joinery and (modest) decorative plasterwork in entrance halls.
- Most of the original materials of the external envelope of the Raffles Hall/Building have been maintained. Internally it has been refitted to accommodate new office uses, though the general character has been maintained.
- The garage block is preserved in its original form, retaining key features and the character of the original building.
- Although House 6 maintains many of its original exterior features, it has been altered internally as it has been adapted for new uses over time. Very few original interior features survive.
- The Potting Yard's buildings were gradually replaced. The existing buildings were not constructed using authentic materials, in order for them to be more durable and meet modern needs.
- The Bandstand has been restored. This was sensitively achieved, using appropriate materials and techniques.

- The Swan Lake gazebo was relocated to the site in 1969 and recently restored. While the balustrades, columns, acanthus acroteria and rainwater spout are original, the ridge cresting, hipped roof, brackets and ceiling are all later additions. There would be benefit in conducting further research to establish the gazebo's original design.
- The columns and brackets of the second historic gazebo are original, unlike the metal hipped roof, rolled steel joist beams and tension rods.
- Other built structures such as pergolas underwent restoration/conservation works, but this was sensitively achieved.

### **Use and Function**

The remit of the Nominated Property was extended from a pleasure garden to a botanic garden in 1874, when the Agri–Horticultural Society who first established the Botanic Gardens handed over its management and maintenance to the government. Ever since, the Botanic Gardens has continued to be run as a botanic garden, maintaining documented and living collections of plants for the purposes of scientific research, conservation, display/recreation and education. These roles are important cultural values of the site.

The recreational value and use of the Botanic Gardens has steadily increased – today it is the most visited botanic garden in the world, used by a wide range of user groups. The Botanic Gardens has long been an inclusive meeting place for all members of the community, who continue to cherish it deeply.

All the Botanic Gardens buildings, apart from those in the potting yard area have been given new uses, allowing the Botanic Gardens to evolve and meet contemporary needs. The presence of nurseries and propagating facilities, a library, laboratories and a herbarium (most now housed in new fit for purpose buildings) was and continues to be central to the work and functionality of the Botanic Gardens. A herbarium and library have existed at the site since 1875 and laboratories since the late 19th century. Accommodation for Directors and senior members of staff is no longer provided on site, but was the norm up until 1969.

### Traditions, Techniques and Management Systems

The Nominated Property has been managed and maintained as a botanic garden since the late 19th century, which has provided continuity in its administration. Albeit having been managed originally by an Agri–Horticultural Society, the site has continuously been under the management of a dedicated garden team, generally headed by a Superintendent or Director). From the 1860s the colonial government also contributed to the labour force. An overall continuity of management and maintenance prevailed, even during the two world wars or when the Botanic Gardens was focused on the greening of Singapore.

In relation to horticultural practices and traditions, until 1974 staff lived on site and very often sons and daughters learnt the trade from their fathers or mothers in order that they could continue to live in the Botanic Gardens. This learning role was eventually translated into the School of Horticulture, founded 1972 and continued until 1999. The tradition of labelling plants and keeping records, a tradition specific to botanic gardens, has been upheld at the Singapore Botanic Gardens since at least 1875.

The Botanic Gardens has and continues to provide the venue and backdrop for a number of local traditions, such as the celebration of momentous occasions/personal milestones. A key social tradition in the Botanic Gardens is that of musical performances, which began in c.1860 and continue to this day.

### **Location and Setting**

Whilst the Singapore Botanic Gardens has always been in the same location, its extent has expanded and contracted over the last 150 years. Although a number of generally more temporary buildings and structures have been removed over time, alongside the majority of the Economic Gardens (both those originally located to the south–west and the main Economic Gardens later located to the north), all other key historic features have remained in the same location. A small number of plants have been relocated, including some original trees from the Economic Gardens, which were transplanted when the land was about to be lost. It should be noted that whilst buildings such as Ridley Hall and Holttum Hall remain in their original location, their collections (herbarium, library and genetic collections) have been relocated to new premises within the Nominated Property, to ensure their security and safety.

The internal setting of landscape components has been retained on balance. The setting of some of the historic buildings has been somewhat altered in some cases. For example, the National Orchid Garden, which surrounds Burkill Hall, is not the original landscaping for this area. E.J.H. Corner House was originally located on Cluny Road when this formed the boundary of the Botanic Gardens and was known as 30 Cluny Road - today it is set among lush vegetation and it is unclear if this was always the case or the design intention. Ridley Hall and Holttum Hall are part of a cluster of buildings which, from 1902 to 2002, included another building (south of Holttum Hall) which housed the herbarium - this building was demolished and recently replaced with a temporary gallery space. The Botany Centre, completed in 2006, partly overshadows Ridley Hall. Houses 1–5 are each situated so that their gardens look down onto the Botanic Gardens and are largely secluded by vegetation. On the front, the houses look onto what has become a ring road around the college buildings. House 1, which is lower than the road level, has been obscured by a large modern canopy. It also now faces a number of modern college buildings, which is also true of House 2. Houses 3, 4 and 5 remain in close proximity to the historic college buildings with which they still form a discernible group. House 5 is however slightly obscured by a new two-storey building to its side.

The Bandstand's setting has generally been preserved, despite some contemporary gardens having been laid out close by and shrub beds having been planted around its base.

### **Intangible Heritage**

The Nominated Property has long formed part of Singapore's social and cultural history, etched in the memories of generations of Singaporeans and visitors and providing a continuous sense of place and identity in a rapidly changing environment.

Visitors remain deeply attached to the Botanic Gardens and appreciate it for what it offers culturally, socially and personally. The invaluable and distinctive green space it affords helped shape the cultural identity of the island through the shared memories of many generations of the Botanic Gardens' visitors, and is part of its unique character.

### **Summary Statement of Authenticity**

The key attributes that contribute to the Outstanding Universal Values of the Nominated Property meet the conditions of authenticity. The landscape, buildings and structures within the Nominated Property have high levels of surviving authentic fabric and the spatial planning and layout of the Nominated Property is authentic. Considerable elements of the Nominated Property are either still used in the manner in which they were originally intended, or are used in a manner that is sensitive to their original purpose.

# 3.1.e Protection and Management Requirements

The Nominated Property is protected by laws of the Singapore Government, namely the Parks and Trees Act and the Planning Act, which provide for a range of statutory conservation designations and development control planning measures that will protect and conserve its attributes of Outstanding Universal Value. The majority of the Gardens is designated as a National Park, and the whole of the Nominated Property is designated as a Conservation Area (which includes a number of Conserved Buildings and Structures) and it is also designated as a Tree Conservation Area. Works affecting these conservation designations are strictly controlled under the relevant legislation. The visual setting of the Nominated Property within the proposed Buffer Zone is protected by stringent controls on the height and form of buildings implemented through the Singapore Master Plan.

All land within the Nominated Property is within the ownership of the State and under the management of NParks. The Singapore Botanic Gardens' current annual operating and staff budget is S\$15 million, with substantial additional funding available to support a variety of infrastructural developments and maintenance works. The Singapore Botanic Gardens employs 125 full-time staff, supported by an active volunteer base. Responsibility for the Gardens' overall management lies with its Director who is assisted by two Senior Deputy Directors and four Deputy Directors. The Management Plan submitted with the Nomination provides an overarching framework for the long-term protection and conservation of the Nominated Property. Implementation of the Management Plan is overseen by a Management Committee comprising representatives from the National Heritage Board/ Preservation of Sites and Monuments, National Parks Board/Singapore Botanic Gardens, Urban Redevelopment Authority, Singapore Tourism Board, National University of Singapore, ICOMOS Singapore, Singapore Botanic Gardens volunteers, The Ministry of Education, The Nature Society Singapore, The Singapore Gardening Society, The Singapore Heritage Society, The Singapore Institute of Architects and the Tanglin Neighbourhood Committee.

There are currently no substantial threats to the Outstanding Universal Values of the Nominated Property. Comprehensive and on-going management, maintenance and monitoring of the Nominated Property as a whole and its individual components will be undertaken in accordance with the approved Management Plan to ensure adequate protection and conservation of its attributes of Outstanding Universal Value. The Singapore Government is committed to recognising the status of the Singapore Botanic Gardens' as a World Heritage Site, supported by the relevant legislation under the Parks and Trees Act and the Planning Act.

### 3.2 Comparative Analysis

# Botanical Gardens Inscribed as World Heritage Sites

Whilst nascent botanic gardens can be reasonably identified in, for example, Aztec, Chinese, Egyptian and Arabic cultures, it is widely accepted that the world's first botanic gardens were the 16th century university physic or medicinal gardens of Italy. The Orto Botanico at Padua in Italy (1545), inscribed as a World Heritage Site in 1997, is undoubtedly the finest example of the renaissance hortus medicus. Unlike their successors, renaissance botanic gardens were devoted to growing medicinal plants as a research resource and at this stage botany was considered an adjunct to the study of medicine. In light of this, the botanical gardens of the renaissance and those of the colonial period do not invite direct comparison.

The 'modern' botanic garden is a product of the intellectual movement known as the Enlightenment, which combined a sense of aesthetic taste with a rational concern for scientific endeavour. It became acceptable to combine beauty and science, which heralded the start of the age of botanic gardens. Botanic gardens such as the Royal Botanic Gardens, Kew (1759, London, UK), inscribed as a World Heritage Site in 2003, were set up across Europe to try to cultivate new species brought back from tropical expeditions and became fundamental in both promoting and encouraging botanical exploration as well as establishing new botanic gardens (primarily for economic reasons).

The colonial powers, and in particular the British and Dutch, established botanical gardens worldwide within their respective empires, from the Caribbean, Pacific, Australia and New Zealand, to Hong Kong, Indonesia and South Africa. The spread of botanic gardens was the mark of a global race to pursue new riches, as what were to become essential commodities spread around the world.<sup>21</sup> Colonial botanic gardens, such as the Singapore Botanic Gardens, became laboratories for crops which had been migrated out of their native landscapes. These 'Nurseries of the Empire' enabled imperial dominance both practically and ideologically in an

<sup>21</sup> Jackson, A. (2013) Buildings of Empire, Oxford University Press.

era when botanical research was at the forefront of scientific enquiry and a driving force in the world economy. These places of tranquillity and beauty were the focus of intense economic activity and crop growing during the colonial expansion (late 18th/ early 20th century), which resulted in the face of trade and balance of power changing forever. Kew (London) played a leading role in both establishing and co-ordinating a worldwide network of botanical outposts and was the British Empire's botanic hub back home. As described by Brockway (1979) 'Kew became a clearinghouse for the exchange of plant information and a depot for the interchange of plants throughout the empire; it sent plants wherever it saw commercial possibilities'. The very European nature of Kew as well as its role as 'mother ship' sets it and its contemporaries (e.g. Leiden, Vienna and Paris), apart from colonial botanical gardens such as the Singapore Botanic Gardens.

Two more botanic gardens are inscribed on the UNESCO World Heritage List, Kirstenbosch Botanical Gardens (Cape Town, South Africa) and the Rio de Janeiro Botanical Garden (Rio, Brazil). Both are inscribed as part of much larger sites namely the Cape Floral Kingdom (inscribed in 2004) and the Rio de Janeiro: Carioca Landscapes between the Mountain and the Sea (inscribed 2012) and thus do not invite direct comparison. The former is a modern garden and was inscribed as a natural World Heritage Site and the latter as part of a site which consists of an exceptional urban setting encompassing the key natural elements that have shaped and inspired the development of the city of Rio de Janeiro (the Rio de Janeiro Botanical Gardens were laid out in 1808 by the Portuguese).

It should be noted that whilst a small number of Botanic Gardens have been inscribed on the World Heritage List (some as part of larger sites), no colonial botanic garden, as a specific type of property, has yet been inscribed. The inscription of the Royal Botanic Gardens, Kew in part denotes the British Empire's remarkable contribution to the international spread of horticultural knowledge in pursuit of economic gain. As Kew's satellites and the Empire's institutional outposts, British colonial botanic gardens complete the story of this worldwide exchange of knowledge and plants. Of the many satellites established in this global network, those in the tropics and especially those in South and Southeast Asia stand out. The Singapore Botanic Gardens represents an outstanding example of a British tropical colonial botanic garden, the best preserved of its kind and one of the most influential in terms of the economic botany work carried out there (particularly in relation to rubber and Ipecacuana); thus making it worthy of representation on the World Heritage List alongside its 'parent', Kew.

### **Tropical Colonial Botanic Gardens**

A great concentration of colonial botanic gardens lies in the humid tropics. The distinctive climate, ecosystems and biodiversity of this latitude distinguishes these botanic gardens from their counterparts in the rest of the world as a result of their unique output and character and their perceived historical value for development of new crops. Indeed, the potential and challenges of an 'ever wet' environment and the resultant successes in economic crop growing places these gardens in a category of their own, separate from gardens in the seasonal temperate regions, where most well-known botanic gardens reside.

Among all colonial botanic gardens in the world South and Southeast Asian gardens have an unrivalled importance in colonial history. No other region of the world can claim to have produced botanic gardens as productive or as cutting edge as those in South and Southeast Asia. The pioneering work done there was to steer the course of history in new directions, revolutionising trade, toppling and establishing economies and determining the international power balance. The most important of these tropical colonial botanic gardens included:

- Sir Seewoosagur Ramgoolam Botanical Garden (Pamplemousses Botanical Garden), Mauritius (French/British).
- Bogor Botanic Gardens and its extension Kebun Raya Cibodas Botanical Gardens, Indonesia (Dutch).
- Royal Botanic Gardens Peradeniya and its lowland and highland sister gardens, Henarathgoda and Hakgala, Sri Lanka (British).
- Calcutta Botanic Garden, India (British).

- Hong Kong Zoological and Botanical Gardens, Hong Kong (British).
- Penang Botanic Gardens, Penang Island, Malaysia (British).
- Singapore Botanic Gardens (British).

Of these tropical colonial botanic gardens, only Sir Seewoosagur Ramgoolam Botanical Garden does not fall within South and Southeast Asia.

### British South and Southeast Asian Tropical Colonial Botanic Gardens

British South and Southeast Asian botanic gardens were pre-eminent as a direct consequence of their mutually advantageous role as outposts of the Royal Botanic Gardens, Kew and their place within a wider network. Kew was the nerve centre for all colonial botanic expeditions and the movement to research, experiment and cultivate valuable economic crops within the Empire's numerous colonies. Satellite botanic gardens were established for this very purpose, expanding Kew's global access to plant species and data over decades. It should be noted that the British network was much bigger than that of other colonial empires, which generally only comprised 1-2 gardens, as opposed to the British Empire's 100+ gardens that spread from Jamaica to Singapore and Fiji (when the British Empire was the most extensive empire in world history). The infusion of resources, direction and expertise from Kew and plant exchange between these botanic gardens enabled the world class research and discoveries that occurred there. These gardens formed part of a network radiating out from the nerve centre of botanical activity at Kew, not only benefitting from Kew, but providing the essential resources which made Kew the world's most important botanical institution.

Colonial botanic gardens in South and Southeast Asia take their place in history as the sites where the most important developments in economic crop growing took place during the 19th century. The revolutionary advances in rubber, cinchona and oil palm had ramifications on the global economy, which established this region of Asia as an important economic power. Malaya became the biggest rubber producer in the world as a direct consequence of Henry Ridley's work on rubber, which he carried out at the Singapore Botanic Garden during the late 19th century. An entirely new and booming economy was created out of a plant which was not native to the region. This was intimately intertwined with the technological advances in industries which benefitted from the emergence of this newly plentiful resource. Ridley also promoted the growing of cacao and African oil palm. Singapore Botanic Gardens carried out experiments with almost every crop which now exists in the region or which had potential to thrive. While Bogor Botanic Gardens (and its extension) played an important role for the Dutch empire, it does not compare to the impact British tropical botanic gardens had on the success of the British Empire.

### Royal Botanic Gardens Peradeniya

The Royal Botanic Gardens Peradeniya, established in 1821, contains 3,000 species of orchids, spices, palm trees and medicinal plants in a setting which is largely unchanged. Its landscape layout is formal (living collections are laid out in a strictly taxonomic/ systematic order) in comparison to the informal English Landscape style inspired layout found at the Singapore Botanic Gardens. Three historic buildings, classical in style, survive - namely the Herbarium and two monuments dedicated to two of the gardens' former Directors. Some of Peradeniya's specimen trees are subject to on-going impact by large numbers of roosting fruit bats.

The Royal Botanic Gardens Peradeniya was the site of important advances in economic crop growing especially tea and cinchona (at its sister garden Hakgala, founded 1861) and its importance in the history of economic crop growing is significant within Sri Lanka. Peradeniya and Henarathgoda contain a number of original rubber trees which are from the same source as those in Singapore, whose descendants founded the rubber industry. Peradeniya was an important early research facility, a role which has continued on a greater scale in Singapore. The herbarium currently contains around 125,000 specimens. Peradeniya exchanged plants with the Singapore Botanic Gardens from the 1870s. Penang Botanic Gardens and Malacca Botanical Garden

The Penang Botanic Gardens (for a long time better known as the Waterfall Gardens) was established in 1884 by the Straits Settlements' administration (which was headquartered at the Singapore Botanic Gardens) and acted as a 'satellite/sister garden' to the Singapore Botanic Gardens up until the late 1940s. At that time Penang's overseer reported to the Straits Settlements Director of Gardens', based at the Singapore Botanic Gardens. Equally, the botanical station at Malacca, established in 1886, was under the auspices of the Straits Settlements and its work was subsidiary to that of Singapore Botanic Gardens. The important work that was done at Penang was intended to support that of Singapore Botanic Gardens, developing initially as a repository before being subsumed as a planting research centre from the 1880s until World War II. Much of the herbarium at Penang was incorporated into Singapore Botanic Gardens' herbarium in 1910 and in 1945. World War II had an adverse impact on the Penang Botanic Gardens, linked to a lack of funds and direction and the accumulation of war debris in the Gardens. Upon British re-occupation in 1945, much restoration and cleaning up had to be done. As part of post war reorganisation, the Penang Botanic Gardens was separated from its parent establishment in Singapore. The Gardens' role in research and botanical activities was gradually eroded. Much of the Penang Botanic Gardens ' original layout (informal in style) survives, but with additions across the site (including nursery facilities and other recent buildings). The renowned waterfall area, now managed by the Water Authority, is no longer publicly accessible.

### **Calcutta Botanic Gardens**

Calcutta Botanic Gardens, established in 1787, is the largest and oldest site of its kind in South Asia. Its layout has been altered since its inception, with some elements (such as the late 18th century teak plantation and the mid-19th century pleasure gardens of the Calcutta Agri-Horticultural Society) no longer remaining. Its 1870s layout, designed by its then superintendent Dr George King, was praised for its quality, containing undulating surfaces and artificial moats and lakes. The re-housed herbarium contains 2.5 million plant specimens from 350 families compared to Singapore Botanic Gardens' 750,000 specimens. While the collection may be larger, it focuses more on the Indian subcontinent, whereas the herbarium at Singapore Botanic Gardens is more cross-regional in character. The Calcutta Botanic Gardens contains an impressive collection of palms, with 116 species of 53 genera. The Singapore Botanic Gardens has a larger variety of palms (683 species).

### **Hong Kong Botanical Gardens**

The Hong Kong Zoological and Botanical Gardens, established in 1871 as an extension to the parkland and gardens of the Governor's residence, stretches over 5.6 hectares. In its early stages it acted as an entrepôt for the export of the largely unknown flora of China to the Royal Botanic Gardens, Kew and elsewhere. At this time it had a significant influence on the establishment of afforestation on the island. It also formerly made a contribution to plant science research and to the impact of economic botany on the prosperity of the region. It was renamed in 1975 as Botanical and Zoological Gardens to reflect the increased commitments to zoological exhibits. Today, the botanic gardens is a popular urban park and zoo, which contains 1,000 species of plants and retains some of its original formal layout/features.

### Summary

All these sites to some degree contributed to 19th and early 20th century developments in economic crop growing, which established this region of Asia as an important economic power. However, Ridley's extensive work at the Singapore Botanic Gardens in the late 19th/early 20th century on perfecting the cultivation, extraction and curing of rubber, combined with his relentless promotion of the crop, can be singled out as perhaps the most significant contribution to Malaya becoming the biggest rubber producer in the world and creating an entirely new and booming economy with global influence.

The Singapore Botanic Gardens also played a key role in economic and ornamental plant research relating to other crops such as oil palm, Ipecacuanha and gutta percha. The results of orchid breeding and hybridization experiments carried out at the Singapore Botanic Gardens in the late 1920s laid the foundation for the establishment of the orchid cut flower industry in Southeast Asia and around the world.

Today, the Singapore Botanic Gardens is internationally recognised as a leading institution for tropical botany and horticulture and its library and herbarium collections serve as an important reference centre for research on the region's flora for botanists around the world. The Singapore Botanic Gardens' well-defined cultural landscape clearly demonstrates the site's evolution since its establishment in 1859 and unusually still preserves its historic core, which represents one of the most authentic and unchanged examples of original design among British colonial botanic gardens in South and Southeast Asia. Its surviving historic landscape and built features have high levels of authenticity and are well maintained and it is the only city botanic garden in the eastern hemisphere to include a tract of primary lowland rainforest within the original boundaries of the gardens, thus preserving the unique ecological heritage of Singapore. It is also recognised as having played a pivotal role in the greening of Singapore (providing expertise, skills and resources), which has influenced town planning in other world cities.

The Singapore Botanic Gardens is amongst the best examples of British colonial botanic gardens, having continued and expanded on all of its functions. The continuity of its scientific and research roles with regional reach is notable (including its continued dedication to plant systematics research), as are both the local and international traditions that typify its visitorship.

Whilst most of the tropical botanic gardens from the British colonial network have vanished, the few remaining ones in South and Southeast Asia have unfortunately lost or partly lost some their original features/functions.

### 3.3 Proposed Statement of Outstanding Universal Value

### **Brief Synthesis**

The Singapore Botanic Gardens, originally laid out in the 1860s, is a green lung in the midst of rapid and extensive urban development. In addition to its botanic excellence today, the continued presence of the Botanic Gardens has provided generations of Singaporeans and visitors alike with a sustained sense of place and anchor to the island's local cultural history.

The Singapore Botanic Gardens is an exceptional example of a 'British tropical colonial botanic garden' which emerged during the 19th century period of global expansion, exploration and colonisation in Southeast Asia. The Botanic Gardens assumed a pre-eminent role in the promotion of economic botany in the Malay Peninsula and Straits Settlements administration during the late 19th century and early 20th century. Today the landscape of the Botanic Gardens bears testimony to the history of British colonial botanic gardens, the 19th century colonial legacy of economic botany and the long lasting history of and unique contribution to the economic, social and scientific developments of the region. In particular, the pioneering work on rubber cultivation and techniques for tapping carried out in the 1880s and 1890s set in place the foundation of the early 20th century rubber boom in Southeast Asia.

The Botanic Gardens has a well–defined cultural landscape which includes a rich variety of historic landscape features that demonstrate clearly its initial establishment as a pleasure garden in the 1860s and its subsequent evolution and continued role as a botanic garden. The extensive living collections include many veteran trees and unusually the site includes a six hectare tract of primary, lowland, equatorial rainforest within its boundaries. An ensemble of historic buildings including colonial style bungalows, built between the 1860s and 1920s for staff residences and administration, contributes to the cultural landscape of the Botanic Gardens. Since its beginning, the Singapore Botanic Gardens has been a leading centre in plant science, research and conservation in Southeast Asia. Today it is internationally recognised as a leading institution of tropical botany and horticulture and its library and herbarium collections serve as an important reference centre for botanists all over the world. The site represents the cradle of breeding science for orchids in Asia, a hybrid programme having first been initiated in the Botanic Gardens in the 1920s, with formal orchid breeding programmes continuing to the present.

The Botanic Gardens has played an integral role in the social history of Singapore, providing a backdrop for the lives of residents, both past and present and a continual sense of place and identity in an otherwise changing city. It was and continues to be instrumental in the 'greening' and transformation of Singapore into a 'City in a Garden', successfully implementing the former Prime Minister Lee Kuan Yew's vision for this in the 1960s.

The British South and Southeast Asian colonial botanic gardens were preeminent in terms of other colonial botanic gardens, as a direct consequence of their mutually advantageous role as outposts of the Royal Botanic Gardens, Kew. Singapore Botanic Gardens was part of a wide network of over 100 other British botanic gardens, which was many times bigger than that of other colonial empires. All these sites to some degree contributed to 19th century developments in economic crop growing which established this region of Asia as an important economic power. However, Ridley's late 19th/ early 20th century extensive work on perfecting rubber cultivation and extraction, undertaken at the Singapore Botanic Gardens, combined with his relentless promotion of the crop, can be singled out as perhaps the most significant contribution to Malaya becoming the biggest rubber producer in the world and creating an entirely new and booming economy with global influence. As stated by Brockway (1979) 'between the two world wars, Singapore was the rubber capital of the world'.

Other remaining British tropical colonial botanic gardens that have survived fully or in part in South and Southeast Asia include Penang (Malaysia), Peradeniya (Sri Lanka), Calcutta (India) and Hong Kong. Only Peradeniya and Calcutta continue as significant botanic gardens today with a degree of scientific and recreation functions. The combination of Singapore Botanic Gardens' rich and diverse historic cultural landscape; long-established scientific, educational and recreational world-class functions; remarkable contribution to economic and ornamental plant research (particularly in relation to rubber production and orchid hybridisation); high level of authenticity and integrity; role in the greening of Singapore and the shaping of the island's identity; along with the presence of a tract of primary lowland rainforest make it stand out when compared to other similar properties.

# Criteria under which Inscription is Proposed (and Justification)

The Singapore Botanic Gardens is proposed for inscription on the World Heritage List under Criteria (ii) and (iv) of the World Heritage Convention.

### Criterion (ii) – "Exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town planning or landscape design".

The Singapore Botanic Gardens has been a prominent centre for plant research in Southeast Asia since the 19th century. It continues to play a leading role in the interchange of ideas, knowledge and expertise in tropical botany, agricultural economy and horticulture and represents an important reference centre for botanists all over the world. The Botanic Gardens has gained international recognition for starting and maintaining traditions in plantation agriculture, natural history, biodiversity science and conservation in the region and has also played a pivotal role in the greening of Singapore, which influenced town planning in other cities in Southeast Asia.

### Criterion (iv) – "Be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history".

The Singapore Botanic Gardens is an outstanding example of a British tropical colonial botanic garden and the best preserved of its kind. This cultural landscape demonstrates its different stages of development since 1859 through its layout<sup>22</sup>, extant historic landscape and built features and its uses and functions. The evolution and sustained preservation of the Botanic Gardens reflects the changing shift in attitudes regarding the role and functions of botanic gardens worldwide and throughout Southeast Asia. The assemblage of historic landscape features and buildings and conserved lowland primary rainforest in combination, richly illustrate the development and mixed role of the Botanic Gardens during the period of British colonisation. These, together with more recent interventions since Singapore's independence, which respect the cultural heritage of the Gardens, continue to support the very significant scientific, educational, cultural and recreational role and offer of the Botanic Gardens in the modern citystate of Singapore.

### **Statement of Integrity**

The Nominated Property includes within its boundary all elements necessary to express its Outstanding Universal Values. Its completeness is represented by the range of landscape features, buildings and structures most closely associated with the Singapore Botanic Gardens as a British colonial botanic garden. The layout and ensemble of landscape, buildings and structures included in the Nominated Property have high integrity, being in good condition and having survived virtually intact. The physical fabric of the property largely has not suffered from adverse effects of developments or neglect, with inappropriate changes controlled through statutory protection and management measures. In addition, late 20th century changes reflect the on-going development of the historic use of the Nominated Property and its role in public education. They do not significantly dilute

the cultural landscape, strong sense of place or traditions that endure at the Singapore Botanic Gardens.

### **Statement of Authenticity**

The key attributes that contribute to the Outstanding Universal Values of the Nominated Property meet the conditions of authenticity. The landscape, buildings and structures within the Nominated Property have high levels of surviving authentic fabric and the spatial planning and layout of the Nominated Property is authentic. Considerable elements of the Nominated Property are either still used in the manner in which they were originally intended, or are used in a manner that is sensitive to their original purpose.

### **Protection and Management Requirements**

The Nominated Property is protected by laws of the Singapore Government, namely the Parks and Trees Act and the Planning Act, which provide for a range of statutory conservation designations and development control planning measures that will protect and conserve its attributes of Outstanding Universal Value. The majority of the Gardens is designated as a National Park, and the whole of the Nominated Property is designated as a Conservation Area (which includes a number of Conserved Buildings and Structures) and it is also designated as a Tree Conservation Area. Works affecting these conservation designations are strictly controlled under the relevant legislation. The visual setting of the Nominated Property within the proposed Buffer Zone is protected by stringent controls on the height and form of buildings implemented through the Singapore Master Plan.

All land within the Nominated Property is within the ownership of the State and under the management of NParks. The Singapore Botanic Gardens' current annual operating and staff budget is S\$15 million, with substantial additional funding available to support a variety of infrastructural developments and maintenance works. The Singapore Botanic Gardens employs 125 full-time staff, supported by an active volunteer base. Responsibility for the Gardens' overall management lies with its Director

<sup>22</sup> The layout has left the unusual legacy of the English Landscape movement in a tropical environment.

who is assisted by two Senior Deputy Directors and four Deputy Directors. The Management Plan submitted with the Nomination provides an overarching framework for the long-term protection and conservation of the Nominated Property. There are currently no substantial threats to the Outstanding Universal Values of the Nominated Property.

II3 Botanical drawing of *Cypripedium tonsum* 

# STATE OF CONSERVATION & FACTORS AFFECTING THE PROPERTY



### 4.0 STATE OF CONSERVATION AND FACTORS AFFECTING THE PROPERTY

### 4.a Present State of Conservation

This section provides the base–line data necessary to monitor the state of conservation of the Nominated Property in the future. Information is provided on the physical condition of the property, any threats to the Outstanding Universal Values of the property and conservation measures at the property.

### **Physical Condition of the Property**

The Nominated Property, which consists almost entirely of a designed landscape (with the exception of the Rainforest), stretches over 49 hectares. A number of buildings/structures (some housing preserved, genetic and/or archival collections and others visitor or staff facilities) are located across the site, among the living collections. The property is in overall good condition, being maintained according to high standards. A breakdown of the physical condition of the site's different elements is provided below.

### Soft and Hard Landscape Features

Overall, the Botanic Gardens' soft and hard landscape elements are in good condition. As mentioned previously (see **Section 2.a**), the living collections were and continue to be managed and maintained according to specific 'Lawns' areas. A 10 Year Living Collection Management Plan (see Appendix ii of **Appendix B**), compiled in 2013, provides the following information for each of the 'Lawns': landscape content and heritage value, present condition, constraints, strengths, weaknesses, potential improvements and 10 year action plan. This information has informed the site's Management Plan and will be essential in relation to monitoring the site's condition.

Features identified in the Collection Management Plan as requiring attention, include, for example:

- The collections near the gateway in Lawn A, which are currently too dense to be properly appreciated.
   Some of the palms there are in poor condition.
- The water quality of the stream and associated features in Lawn C which is poor and needs better filtering and lowering of the pH.
- A number of heritage trees in Lawns E, O and W, which are suffering from soil compaction.
- The climbers in the Plant House Garden and Lawn M, which are over–crowded and flower infrequently.
- The bonsai collection in Lawn N, which is in moderate condition.
- Some of the palms in Lawn W, which are suffering from recurring problems with rhinoceros beetle.
- Site-wide some tree specimens require crown reductions/arboricultural works and some plants need to be labelled.

As described in **Section 3.0**, the Nominated Property has a high level of integrity and authenticity. It is acknowledged that loss or damage to a wide range of its hard and soft landscape elements has the potential to negatively affect the proposed Outstanding Universal Values of the Nominated Property. It is however recognised that living collections are ephemeral and that the Singapore Botanic Gardens is a dynamic cultural landscape where change is inevitable and continuous. A robust maintenance programme will continue to be central to the on–going management of the site and to upholding it in a good state of conservation.

### **Built Features**

All key built features within the Nominated Property (see **Figure 10**) are currently in good condition. Individual buildings/structures have generally retained their original character and key features. The condition of individual buildings is listed below:

- The **Tanglin Gate** is in good condition.
- The Green Pavilion is in good condition.
- The Botany Centre is in generally good condition (leaks from rainwater were corrected in 2012).
- Ridley Hall is in good condition retaining original proportions, layout and over character as well as external features. The roof's timber structure appears to be largely intact with marseille roof tiles of varying makes and ages. The timber double casement doors, double casement windows, lourved clerestories and their frames are also largely intact, although the window glass panels inserts may have been added at a later date. The internal partition of the rear accommodation space is a later addition as evident from the contemporary door frame details and construction methods.
- **CDL Green Gallery** is in good condition.
- Holttum Hall is in good condition retaining most of its original exterior features and character. Its interior has been sensitively altered to accommodate the Heritage Museum/ interpretation. The lourved clerestories at ground level and timber frames are largely intact. The timber structure of the roof is also largely intact with marseilles roof tiles of varying makes and ages. The majority of the timber floor boards are intact.
- **The shelter and toilet block** are in good condition.
- The Bonsai Garden (refurbished in 2004–05) and Sun Garden structures are in good condition.
- The Sundial Garden structure is in fair condition (refurbished in 2004–05).
- The pergola by the Sun Garden (refurbished 2004/05) is in good condition.
- The Bandstand is in very good condition. Its roof was repaired in 2012.
- The Gazebo by Swan Lake is in good condition and recently had its roof replaced. While the balustrades, columns, acanthus acroteria and rainwater spout are original, the ridge cresting,

hipped roof, brackets and ceiling are all later additions.

- The second historic gazebo is in good condition (it was refurbished in 2004–05). Its columns and brackets are original.
- The Potting Yard and National Orchid Garden nurseries are in the process of being refurbished with works due for completion in 2016 and 2018 respectively.
- Burkill Hall is in good condition and has been carefully conserved, maintaining most significant interior and exterior features and its overall character. True to the original design intent internal partitions are kept to a minimum.
- The Cool House, Misthouse, Bromeliad House, and Bonsai Garden structure are in good condition.
- The entrance pavilion to the National
   Orchid Garden is in good condition but will be redeveloped under the wider enhancement plan for the National Orchid Garden (due to be completed by 2018).
- The **Symphony Stage** is in good condition (refurbished in 2005).
- E.J.H. Corner House is in good condition and retains its character and key external features. It would however benefit from having some modern additions, such as the glass enclosures around the verandas, removed. There have been some internal changes to accommodate a new use, but its overall plan, form and key features have been maintained. Extant original detailing includes scalloped ends of timber floor joists and carved floor beam brackets.
- The Halia restaurant (Ginger Villa redeveloped in 2008) is in good condition (due to be refurbished in 2013).
- The Visitor Centre (roof replaced in 2013) and NParks' Headquarters are in good condition.
- Houses 1–5 are in good to fair condition. No single house has however survived intact with all of its original features but the survival of different features in the various houses provides a good understanding of the original layout and character

of these houses. Houses 1, 2, 3 and 5 are wellmaintained and in good decorative order. In each case, the general layout of the main house has been retained, although ancillary buildings have not always survived. A number of original features, notably the staircase and some windows and doors survive. The original character of front and rear elevations is evident but sometimes obscured. House 4 is in a reasonable state of conservation. It has, however, been much altered internally and externally with a ground floor extension and opening up of the upper floor spaces. A number of internal features, including the staircase and timber partition survive. Further information relating to original as well as altered features is provided in Appendix D.

- Raffles Hall/Building is in good condition, though some crumbling of concrete was noted on the projecting concrete canopies and shade structures. These are quite thin profiles in places and common areas for failure of reinforced concrete of this age. Internally the building is well maintained.
- House 6 retains many of its original exterior features but has been altered internally. It is in a fair decorative order and state of conservation.
- The Garage is in need of external decoration and repair. (The building has some termite damage and leaking roof, issues which are scheduled to be addressed during 2014) The key characteristics of the building and its external form have been preserved.
- The **wooden shelters** are in good condition.
- The **sculptures** are in good condition.
- **The Chinese graves** are in good condition.

### **Biodiversity**

Biodiversity conservation is central to the management of the Singapore Botanic Gardens. Various ecological surveys have been carried out as listed in Appendix iii of **Appendix B**. It is recognised that knowing the area of habitat types present and their flora and fauna composition, along with monitoring their condition is vital to conserving, protecting and enhancing the Botanic Gardens' biodiversity. Whilst there has historically been no structured programme for monitoring the condition of species/habitats at the Site, this has been addressed through the new Management Plan and associated monitoring systems. Efforts to conserve and enhance the Botanic Gardens' biodiversity include the replacement of paths in the Rainforest with raised boardwalks and the removal of Tyersall Avenue to allow species dispersal/connectivity between different parts of the Botanic Gardens.

### **Preserved Collections**

The preserved collections are actively managed by a team of curatorial staff under the guidance of the Keeper of the Herbarium. The collections are in generally good condition and are used in accordance with international standards, as described in the 'Herbarium Handbook' (Royal Botanic Gardens, Kew). The herbarium's overall capacity is for 1,000,000 specimens and there is therefore space for expansion of the collection. Minor repairs and re–classification forms part of the on–going curation of the preserved collections.

### **Documentary and Visual Reference Collections**

The library and archive are actively managed and curated by a dedicated team of librarians and archivists. The documentary and visual reference collections are in generally good condition. Necessary repairs to artwork and old/rare books are identified by the Botanic Gardens' staff and executed by the National Archives.

# Threats to the Outstanding Universal Values of the Property

It is recognised that the Singapore Botanic Gardens is a complex, multi–layered, multi–use and dynamic landscape where change is inevitable and continuous. Comprehensive and on–going management, maintenance and monitoring of the site as a whole and its individual components are therefore vital to the protection of the Site's Outstanding Universal Values.

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There currently are no substantial threats to the Outstanding Universal Values of the Nominated Property. The following list outlines lesser threats/ issues that may be relevant in the future:

- Decay/deterioration if there were to be a shortfall in maintenance, monitoring, curation or resources (including skilled staff).
- Wear and tear linked to visitation, which could be exacerbated if visitor numbers, events and/ or activities were to increase without careful consideration and appropriate management.
- Loss of authenticity if inappropriate repairs were to be carried out, rare/special plant specimens were not propagated and/or inappropriate developments permitted (possibly impacting on the setting of the Botanic Gardens/key features).
- Loss of fabric if certain features were to be lost or removed.
- Impacts linked to potential pest/disease outbreaks, extreme weather and/or a natural disaster.
- Impacts linked to climate change.

### **Conservation Measures at the Property**

The Nominated Property is protected by a range of statutory and non-statutory designations, land use planning controls, site security and a buffer zone. These conservation measures are detailed in Section 5.0. The Management Plan also sets out policies and actions which provide a framework for the future conservation and management of the site, thus guiding protection, enhancement and possible change to the use or fabric of the place. The Nominated Property is maintained according to high standards and has received high and stable levels of financial and human resources since its inception, which has contributed to its conservation. The Botanic Gardens also benefits from housing NParks' headquarters and the offices of organisations such as CUGE and the National Biodiversity Centre, who offer a range of expertise and skills, which the Botanic Gardens' staff can readily call upon.

A range of conservation/refurbishment works have taken place at the Singapore Botanic Gardens since the 1990s, including, for example:

- Redecoration/painting of the exterior of Holttum Hall and Ridley Hall using original historic colours.
- Restoration/conservation works to one of the historic gazebos and Bandstand.
- Restoration/conservation works to Burkill Hall.

On–going monitoring and maintenance of the physical condition of the site is a key conservation measure. The site's different elements are currently inspected/monitored and maintained as set out in **Table 4**.

Element	Current monitoring/inspection and Maintenance Regime
Soft landscape (excluding trees)	The Director and two Senior Deputy Directors of the Singapore Botanic Gardens informally check the condition of the Botanic Gardens as a whole on a weekly basis. Any defects/issues are reported back to 'Lawn' Managers. The Botanic Gardens' individual 'Lawn' Managers work alongside
	maintenance contractors and therefore pick up on defects/issues on an almost daily basis. Maintenance contractors have a duty to report all condition issues (e.g. pests and diseases/trampling/compaction of soil) to the appropriate 'Lawn' Manager and to formulate a remedial strategy to be approved by them.
	Maintenance work is carried out on a daily basis by contractors (seven days a week), in accordance with detailed maintenance schedules/work specifications (delivered under performance based contracts – it is the responsibility of the Botanic Gardens' staff to ensure that contracts are adhered to). Maintenance programmes/specifications are formulated by each contractor in light of the standards/condition of the landscape which the Botanic Gardens expects contractors to uphold. The quality of the maintenance work (which relates directly to condition) is assessed no less than three times a week against the strict specifications which all contractors work to. Maintenance programmes/contracts are reviewed approximately every three years (at the end of individual contracts).
Outdoor hard landscape (paths, parking areas, orientation panels, finger posts, bins, benches/tables, interpretation fixtures, fencing, walls, gates and entrances)	Any emergency works required are reported to the appropriate 'Lawn' Manager and contractors asked to carry out the necessary works.
	The water quality of lakes/water features is not currently assessed/ monitored but their cleanliness forms part of the Park Cleansing contract. As above
	Infrastructural maintenance (buildings and hard landscape drainage) is centrally managed and resourced by NParks' headquarters, which are stationed on–site.
	Fencing is inspected every 10 years.
Trees	Trees are inspected based on their importance and location. An ISA process is in place for tree inspections. Heritage trees are inspected annually and all other trees every 12–18 months (a number of trees located in car parks etc are inspected every 3 months). An on–going pruning schedule is in place to ensure safety and tree health.
	Fencing is erected, on a case-by-case basis, around trees deemed to be at risk from visitor impacts.
	The Botanic Gardens' staff receives support from NParks' Streetscape Team of arborists.

TABLE 4 CURRENT MONITORING / INSPECTION AND MAINTENANCE REGIME

Element	Current monitoring/inspection and Maintenance Regime
Bandstand, gazebos, Chinese	These structures are inspected and painted on a quinquennial basis.
graves, wooden shelters, sculptures	
Buildings	Nursery buildings Ongoing maintenance and inspections programme in place. Singapore Botanic Gardens's Facilities Management team manages a term contractor who carries out minor repair work and emergency work (depending on their severity). NParks' Facility Branch deals with any major works such as refurbishment.
	All other buildings
	Ongoing maintenance and inspections programme in place. The structural integrity of all buildings is inspected on a quinquennial basis by contractors and reported back to Singapore Botanic Gardens's Facilities Management team. A visual inspection for termites is carried out annually by contractors. For tenanted buildings, tenants are liable to conduct the quinquennial structural inspections and submit reports to Singapore Botanic Gardens staff.
	Works arising from the quinquennial inspections or reported to Singapore Botanic Gardens' Facilities Management team (e.g. by the Botanic Gardens' Visitor Services, Security and Facilities Management Branch and users of the buildings) are promptly carried out by contractors (who are required to consult a building restoration/conservation expert prior to commencing the works).
	Conserved buildings and structures
	In addition to the above, refurbishment/restoration works to a Conserved Building/Structure, as well as the erection of features in their vicinity, necessitate authorisation from the Urban Redevelopment Authority (URA). New uses which do not affect the building/structure significantly may be permissible without prior notification to URA.
	A change of use may require contact with URA if it affects the GFA tax payable for use of publicly owned buildings, but this is not connected with their conservation status.
Genetic collections	The laboratories are not currently inspected.
Preserved collections	General cleaning of the Herbarium is carried out by the Cleansing Contractor employed by Singapore Botanic Gardens. Floors are swept on a weekly basis and the top of the compactors on an annual basis. A pest contractor visits on a monthly basis. When specimens undergo basic curation they are checked for insect damage and any other repairs necessitated. All collections are currently being checked and given an archival cover (to replace worn folders) as part of a three-year
	project. Outside of this project repair works have been identified on occasion when visiting researchers have looked through specimens or Garden staff have processed specimens for re–filing/databasing/ systems updates.
	On–going checking by Herbarium curatorial staff will take place following the completion of the three–year project.

Element	Current monitoring/inspection and Maintenance Regime
Documentary and visual reference	General cleaning of the Library/Archive is carried out by the
collections	Cleansing Contractor employed by Singapore Botanic Gardens.
	Floors are swept on a weekly basis and the bookshelves every 6
	months. A pest contractor visits on a monthly basis.
	An on-going Book and Artwork Conservation project with the
	National Archives of Singapore is in place. Artworks and old/rare
	books are sent to the National Archives where conservation works,
	digitisation and binding is carried out on a regular basis.
Biodiversity	Surveys carried out on an ad hoc basis. The Botanic Gardens' staff
	receives support from the National Biodiversity Centre set up by
	NParks.

In light of the dynamic nature of plants and possible threats to the living collections (e.g. losing plants due to their age, pests and diseases or the weather) the Singapore Botanic Gardens includes teams and facilities dedicated to the propagation and growing of plants for successive planting. The existing strategy for the propagation of the Botanic Gardens' living collections is currently being fine tuned. Rare, endemic, endangered and nationally extinct plants are the main propagation targets. 5,000 plants are raised every year (some planted in the Botanic Gardens and the rest kept as insurance against unexpected loss). The orchid conservation and breeding programme produces on average 20,000 plants/plantlets on an annual basis (17,000 from the Micropropagation Laboratory and 3,000 from the conventional nurseries).

Maintaining good documentation/records of living collections is essential at any botanic garden – it adds value to the collections and is an important part of monitoring their conservation status. In light of this, the Singapore Botanic Gardens formed a Plant Records Unit (which falls under the Horticulture, Exhibitions and Events Branch) in 1996. Its key roles are to:

- Act as a central repository of all botanical information about the living collections in the Botanic Gardens.
- Document, update and manage the records of the living collections to maintain accurate and updated inventory data and conservation status of collections.

- Liaise with Herbaria and visiting taxonomists to verify plant identifications and ensure updated botanical names are correctly applied to the collections.
- Carry out regular inventory or stock-take (once every 2–3 years) of the collections.
- Manage the fabrication of plant labels and interpretative materials.
- Oversee the plant exchange programme with international botanical institutions (Index Seminum).
- Oversee and ensure the usage of plant materials is in line with prevailing international regulations, such as the Convention in Trade of Endangered Species of fauna & flora (CITES) and the UN Convention on Biological Diversity (CBD).

### 4.b Factors Affecting the Property

This section provides information on all the factors which are likely to affect or threaten the Outstanding Universal Values of the Nominated Property. Any difficulties that may be encountered in addressing such problems are also described.

### **Development Pressures**

The Botanic Gardens and its setting are subject to the following potential pressures from development or changes in land use:

- Inappropriate changes, which could affect the fabric/presentation of the Nominated Property. The pressure for these changes can come from a number of sources, including for example visitor needs or lack of integrated management. Most of these changes are controlled within Singapore's planning system and development control measures. As discussed in Section 5.0, permission to carry out certain works within the Nominated Property must be sought from the Competent Authority. A Management Plan has been developed as part of the development of the Nomination Dossier which sets out clear policies for the future management of the site.
- Inappropriate changes, which could affect the Botanic Gardens' setting, partly linked to development pressure in Singapore (which contains one of the most densely–populated cities in the world). Most of these changes are controlled within the planning system. A proposed Buffer Zone (see **Figure 1**) has also been established.

### **Environmental Pressures**

Both the humid tropical climate of Singapore and the presence of termites have an impact on the condition of a range of buildings located within the Nominated Property, contributing to faster deterioration of their fabric. A range of pests (including termites) also cause damage to the living collections. Strategies to counteract these issues are however in place. Much work has been done recently to identify appropriate biological control measures. The frequency and severity of storms in Singapore is also an issue. Lightning conductors have been placed on all heritage and tall trees and historic buildings.

A Climate Change Study has been commissioned by the Singapore National Climate Change Secretariat to examine Singapore's vulnerabilities to climate change. Phase 1 of the Study was completed in 2009 and looked at the physical effects of climate change such as changes in sea–level and temperature rise. The findings of the Study are 'that by 2100, average temperatures could increase by 2.7 to 4.2 degrees Celsius; while sea levels could increase by 0.24 to 0.65m.' No discernible trend was identified in relation to change in rainfall, necessitating further studies. Phase 2 of the Study has been commissioned and will look at other projected effects of climate change, such as public health, biodiversity and energy consumption. Considerable droughts were experienced in 2012, which resulted in the Botanic Gardens almost running out of water - staff at the Botanic Gardens are thus considering options for improved water storage. The possible impacts of climate change on the Nominated Property will be further analysed and monitored. The most likely risks at present are increased incidence of severe weather events leading to storm damage or prolonged droughts (impacting on water resources) and changes to existing growing conditions (which may alter what can be grown in the Botanic Gardens and could lead to loss of biodiversity/affect the range of flora and fauna found in the Botanic Gardens). Whilst the likelihood of a micro-burst storm affecting Singapore is small, it cannot be ruled out or prevented - such a storm would have the potential to cause significant damage to both living collections and buildings (as recently happened in Penang).

Close monitoring of wild boar (spotted nearby the Botanic Gardens) is required as these have the potential to cause great damage to the Botanic Gardens' living collections if they were to get in.

### **Natural Disasters and Risk Preparedness**

Few disasters present a foreseeable threat to the Nominated Property. Those which do are listed below, alongside an explanation of the steps/ contingency plans in place for dealing with them:

- Fires: not anticipated to be a major threat in the landscape (in light of the climate, provision of irrigation during times of drought and no fires/ smoking policy). Fire prevention measures are established; the Site's buildings are inspected by the fire brigade/specialist contractors and staff receive fire safety training. A sprinkler system is in place in the herbarium and the Types Collection is located in a separate room which can be filled with inert gas in the advent of fire.
- Severe storms involving high winds (microbursts). Historic buildings/structures and heritage trees have been fitted with lightning conductors.

NParks has developed a Crisis Management Plan which encompasses the Botanic Gardens. Also, in order to counteract potential issues (e.g. power outage, failure of cooling and ventilation mechanisms), which would affect living collections located in protected environments (such as cool houses), the Botanic Gardens maintains a chiller and generators on standby.

### **Management and Maintenance**

Whilst the Singapore Botanic Gardens is maintained to an exceptionally high standard, there has been no management plan in place to guide short, medium and long-term decision making. The complex nature of managing dynamic historic landscapes requires that a considered sustainable approach to the management of the whole landscape be in place, based on the best information possible and involving those who use, own or are otherwise concerned with the site in making decisions on its future. There is a need for the full spectrum of interests associated with the site to be reconciled within a long-term integrated Management and Maintenance Plan. A Management Plan has been prepared as part of the Nomination Dossier for the site and is provided in Appendix B.

The lack of an integrated Management and Maintenance Plan has led to some historic features being removed and not recorded in detail (e.g. the Assistant Director's House by Burkill Hall; some original features within a number of the buildings; the original colour scheme of some of the buildings); a lack of consideration being given to the setting of key heritage features; limited monitoring of visitor profiles and satisfaction; and a lack of interpretation about the site's heritage values.

Management prescriptions for each of the Botanic Gardens' 'Lawns' started to be developed very recently and have helped inform the development of the site's Management Plan.

Another issue is the lack of plant knowledge among some of the Botanic Gardens' staff (plant identification/origin/cultivation requirements etc.). This is being addressed through training and policies outlined in the Management Plan.

### **Responsible Visitation at World Heritage Sites**

### **Status of Visitation**

The Singapore Botanic Gardens is the most visited botanic garden in the world. It is opened between 5am and midnight and received approximately 4.4 million visitors between April 2012 and March 2013 (600,000 of which visited the National Orchid Garden either exclusively or as part of a wider visit to the Botanic Gardens). Visitation in 2011–2012 totalled c.4.1 million and 3.1 million in the period 2010–2011. Infra–red counters were installed at key entrances in 2003, providing information on the level of use of individual gates as well as overall total visitation. As shown in **Table 5** below, the Visitor Centre entrance is the most used. The Botanic Gardens is mainly used during daylight hours.

Gate	Apr 2012–March 2013	
Visitor Centre	809,215	
National Orchid Garden	588,488	
Bukit Timah	566,174	
Tanglin	477,864	
Jacob Ballas Children	234,009	
Garden		
Others	1,767,989	
Total	4,433,739	

TABLE 5 VISITORS NUMBERS BY INDIVIDUAL GATES

Visitors are currently fairly well dispersed across the Botanic Gardens, with some concentrations noticeable in and around the Visitor Centre, Viewing Terrace and Orchid Plaza. The National Orchid Garden and Ginger Garden also tend to get more crowded than some of the other display gardens. The Botanic Gardens offers many opportunities for passive and active recreation as well as formal and informal learning activities. As described in Section 2.a, visitors come to the Botanic Gardens for many different reasons including, for example, to exercise, have a stroll, learn about the plant world, see specific horticultural attractions/displays, observe nature, meet friends/family and celebrate a momentous occasion. 70+ groups use the site for exercise, the Viewing Terrace being particularly

popular with groups practising sports such as yoga and tai chi. A great number of newlyweds have their wedding photographs taken at the Botanic Gardens. 89,000 school children visited the Botanic Gardens in the period 2012–13, 24,000 of which received programmed educational activities. A further 9,000 adults benefited from such programmes. The Botanic Gardens is on track to receive 100,000 school children in the period 2013-2014.

### **Planned Developments**

A number of projects/works are planned at the Singapore Botanic Gardens (see **Figure 17**) – these are likely to result in an increase in visitor numbers. Some of these projects are located within parts of the Botanic Gardens which lie outside the boundary of the Nominated Property, but are nonetheless likely to lead to increased visitor numbers across the Botanic Gardens as a whole. Planned projects/ works include:

### Within the Nominated Property:

- Enhancements to the National Orchid Garden and nursery. It is anticipated that this project will be completed by the end of 2018 and will include an enhanced visitor entrance, diverse interpretation material and new displays.
- Enhancements to the **Potting Yard.**
- Renovation to the **Guest Room in Ridley Hall.**
- The provision of new food and beverage outlets in The Garage (pending a structural assessment of the building).

### Partly within the Nominated Property:

- An extension to the Jacob Ballas Children's Garden. It is anticipated that this project will be completed by the end of 2015 and will include attractions directed at 9–14 year olds.
- An Ethnobotany Garden adjacent to the Foliage Garden to the east. This will include kampong–style plantings with interpretation of local plant uses. It is anticipated that this project will be completed in 2016.

Within the Singapore Botanic Gardens but outside the Nominated Property's Boundary:

- The Tyersall Learning Forest in 2006 approximately 9 hectares of land to the southwest of the Botanic Gardens (across Tyersall Avenue) was added to the Gardens. This land, which consists of a century-old secondary forest (it includes a number of rare species), restores the Botanic Gardens back to its 1879 extent. This project aims to develop the land into a 'learning forest' and will involve the conservation of existing biodiversity, curation of botanical collections, establishment of better connectivity with the Rainforest, repositioning of the existing Tyersall Avenue, restructuring of visitor access to the National Orchid Garden/Ginger Garden, creation of fresh water swamp forest and extension of the National Orchid Garden nursery. It is anticipated that this project will be completed by the end of 2016.
- Enhancements to the Plant Resource Centre.
- The second MRT station at the Bukit Timah Gate and a third, projected for 2020 near the Tanglin Gate (immediately outside the Nominated Property).

The opening of two new MRT stations (both outside the boundary of the Nominated Property), one along the Downtown Line (station due to be opened in 2015, by the existing MRT station in the north–west corner of the Botanic Gardens) and one along the Thomson Line (Napier station due to be opened in 2020, opposite the Tanglin Gate), are also anticipated to have a knock–on effect on the Botanic Gardens' visitor numbers, allowing a greater number of people wishing to travel by public transport to gain easy access (from three separate MRT lines) into the Botanic Gardens from its southern and northern extremities.

A number of projects/works were completed shortly before the submission of the Nomination Dossier, which are also likely to result in an overall increase in visitor numbers at the Botanic Gardens. These include:

 The establishment of the Fragrant Garden (within the boundary of the Nominated Property), completed in February 2013.



FIGURE 17 PLANNED DEVELOPMENTS



- The establishment of the Foliage Garden (within the boundary of the Nominated Property), completed in September 2013.
- The redevelopment of Holttum Hall as a Heritage Museum (within the boundary of the Nominated Property), completed in November 2013.
- The establishment of the temporary CDL Green Gallery, immediately south of Holttum Hall, which houses a rolling programme of exhibitions (within the boundary of the Nominated Property), completed in November 2013.
- The relocation/enhancement works to the visitor information counters at the Tanglin and Nassim Gates (including new shops), completed in 2013.
- Enhanced lighting to encourage more night time visitation, (ongoing).

### **Projected Levels of Visitation**

The projected sustained level of visitation due to improved access via new MRT stations/lines and enhancements to display gardens, is six million by 2020.

### **Carrying Capacity of the Property**

The Singapore Botanic Gardens is likely to remain one of the key visitor attractions in Singapore, with added attention following its inscription on the World Heritage Site list. This has the potential to bring additional pressures to the Botanic Gardens alongside its existing on-going use and popularity as a local amenity and key visitor attraction in Singapore. Shortly after being inscribed on the World Heritage Site List, sites tend to experience an immediate surge of visitors, before numbers level off. The Gardens will be carefully monitored during this period. Even though visitor numbers are expected to increase in the short and medium term, the Gardens is well equipped to keep any potential associated risks under control. A Visitor Management Strategy will be developed for the site. Possible Forms of Deterioration of the Property due to Visitor Pressure and Behaviour

- Wear and tear (e.g. soil compaction, trampling, damage to fabric of buildings).
- Misuse of features (picnicking and exercise in wooden shelters).
- Visitor expectations in relation to the site's offer (potential desire for particular refreshment facilities, display gardens/changing displays, more events/activities).
- Need for sufficient facilities to cater for visitor numbers (toilets, shelters etc.).
- Impact on tranquillity/atmosphere through overcrowding.

# Number of Inhabitants within the Property and the Proposed Buffer Zone

There are currently no inhabitants within the Property and approximately 3,788 in the Buffer Zone.

# 115 Ginger Garden ROTECTION & NAGEMENT O THE PROPERT



5.0 PROTECTION AND MANAGEMENT OF THE PROPERTY

This section of the nomination provides an outline of the legislative, regulatory, contractual, planning, institutional and/or traditional measures and management systems that are in place to protect and manage the Nominated Property.

All land within the Nominated Property is within the ownership of the State and under the management of the National Parks Board (NParks). A range of statutory conservation designations and development control planning measures are in place to protect the Nominated Property and its proposed Buffer Zone. The Management Plan submitted with the nomination provides an overarching framework for the long–term sustainable management of the Nominated Property in the context of wider regeneration goals for Singapore.

### 5.a Ownership

All land within the Nominated Property is within the ownership of the Singapore Government. As illustrated on **Figure 18** the majority of the State land within the property is leased to NParks (under a 99 year lease, in force between 1990 and 2089), a statutory board of the Ministry of National Development. The remainder of the property is allocated to the Ministry of National Development and managed by NParks.

Within the proposed Buffer Zone, the State land immediately to the north and south-west of the Nominated Property is under the direct management of NParks as part of the Singapore Botanic Gardens. Beyond the Singapore Botanic Gardens' boundary, the remainder of land within the proposed Buffer Zone is under a mix of private and State ownership.

### 5.b Protective Designation

## Protective Designations within the Nominated Property

Areas, buildings and features of conservation value within the Nominated Property are protected by a range of statutory and non–statutory designations (see **Figure 19**). The protective designations that apply to the Nominated Property are listed in the **Table 6**. Copies of relevant legislative acts are provided in **Appendix F**.



FIGURE 18 OWNERSHIP







Designation	Extent/Date of Designation	Legislation under which status is provided
National Park	Majority of the Nominated Property	The Parks and Trees Act (Cap. 216) makes
	is within a <b>National Park</b> (designated	provision for National Parks to be 'set aside for
	1990).	all or any of the following purposes:
		(a) the propagation, protection and
		conservation of the trees, plants, animals
		and other organisms of Singapore, whether
		inalgenous or otherwise;
		(b) the study, research and preservation of objects and places of aesthetic, historical or scientific interest;
		(c) the study, research and dissemination
		of knowledge in botany, horticulture,
		biotechnology, or natural and local history; and
		(d) recreational and educational use by the public'.
Conservation	Entire Nominated Property is within the	The Planning Act (Cap. 232) provides for 'where
Area	Singapore Botanic Gardens which was designated a <b>Consenvation Area</b> in 2008 <sup>23</sup>	in the opinion of the Minister any area is of
		aesthetic interest, the Minister may approve
	Conserved Buildings within	under Section 8 a proposal to amend the Master
	the Singapore Botanic Gardens	Plan to designate the area as a conservation
	Conservation Area.	area. A conservation area may comprise an
	<ul> <li>Houses 1–5 of the former Raffles College (designated 2008)</li> </ul>	area, a single building or a group of buildings'.
	<ul> <li>Raffles Hall (designated 2006<sup>24</sup>)</li> </ul>	
	<ul> <li>E.J.H. Corner House (designated 2008)</li> </ul>	
	<ul> <li>Burkill Hall (designated 2008)</li> </ul>	
	<ul> <li>Holttum Hall (designated 2008)</li> </ul>	
	<ul> <li>Ridley Hall (designated 2008)</li> </ul>	
	<ul> <li>House 6 (designated 2013)</li> </ul>	
	<ul> <li>The Garage (designated 2013)</li> </ul>	
	Conserved Structures within	
	the Singapore Botanic Gardens	
	Conservation Area:	
	<ul> <li>Bandstand (designated 2009)</li> </ul>	
	– Swan Lake Gazebo (designated 2009)	
Tree	Entire Nominated Property is	The Parks and Trees (Preservation of Trees)
Conservation	within a Tree Conservation Area	Order (Cap. 216, 01).
Area	(designated 1991).	

### TABLE 6 PROTECTIVE DESIGNATIONS

23 The boundary of the Singapore Botanic Gardens Conservation Area is due to be adjusted in 2014 so as to include the Bukit Timah Campus

24 Initially designated as part of another conservation area which was absorbed into the Singapore Botanic Gardens Conservation Area on the 23rd May 2008

Designation	Extent/Date of Designation	Legislation under which status is provided
Nature Area	The Rainforest area is a Nature Area (designated 2003).	A Nature Area is a non-statutory designation demarcated on the Parks and Waterbodies Plan, a special and detailed controls plan which is a development control plan issued by the Competent Authority under paragraph 2.5 of the Singapore (URA) Master Plan Written Statement 2008 to elaborate on the planning intention for the area. Nature Areas are areas of high biodiversity.
Heritage Trees	44 Heritage Trees within the Nominated Property.	Heritage Trees are included on a non-statutory register by the NParks Heritage Tree Panel under the 2001 Heritage Trees Scheme. Heritage Trees must meet certain criteria in respect of their size, age and quality. Heritage Trees within national parks, nature reserves, tree conservation areas, heritage road green buffers and other specified areas (as defined by the Parks and Trees Act) are protected under the Parks and Trees Act (Cap. 216).

# Protective Designations within the Proposed Buffer Zone

As shown on **Figure 20**, much of the land within the proposed Buffer Zone is designated as 'Landed Housing Areas' (including 'Good Class Bungalow Areas' ) with guidelines on the height and building form of residential developments within such areas. Under these guidelines, the intention is that developments within the proposed Buffer Zone should generally maintain a low-rise/low density character. Developments in close proximity to the Botanic Gardens are also subject to more stringent height controls under the Building Height Plan such that the visual amenity of the Botanic Gardens is protected.

### 5.c Means of Implementing Protective Measures

### The Land Use Planning System in Singapore

Land use planning in Singapore is carried out by URA, the national land use planning and conservation authority, in conjunction with other government agencies. A long-term approach to land use planning has enabled Singapore to achieve a balance between development and conservation of natural and cultural heritage assets. The Singapore Concept Plan is the strategic land use plan that guides Singapore's development over a 40 to 50 year period. This is supported by the Master Plan which is the statutory land use plan prepared under the Planning Act for guiding Singapore's development in the medium term over a 10 to 15 year period. The Master Plan translates the broad long-term strategies of the Concept Plan into detailed plans to guide development, and sets out land use zoning and plot ratio/intensity policies for land in Singapore. Development control plans such as Landed Housing Area Plans and Building Height Plans referred to above are published to provide further elaboration and guidance of the planning intention of the Master Plan.

### Singapore Master Plan

The Singapore Master Plan may be amended as and when necessary to facilitate development. The amendments include rezoning of land use, adjustment in the plot ratio and designation of conservation areas. The amendments could be



FIGURE 20 BUILDING HEIGHT CONTROL
part of the regular Master Plan review, which is carried out at least once every five years, or on an ad hoc basis arising from a development application proposal to develop the land. Being a collaborative effort between agencies to ensure that plans meet immediate economic and social needs while maintaining a good quality living environment, inputs from technical agencies are typically sought before amendments are made to the Master Plan.

The statutory procedure for submission and approval of amendments to the Master Plan is provided in the Planning Act and its subsidiary legislation. Under the statutory procedure, any proposed amendment to the Master Plan is submitted to the Minister for approval. Before the Minister makes his decision, the proposed amendment is exhibited for public feedback for at least 2 weeks. During the exhibition period, objections and representations on the proposed amendment may be submitted to the Minister. If the proposed amendment is approved by the Minister, the Master Plan is amended with effect from the date of the Minister's approval.

#### **Development Control System in Singapore**

The principle legislation that regulates development of land and conservation in Singapore is the Planning Act. Under the Planning Act, any proposal to develop land or to carry out works in a conservation area (e.g. to erect a new building, to carry out additions or alteration to or change the use of an existing building) is required to obtain planning and/or conservation permission under the Act before the development or works are carried out. An effective regulatory system is thus in place, such that proposals for new developments, change of use or alterations to existing buildings of the Nominated Property or land within the proposed Buffer Zone are subject to planning or conservation permission (unless otherwise exempted). This regulatory process allows URA to assess each proposal and to consciously guide developments in accordance with the intended outcomes.

#### Application of Land Use and Conservation Guidelines for the Nominated Property

The Nominated Property is zoned 'Park' in the Master Plan 2008, which requires that the land be set aside for use as park or garden, for the enjoyment of the general public. The Nominated Property also falls within a gazetted Conservation Area. Hence, any proposal to carry out works within the Singapore Botanic Gardens (whether it's development, change of use or conservation restoration works) will be required to obtain a conservation permission under the Planning Act.

The Conservation Guidelines (URA, 2011) provide the conservation principles, planning parameters and restoration guidelines for conserved shop house and bungalow building typologies, as well as planning parameters and envelope control guidelines for new buildings within Conservation Areas. It is an owner's responsibility to upkeep a conserved building or structure. However, if the building is not in a state of good and serviceable repair or in a proper and clean condition, the Commissioner of Buildings may, by written notice, require the owner to carry out repair and maintenance works.

#### Master Plan and Development Control Guidelines for Properties within the Proposed Buffer Zone

The land within the proposed Buffer Zone is zoned in the Master Plan (2008) for a mix of uses such as Residential, Education and Open Space. Development within the proposed Buffer Zone is assessed based on the Master Plan and also detailed development control plans and guidelines.

In areas designated as 'Landed Housing Areas' (including 'Good Class Bungalow Areas'), landed housing developments are subject to a lower permissible building height of not more than 2 storeys tall. For Good Class Bungalow Areas, there are also more stringent controls on site coverage, to reduce the extent of built-up areas such that the environment retains, as much as possible, an open and wooded character. As for other non-landed residential and/or nonresidential developments within the proposed Buffer Zone, these are generally zoned with a lower plot ratio of 1.4, the intention being to maintain a low rise/low density character congruent to the Nominated Property. To safeguard the visual amenity of the Nominated Property, the Building Height Plan also provides for more stringent height controls on developments in close vicinity of the Singapore Botanic Gardens.

Given the protective heritage designations and controls that apply to the Nominated Property, proposals for new development or change that would harm its Outstanding Universal Values are not likely to be permitted.

#### **Application of Other Protective Measures**

**Works within National Parks** 

The Parks and Trees Act and its subsidiary legislation (such as the Parks and Trees Regulations) set out a number of restricted activities in National Parks. A number of specific rules apply to the Singapore Botanic Gardens which are displayed on notices within the grounds of the site. The Act states that no works can be carried out in a National Park except by authorised individuals. Part III of the Act sets out:

- Restricted activities in terms of trees and plants in National Parks, including cutting and felling trees or digging or cultivating land within a National Park.
- Restricted activities in respect of animals in National Parks, including capturing, displacing or feeding any animal.
- Restricted activities in respect of boundary notices, including removing, damaging or replacing said notices.

The carrying out of restricted activities in a National Park requires approval from the Commissioner of Parks and Recreation (currently the deputy CEO of NParks). The Commissioner may request further information in relation to the application for approval and may grant or refuse an application at his discretion. The applicant must apply for a compliance certificate from the Commissioner on completion of the works. Applications for permission to carry out works within a National Park must also be made to the Competent Authority under the Planning Act (Cap. 232). In determining an application, the Competent Authority will take into account any relevant guidelines relating to National Parks which may be issued by NParks as well as all applicable building guidelines, relating to building height and density, building use and form, urban design, plot size and any conservation guidance where applicable.

Works Affecting Tree Conservation Areas

Trees within a Tree Conservation Area are protected under the Parks and Trees Act/Order. It is a requirement of the Act that written permission for proposals to fell any mature tree (defined as any tree with a girth measurement greater than one meter, measured half a metre from the ground) is obtained from the Commissioner of Parks and Recreation. This applies to developers as well as owners of private properties (even if no development works are being undertaken).

#### **Works Affecting Heritage Trees**

Heritage Trees within the Nominated Property are protected under the Parks and Trees Act (Cap. 216). The health of Designated Heritage Trees is assessed at least once a year and each Heritage Tree is fitted with a lightning protector. An educational sign is erected in the vicinity of each Heritage Tree for educational purposes.

#### **Works Affecting Nature Areas**

While there are currently no statutory planning guidelines pertaining to Nature Areas, if development falls within or in the vicinity of a demarcated Nature Area, ecological studies may be required as advised by the relevant authority before any development proceeds.

#### 5.d Existing Plans related to Municipality and Region in which the Proposed Property is Located

Existing adopted plans that relate directly or indirectly to the protection, management and/or presentation of the Nominated Property are listed in **Table 7** and provided in **Appendix G**.

Plan	Summary Description	Agency	Date
		Responsible	Adopted
Singapore Concept Plan	The Concept Plan 2001 is the long-term vision for Singapore's physical development in the next 40 to 50 years. It is reviewed once every 10 years. The seven key thrusts of the Concept Plan 2001 are: new homes in familiar places; high-rise city living; choices for recreation; flexibility for businesses; developing a global business centre; building up an extensive rail network; and	URA	2001
	focusing on identity.		
Singapore Master Plan	The Master Plan is the statutory land use plan which guides Singapore's development in the medium term over the next 10 to 15 years. It is reviewed every five years and translates the broad long–term strategies of the Concept Plan into detailed plans to guide development. The Master Plan shows the permissible land use and density for every parcel of land in Singapore.	URA	2008
Conservation Guidelines	This document provides the conservation principles, planning parameters and restoration guidelines for conserved shop house and bungalow building typologies, as well as planning parameters and envelope control guidelines for new buildings within conservation areas. Owners, architects and engineers intending to carry out restoration works or development within conservation areas are required to comply with the guidelines accordingly. Other building types, which do not conform to the standard shop house or bungalow typology are evaluated on a case by case basis in accordance with conservation principles. This document is to be read in conjunction with the Specific Façade Restoration Guidelines for the subject building.	URA	2011

#### TABLE 7 RELEVANT EXISTING ADOPTED PLANS

#### 5.e Property Management Plan and Other Management Systems

A full Management Plan has been prepared for the Singapore Botanic Gardens and is annexed to the nomination in **Appendix B.** The primary aim of the Management Plan is to ensure the effective protection, conservation, presentation and transmission of the attributes of the site's Outstanding Universal Value for future generations. The Plan provides the over-arching framework for co-ordinated management of the Nominated Property. It aims to:

 Protect Singapore Botanic Gardens from inappropriate changes that would harm the Nominated Property's Outstanding Universal Values, integrity and authenticity.

- Encourage greater local and international awareness and appreciation of the Nominated Property's Outstanding Universal Values.
- Promote Singapore Botanic Gardens' contribution to Singapore's wider regeneration.

In summary, the Management Plan includes:

- A description of the Nominated Property, its Outstanding Universal Values and current policy and management context.
- An evaluation of the key management issues facing the Nominated Property.
- An overarching vision, aims and policies for guiding the protection, conservation and sustainable use of the Nominated Property.
- An action plan for implementing the Plan's vision, aims and policies over the short, medium and long-term.
- Procedures for monitoring and reviewing the Plan.

The management of the Nominated Property lies with NParks, a statutory board of the Singapore Government. Implementation of the Management Plan will be overseen by a Management Committee comprising representatives from the National Heritage Board/Preservation of Sites and Monuments, National Parks Board/Singapore Botanic Gardens, Urban Redevelopment Authority, Singapore Tourism Board, National University of Singapore and ICOMOS Singapore which will constitute an advisory group of experts and user group representatives. The Management Committee is responsible for co-ordinating actions, monitoring and reviewing progress and reporting results back to stakeholders to inform on-going effective management of the Nominated Property.

The Management Plan was prepared on behalf of the Management Committee by independent consultants (Chris Blandford Associates), who also assisted with the preparation of this World Heritage Nomination. The Plan and the nomination have been informed by ongoing consultations and dialogue with local stakeholders and the wider public. To support and develop further opportunities for volunteering, the active involvement of local communities in the longterm management of the Nominated Property will be encouraged in line with the policies of the Management Plan.

Assurance of effective implementation of the Management Plan is demonstrated by the commitment and engagement of the key partners in the nomination process and development of the Plan, and also through the Singapore Government's commitment to ensuring that the Outstanding Universal Values of the Nominated Property are protected through the land use planning system.

#### 5.f Sources and Levels of Finance

The Botanic Gardens' current annual operating and staff budget amounts to S\$15 million. Prior to setting budgets for its various divisions each year, NParks asks Divisional Directors to prepare cases for any additional funding required, whether for maintenance or events. If needs arise during the course of the fiscal year, the Botanic Gardens can also request additional funds from NParks' Central Pool fund. As regards to infrastructural maintenance, large items/projects are handled and funded through NParks' Facilities Management and Parks Development teams, so do not figure in the Botanic Gardens' annual budget.

NParks also receives a dedicated budget from the Singapore Government for capital maintenance of specifically the Singapore Botanic Gardens and Fort Canning Park, in view of these being leased to NParks (i.e. under NParks' direct control). These funds are accumulated in the Sinking Fund and can only be used for the Botanic Gardens and Fort Canning.

The Botanic Gardens can also seek approval from NParks' Board for funds to be released from NParks' Reserves Fund, to support a variety of infrastructural developments and maintenance works for both new and old structures as well as events.

#### 5.g Sources of Expertise and Training in Conservation and Management Techniques

Varied horticultural/landscape and ecological training is locally provided by CUGE, a division of NParks. Other training is obtained by sending chosen candidates abroad on scholarships, whether to other botanic gardens or academic institutions (mainly universities). Staff exchanges also take place, for example with Longwood Gardens. A botanic garden management training course (for the Southeast Asian region), run by Botanic Gardens Conservation International (BGCI), was delivered at the Singapore Botanic Gardens in 2010 and attended by some of the Botanic Gardens' staff.

Most skills and expertise needed in relation to the scientific research carried out at the Botanic Gardens are brought in with the appointed staff, these often being foreign recruits, since little training in the relevant areas of plant science (excluding molecular techniques) is available in Singapore.

#### 5.h Visitor Facilities and Infrastructure

This section provides an overview of all visitor facilities/infrastructure on offer at the Singapore Botanic Gardens, including those parts of the Botanic Gardens which fall outside of the boundary of the Nominated Property.

The Botanic Gardens is free to access, with the exception of the National Orchid Garden, and are the only botanic gardens in the world that is open between 5am and midnight every day of the year. The Botanic Gardens contains a range of visitor facilities/infrastructure including:

- Display gardens and landscaped areas such as the Sun Garden, National Orchid Gardens, Palm Valley and the Saraca Stream.
- An area of primary rainforest.
- A network of paths, providing access across the site.
- Visitor information points at the Nassim Gate, Green Pavilion and Jacob Ballas Children's Garden points of entry.

- A Heritage Museum housed in Holttum Hall and exhibition centre in the CDL Green Gallery.
- A horticultural library (open Monday to Friday).
- Visual access to some of the laboratories and work undertaken there.
- Food and beverage outlets are located at the Botany Centre, Visitor Centre, Jacob Ballas Children's Garden, Raffles Building, Ginger Garden and at E.J.H. Corner House.
- Toilets, shelters, seating and bins evenly distributed across the sites.
- First aid points at the Botany Centre, Nassim Gate
  Visitor Centre and Jacob Ballas Children's Garden.
- Some interpretation.
- Orientation panels and finger posts.

The linear distance between the northern and southern end of the Singapore Botanic Gardens (including the northern Buffer Zone) is approximately 2km. The Singapore Botanic Gardens as a whole (including areas which fall outside the boundary of the Nominated Property) can be accessed via 16 main entrances/gates. Four of these entrances are pedestrian and vehicular entrances (used for deliveries and VIP visits only). Access can also be gained into the Botanic Gardens from the National University of Singapore's Law Faculty, the Botanic Gardens MRT station and exits from underground parking located below the Botany Centre. Cycling is prohibited in the Botanic Gardens, the exception being a tolerance for small children's cycles. As shown in the **Appendix H**, there is ample provision of car parking in different locations around the site and this will be further increased when the Tyersall Learning Forest is opened (located within the proposed Buffer Zone).

Coach drop-off points are located at the Nassim Gate Visitor Centre, Ginger Garden and Jacob Ballas Children's Garden and coach parking at the visitor centre, Tyersall Avenue and Jacob Ballas Children's Garden. There are dedicated taxi stands at the Botany Centre (Tanglin Gate) and Visitor Centre (Nassim Gate) and bus stops along Holland Road and Bukit Timah Road. Access by MRT is currently via the Botanic Gardens station (in the north-western end of the Botanic Gardens) which forms part of the Circle Line. A second station, adjacent to it, is under construction and will form part of the Downtown Line (due to open in 2015). An MRT station along the Thomson Line, with an exit opposite the Tanglin Gate is also due to be constructed and opened in 2020. Parking lots close to the Ginger/National Orchid Gardens are due to be reconfigured and expanded as part of the Tyersall Learning Forest developments.

#### 5.i Policies and Programmes Related to the Presentation and Promotion of the Property

The inscription of the Singapore Botanic Gardens as a World Heritage Site will heighten awareness and an uplift in tourism is predicted, adding to the local economy, increasing educational potential and enriching community identity. As part of the nomination, the Botanic Gardens will be developing a programme of work related to the presentation and promotion of the Nominated Property, to help unlock the benefits of World Heritage Site status for visitors and local communities. This includes development and implementation of the following policies and programmes:

- Audience Development to identify opportunities for increasing local community and visitor usage of the nominated property in relation to its Outstanding Universal Values.
- Visitor Management to identify any measures required to effectively manage the impact of increased usage on the Nominated Property's fabric and Outstanding Universal Values.
- Marketing and Brand Development to identify opportunities for further promoting the Nominated Property and to explore potential benefits of cross-marketing and using the World Heritage Nomination status.
- Orientation Signage to improve pedestrian signage from bus stops and MRT stations to encourage visitors to explore all parts of the Nominated Property.
- Access to understand and address the needs of visitors with disabilities in relation to the different attractions within the Nominated Property.

- Interpretation to address interpretation needs for the Nominated Property in relation to promoting understanding of its Outstanding Universal Values.
- Education to further identify formal education and life-long learning opportunities linked to the Outstanding Universal Values of the nominated property and develop processes of evaluation and review.
- Public Realm to identify opportunities for enhancing the public realm within the Nominated Property (such as paths, seating and lighting).

A user survey was recently commissioned, which will outline the site's visitor profile as well as visitor satisfaction, needs and aspirations. A museum, providing interpretation on the Gardens' heritage, was opened in Holttum Hall in November 2013 and interpretation panels showcasing the heritage value of key features across the site are gradually being installed. An application linked to the museum as well as a range of publications provide supplementary information about different aspects of the site. A self-guided heritage trail leaflet is available as well as regular themed guided tours (e.g. Rainforest tour, heritage tour, herbarium/ laboratories tour and National Orchid Garden tour). A range of musical events take place in the Gardens throughout the year. The CDL Green Gallery hosts a rolling programme of exhibitions, the first of which focused on Singapore's greening movement, including the Botanic Gardens' involvement.

Events linked to the nomination have included the re-creation of moon-lit performances at the bandstand, heritage themed education programmes and an exhibition of black and white photographs of the Gardens. An exhibition on the Gardens' heritage will be held in the National Museum of Singapore in 2014, which will later tour schools and shopping centres. Information about the site and the WHS nomination process was publicised through the media.

The Botanic Gardens offers approximately 50 different educational programmes for schools (guided tours, talks and workshops), over 20 for adults and monthly talks by local and international speakers focused on botany, biodiversity and conservation. It has and continues to run a range of activities/training programmes which contribute to capacity building and technology transfer. Research and horticultural perspectives from the Gardens is shared with specialist and non-specialist audiences through the Gardens' century–old scientific journal The Garden's Bulletin Singapore and Gardenwise magazine - both are available online.

An integrated communications plan is implemented annually to promote the Singapore Botanic Gardens to the local and international media. This includes organising of media briefings and media tours to promote the Botanic Gardens' latest amenities, programmes or activities. This has resulted in extensive media coverage of the Botanic Gardens using a range of marketing channels such as the leading online, print and broadcast media in Singapore and overseas (e.g. Australia, China, France, Germany, Indonesia, Italy, Japan, Malaysia, UK and the USA). The Botanic Gardens' programmes and activities are also promoted on its website as well as in monthly electronic direct mail and quarterly newsletter articles that are sent out to over 80,000 subscribers of NParks. Interesting facts about the Botanic Gardens are also posted on popular social media platforms such as the Singapore Botanic Gardens' Facebook page and NParks' Facebook page and Twitter account.

#### 5.j Staffing Levels and Expertise (professional, technical, maintenance)

The Singapore Botanic Gardens currently employs 125 full-time members of staff. The responsibility for the Botanic Gardens' overall management lies with its Director who is assisted by two Senior Deputy Directors and four Deputy Directors. Garden staff are employed in the following five departments: Research and Conservation (RC); Horticulture, Exhibitions and Events (HEE); Education, Development and Administration Support (EDA); Visitor Management, Security and Operations (VMSO); and Singapore Garden Festival (SGF). Qualifications held by staff can be summarised as follows:

 RC department: all members of staff, other than assistants, have either first degrees or post graduate degrees in relevant science disciplines.

- HEE department: staff qualifications range from practical experience without academic certificates (older landscape technicians), to horticultural diplomas (junior managers), first degrees (more senior lawns managers) and Masters and PhDs (assistant directors, senior deputy/deputy directors).
- EDA department: the deputy director, assistant director and managers have a general degree (either in arts or science) although some have Masters degrees. Executives have diplomas and officers GCE 'A' Level certificates.
- VMSO department: the deputy director/assistant directors and managers have a general degree (either in arts or business administration/ marketing) or degree in applied science.
   Executives have diplomas and assistants GCE 'O' Level certificates.
- SGF department: the deputy director and managers have a general degree either in arts or science. Executives have diplomas and assistants GCE 'O' Level certificates.

This represents a substantial body of on-site knowledge and expertise, which underpins the successful development and management of the Nominated Property and its associated functions. Staff benefit from external specialist expertise and knowledge from a range of organisations/ individuals including the National Archives, CUGE and the National Biodiversity Centre (the latter two are based at the Botanic Gardens). Government agencies, such as the Urban Redevelopment Authority's Conservation department, give their views and advice on applications for planning consents involving changes to or restorations of the historic landscape and buildings. Appropriately qualified grounds and buildings maintenance contractors carry out maintenance tasks across the site and specialist restoration contractors are called upon as and when necessary. A valuable volunteer base lead walks around the Gardens, including a specialist heritage walk.

# School visit to the Botanic Gardens MONITORING



#### 6.0 MONITORING

# 6.a Key Indicators for Measuring State of Conservation

Periodic monitoring of the Nominated Property is a requirement under Article 29 of the World Heritage Convention. The objectives of periodic reporting are to assess the overall application of the World Heritage Convention by the Singapore Government and to assess whether the Outstanding Universal Values for which the site is inscribed are being maintained.

To assist in this process, key indicators for measuring quantitatively and qualitatively the state of conservation are established in the Management Plan. These are listed below:

Indicator	Periodicity	Location of records
Percentage of buildings/structures requiring major repair (state of conservation reports)	Quinquennial	Singapore Botanic Gardens
Observed change in the condition of the living collections	Annual	Singapore Botanic Gardens
Number of major changes to the historic layout	Annual	Singapore Botanic Gardens
Population size of keynotes species in the Rainforest	Annual	Singapore Botanic Gardens/National Biodiversity Centre
Observed change in the condition of the preserved collections	Quinquennial	Singapore Botanic Gardens
Observed change in the condition of the documentary/visual reference collections	Quinquennial	Singapore Botanic Gardens
Continuity of the site's scientific and recreational functions	Annual	Singapore Botanic Gardens
Percentage of visitors expressing satisfaction	Every three years	Singapore Botanic Gardens
Number of participants in educational activities	Annual	Singapore Botanic Gardens

#### 6.b Administrative Arrangements for Monitoring Property

Singapore Botanic Gardens 1 Cluny Road Singapore 259569 Tel: +65 6471 7361 http://www.sbg.org.sg/

National Biodiversity Centre 1 Cluny Road Singapore 259569 Tel: +65 6465 1696

https://www.nparks.gov.sg/cms/index. php?option=com\_content&view=article&id=58&lt emid=153

#### 6.c Results of Previous Reporting Exercises

Earlier reports on the state of conservation of the Nominated Property include:

- Quinquennial structural inspections of the buildings (most recent dated 2013).
- 10 Year Living Collection Management Plan (2013 – see Appendix ii of **Appendix B** for more details): provides information relating to the landscape content, heritage value and condition of the Gardens' individual 'Lawns' (management zones).

Overall, the Nominated Property is in good condition, being maintained according to high standards.





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#### 7.0 DOCUMENTATION

7.a Photographs and Audio–Visual Image Inventory and Authorization Form

#### Photographs

An Index of all photographs contained in the Nomination Dossier is provided in **Appendix I**. Information is provided in the format requested in Annex 5 of the *Operational Guidelines for the Implementation of the World Heritage Convention* (World Heritage Centre, 2013).

Those photographs indicated in the column 'Non exclusive cession of rights' may be used by UNESCO in the way described in Annex 5 of the *Operational Guidelines*. These are annexed to the Nomination as electronic images in jpg format at a minimum of 300 dpi resolution.

#### **Audio-visual presentation**

An audio-visual presentation describing the history of the Singapore Botanic Gardens is annexed to the Nomination.

7.b Texts Relating to Protective Designation, Copies of Property Management Plans or Documented Management Systems and Extracts of Other Plans Relevant to the Property

Copies of the following documents will be provided in **Appendices B, F and G**.

- Management Plan (Appendix B).
- Planning Act (Cap. 232) (Appendix F)
- National Parks Board Act (Cap. 198A) (Appendix F)
- Parks and Trees Act (Cap. 216) (Appendix F)
- Parks and Trees (Preservation of Trees) Order, Order 1 (Appendix F).
- The Concept Plan (URA, 2001) (Appendix G).
- The Master Plan Written Statement (URA, 2008) (Appendix G).
- The Conservation Guidelines (URA, 2011) (Appendix G).

#### 7.c Form and Date of Most Recent Records or Inventory of Property

The form and date of the most recent records of the Property are:

- Digital inventory of the Living Collections (2013, updated on an ongoing basis).
- Digital inventory of the Library Collection (published and archival material) (2013, updated on an ongoing basis).
- Digital inventory of the Herbarium's Type
  Specimens (2013, updated on an ongoing basis).
- Digital inventory of Conserved Buildings and Structures, held by the Urban Redevelopment Authority (2013, updated as and when necessary).
- Digital inventory of Heritage Trees, held by the National Parks Board (2013, updated on ongoing basis)
- Digital inventory of all buildings within the Singapore Botanic Gardens, held by the National Parks Board's Resource Management Division (2013, updated on ongoing basis)
- Biodiversity survey of the Rainforest (2009-2012).

## 7.d Address where Inventory, Records and Archives are Held

Singapore Botanic Gardens, 1 Cluny Road, Singapore 259569.

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122 'Girl on a Bicycle' by Sydney Harpley

#### 8.0 CONTACT INFORMATION OF RESPONSIBLE AUTHORITIES

#### 8.a Preparer

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#### 8.c Other Local Institutions

#### Singapore Botanic Gardens

1 Cluny Road Singapore 259569

#### **National Parks Board**

1 Cluny Road Singapore 259569

#### 8.d Official Web Address

#### http://www.nhb.gov.sg/psm

Contact name: Jean Wee

# SIGNATURE ON BEHALF OF THE STATE PARTY



9.0 SIGNATURE ON BEHALF OF THE STATE PARTY

MR LAWRENCE WONG Acting Minister for Culture, Community and Youth

Chairman of the Singapore National Commission for UNESCO

# APPENDICES

#### APPENDIX A OVERVIEW OF CONSULTATION/ AWARENESS BUILDING





#### We Want to Hear From You

Public Consultation on the Draft Nomination Dossier for Singapore's Bid to List Singapore Botanic Gardens as a UNESCO World Heritage Site

In June 2012, Singapore ratified the World Heritage Convention and in December 2012, submitted its World Heritage Tentative List to UNESCO to indicate interest in inscribing the Singapore Botanic Gardens as a World Heritage Site.

Please click here for an overview of the World Heritage Site Inscription Process and Singapore's Selection Process.

Over the last few months, the Ministry of Culture, Community and Youth, National Heritage Board and National Parks Board have been working in consultation with members of heritage and environment groups as well as members of the landscape industry whose comments and feedback have helped to inform and shape the contents of the Nomination Dossier (comprising the Nomination Document and Site Management Plan).

On 11 September 2013, we launched the first phase of a public consultation process to seek your views on the Draft Nomination Document. We have just launched the second phase of the public consultation on the Site Management Plan. We are seeking your views to help strengthen the Draft Site Management Plan. After the consultation process, we will collate the responses that we have received and, where applicable, use them to enhance the contents of the Nomination Dossier, which will be submitted to UNESCO by 1 February 2014.

Click here to view Nomination Document

Nomination Document

Click here to view Site Management Plan

Site Management Plan



Swan Lake - Singapore's oldest ornamental water body was developed in 1866.



The 1850s Victorian cast-iron gazebo is the oldest structure in the Gardens



integral part of Singapore's social and cultural heritage

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Singapore Botanic Gardens Website Nomination Document and Management Plan Consultation Page

#### APPENDIX A

#### OVERVIEW OF CONSULTATION/ AWARENESS BUILDING

#### PUBLIC CONSULTATION

#### **Draft Nomination Document**

September 2013–January 2014

Hard copies of the Draft Nomination Document were made available for review and comment at three visitor counters within the Botanic Gardens. Digital copies were also made available on the Singapore Botanic Gardens and the National Heritage Board's websites. Feedback was provided either via the websites or by filling out a form onsite.

#### **Draft Management Plan**

November 2013-January 2014

Hard copies of the Draft Management Plan were made available for review and comment at three visitor counters within the Botanic Gardens. Digital copies were also made available on the Singapore Botanic Gardens and the National Heritage Board's websites. Feedback was provided either via the websites or by filling out a form on site.

Exhibition Panels detailing the Inscription Process as well as the Management Plan were set up outside the new CDL Green Gallery.

Singapore Botanic Gardens have received over 100 feedback submissions from both consultations. Most of the participants have either contributed memories or pledged their support.

#### STAKEHOLDER CONSULTATION

A wide range of stakeholders were consulted and contributed to the development of the Nomination Dossier including the Management Plan. These include:

- ICOMOS Singapore Ltd
- Singapore Botanic Gardens volunteers
- The Ministry of Culture, Community and Youth
- The Ministry of Education
- The Ministry of Foreign Affairs

- The National Heritage Board
- The National Parks Board (including representatives of the National Biodiversity Centre, Centre for Urban Greenery and Ecology and Resource Management)
- The National University of Singapore
- The Nature Society Singapore
- The Preservation of Sites and Monuments
- The Singapore Botanic Gardens (representatives of all teams) (National Parks Board)
- The Singapore Gardening Society
- The Singapore Heritage Society
- The Singapore Institute of Architects
- The Singapore Land Authority
- The Singapore Tourism Board
- The Tanglin Neighbourhood Committee
- The Urban Redevelopment Authority
- National University of Singapore

#### AWARENESS BUILDING

Concerted efforts were made to build as broad an awareness as possible of the bid to inscribe the Singapore Botanic Gardens on the UNESCO World Heritage List. Awareness building focused on the WHS inscription process, the Nomination Dossier, the Nominated Property's Outstanding Universal Values and history as well as the public consultation.

#### **Sharing Sessions**

A number of 'sharing sessions' were delivered as a way of introducing individuals/stakeholders to the WHS inscription process, the Nomination Dossier, the Nominated Property's Outstanding Universal Values and history as well as the public consultation process. The sessions were conducted prior to the launch of the public consultation. Attendees were subsequently sent links/copies of the Draft Nomination Document for their review and comment. The same exercise was conducted in relation to the Draft Management Plan. The following 'sharing sessions' took place:

**Green & Gardening Groups** 

- Orchid Society of Southeast Asia
- Nature Society Singapore
- Raffles Museum of Biodiversity Research
- Singapore Botanic Gardens Volunteers
- Singapore Gardening Society

#### **Industry Groups**

- Landscape Industry Association Singapore
- Singapore Institute of Landscape Architects

#### Others

- Heritage Stakeholders, including the Singapore Heritage Society
- MP for Tanjong Pagar GRC (Tanglin-Cairnhill)
- National University of Singapore
- Tanglin Neighbourhood Committee & Residents

#### Talks/Heritage Tours

Talks and heritage tours were delivered to the following stakeholders/groups:

- ASEAN Youth Camp
- Bogor Botanic Gardens
- INSPIRIT (Youth Leaders)
- Ministry Of Education Officers from Science, Character and Citizenship Education, Humanities
- National Museum
- National University of Singapore Geography students
- National University of Singapore History students
- National University of Singapore International students
- National University of Singapore Museum (Baba House)

- People's Association Grassroots Leaders
- Royal Botanic Gardens Peradeniya
- Singapore Discovery Centre
- South China Botanical Institution
- West Grove Primary School teachers
- World Library Congress

#### 50 Years of Greening Singapore | SBG Heritage Tour Groups

S/N	Community Centres/Neighbourhood Committee/	Date of Visit/Time	Pax
	Schools/Voluntary Welfare Organisation Groups		
1	Toa Payoh Central Active Ageing Committee	Saturday, 30 Nov 2013 at 10.00 am	47
2	Eunos Zone 5RC	Saturday, 30 Nov 2013 at 10.00am	42
3	Tai Keng Gardens NC	Saturday, 30 Nov 2013 at 4.00 pm	45
4	Bukit Timah Active Ageing	Sunday, 1 Dec 2013 at 10.00 am	40
5	Geylang Serai CC IAEC	Sunday, 1 Dec 2013 for at 4.00 pm	45
6	Geylang Serai Community	Sunday, 1 Dec 2013 for at 4.00 pm	45
7	Ayer Rajah AAC	Friday, 6 Dec 2013 at 4.00 pm	42
8	Jalan Kayu CC	Friday, 6 Dec 2013 at 4.00 pm	50
9	Toa Payoh East Community Club	Friday, 6 Dec 2013 at 4.00 pm	45
10	Harbour View Towers NC	Saturday, 7 Dec 2013 at 4.00pm	14
11	Garden Club (Opera Estate) / Siglap South Community Centre	Saturday, 7 Dec 2013 at 4.00pm	60
12	Cashew Zone 2 RC	Sunday, 8 Dec 2013 at 10.00 am	75
13	Eunos AAC	Sunday, 8 Dec 2013 at 10.00 am	42
14	The Serangoon Active Ageing Committee (AAC)	Sunday, 15 Dec 2013 at 10am	40
15	Bukit Timah Active Ageing	Friday, 13 Dec 2013 at 10.00 am	40
16	Bukit Merah Community Centre	Saturday, 14 Dec 2013 at 4.00pm	70
17	Eunos Zone 6RC	Sunday, 15 Dec 2013 at 10.00 am	42
18	National Heritage Board (Indian Heritage)	Friday, 13 Dec 2013 at 2 pm	7
19	Society of Tourist Guides (Singapore)	Monday, 2 Dec 2013 at 4.00pm	40
20	Temasek Polytechnic	Tuesday, 3 Dec 2013 at 4.00pm	41
21	Singapore Polytechnic	Friday, 6 Dec 2013 at 10.00am	40
22	Society of Tourist Guides (Singapore)	Friday, 6 Dec 2013 at 4.00pm	40
23	Bukit Gombak Community Centre	Saturday, 7 Dec 2013 at 10.00am	50
24	LHNC, Bedok Constituency	Saturday, 7 Dec 2013 at 4.00pm	40
25	Institute of Technical Education	Thursday, 12 Dec 2013 at 10.00am	15
26	Muhammadiyah Welfare Home (MWH)	Tuesday, 3 Dec 2013 at 10.00am	30
27	Kampung Senang Charity & Education Foundation	Tuesday, 3 Dec 2013 at 2.00pm	50
28	SASCO DACE	Thursday, 5 Dec 2013 at 10.00am	60
29	Singapore Association for Mental Health (SAMH Insight	Friday, 6 Dec 2013 at 2.00pm	15
	Centre)		
30	NTUC Women Development Secretariat, (AUPE Women's	Saturday, 7 Dec 2013 at 2.00pm	34
21	Committee) MacDharran Shang Hang Childrene Cantro	Tuesday 10 Dec 2012 at 10 00am	120
31	MacPherson Sneng Hong Childcare Centre	Tuesday, To Dec 2013 at 10.00am	130
32	Hong Kan North Day Care Centre for the Elderly	Wednesday, 11 Dec 2013 at 2.00pm	60
33	Queenstown Multi Service Centre (YMCA)	Thursday, 12 Dec 2013 at 10.00am	30
34	Metropolitan YMCA Singapore - MY World @ Bishan	Friday, 13 Dec 2013 at 10.00 am	140
35	SAMIH BUKIT Gombak Group Homes	Friday, 13 Dec 2013 at 2.00pm	20
36	Shan You Counselling Centre	Friday, 13 Dec 2013 at 2.00pm	40
37	U Joy Care Services	Saturday, 14 Dec 2013 at 10.00am	80
38	i ne Mahaprajha Buddhist Society	Sunday, 15 Dec 2013 at 11 am	18
	lotal Pax		1764

#### Media/Press

There has been extensive media/press coverage of Singapore's bid to inscribe the Singapore Botanic Gardens on UNESCO's World Heritage List and the nomination process. Numerous articles have been

published in the local press/websites. Reporting extended to some televised channels. Examples of the media/press coverage is provided below.

# Too much love for iconic Tembusu trees



PERCH NO MORE: Decades of visitors trampling on its roots and perching on its branches have proven too much for this Tembusu tree in the Botanic Gardens. PHOTO: JOYCE FANG/THE STRAITS TIMES

T HAS sheltered lovers, borne the weight of enthusiastic climbers and formed the backdrop of many a photo shoot.

a photo shoot. But decades of visitors trampling on its roots and perching on its horizontal branch have proven too much for the icon-ic Tembusu tree in the Botanic Gardens. The National Parks Board and the Na-

tional Heritage Board said yesterday that, later this year, they will be installing a fence around the tree, which is older than the 154-year-old Gardens and features

the 154-year-old Gardens and features prominently on the \$5 currency note. The high number of visitors treading around and climbing on the tree has caused soil compaction, which has imped-ed root growth and has proved "detrimen-tal" to the tree's health, said the govern-

ment agencies

ment agencies. Another Tembusu tree in the Gardens' Manu Valley, which is suffering from a sim-ilar fate, will also be fenced up. The conservation of these heritage trees is among several measures laid out in a site-management plan for the Botanic Gardens for its nomination as a Unesco World Heritage Site. The plan also includes a new foliage garden with more than 300 species of plants, a heritage museum detailing the Gardens' history and a green gallery with totanical exhibits. The public is invited to give feedback on the nomination documents and plan at www.sbg.org.sg/unesco.

)) myp@sph.com.sg

Source: MyPaper (print)

### Rooting for Unesco heritage status

Museum part of Botanic Gardens' required site plan for UN listing

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Heritage Convention last year, which means it has an obligation to protect its national heritage. Unesco World Heritage sites are cultural or natural attractions that are deemed to have outstand-ing universal value. There are 981 such sites in the world.

last month. The new trees include:
 An 87-year-old Buni tree.
 The Iom-tall tree's fruit can be used to make jams, jellies and wines.
 A Senegal Mahogany tree planted by former prime

Botanic gardens already on the list include London's Royal Botani-tis Gardens, which boasts one of the world's largest collection of living plants, and Italy and tapping 468-year-old Orto Botanico ja Padua. The 154-year-old Gardens in

said: "The rich heritage of the Gar-dens is a testament to how far we've come as a nation." The Botanic Gardens' nomina-tion document and site manage-ment plan can be found at www.sbg.org.sg/umesco izagkun@sph.com.sg

Source: The Straits Times Newspaper (print)

(Above) Visitors feeding fish at the Botanic Gardens. The 154-year-old gardens span 74ha, drawing more than four million visitors a year. (Below) One of the two Tembusu trees which will be fenced up to reduce the high number of visitors treading around them. ST PHOTOS: DESMOND WEE. FILE Growing Singapore's heritage TEN more trees in the Botanic Gardens were added to the Singapore Heritage Tree list last month. The new trees



The public is encouraged to give feedback to show that the whole community is behind the Singapore Botanic Gardens' nomination. ST FILE PHOTO

# Help in Botanic Gardens' Unesco site bid

Personal stories sought as 154-year-old attraction vies for UN heritage status

#### By MELISSA LIN

MEMBERS of the public are being invited to take part in the Singapore Botanic Gardens' bid for Unesce World Heritage Site status. The have until December to give their feedback on the nomination dossier, which sets out why the 134-year-old attraction deserves the honour. The valonal Heritage Board and the National Parks Board want the public's opinion on two docu-ments that will be submitted to Unesco, honown in full as the United Nations Educational, Scientific and Cultural Organisation. The National Heritage Board and the National Parks Board want the public's opinion on two docu-ments that will be submitted to Unesco, honown in full as the United Nations Educational, Scientific and Cultural Organisation. To coutlines how the gardens fulfil the nomina-tion criteria, while the other is a site management plant proposes how they will be run if the bid is successful. To receive the honour, they must also meet at least one of 10 criteria. The gardens were nominat-d under two of them. The strength were the strength of a strength of a strength they "exhibit an important interchange of human values, over a span of time or within a cul-ture or technology, monumental arts, town plan-ning or landscape which illustrates a significant stage in human history." To show the gardens' value, the nomination pa-pende of building, architectural or technological en-semble or landscape which illustrates a significant stage in human history." To example, "pioneering work on rubber cultura-tion and techniques for tapping" was carried out for the artly 20th-century rubber boom. The gardens also al 1800s, laying the foundation for the early 20th-century rubber boom. Members of the public can view the documents many of which are more than 100 years old. A cha ationest in the gardens contains trees native to Singapore Hieritage Society vice president Chus Singapore Hieritage Society vice president Chus Singapore Hieritage Society vice president Chus Chus Menters of the public can view the documents intore the industh aten ware

Source: The Straits Times Newspaper (print)



- Bit Africa South, sand

tourism, it would bring intangible benefits such as cultivating a sense of civic



Source: The Straits Times Newspaper (print) April 2013

# Botanic Gardens plans gallery and museum

They will showcase its heritage as part of bid for World Heritage status

By GRACE CHUR

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Source: The Straits Times Newspaper (print) May 2013

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CDI GATTA CALL
### Public feedback wanted on nomination of Botanic Gardens for World Heritage Site





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The National Heritage Board and the National Parks Board are seeking public feedback ahead of their bid to make 154-year-old Singapore Botanic Gardens a Unesco World Heritage Site. -- ST FILE PHOTO: DESMOND WEE



#### By Melissa Lin

The National Heritage Board and the National Parks Board are seeking public feedback ahead of their bid to make 154-year-old Singapore Botanic Gardens a Unesco World Heritage Site.

They are holding a public consultation from Wednesday to December on two documents that will be submitted for the nomination. The first is a nomination document which provides information on how the



Botanics fulfils Unesco's inscription criteria. The second document is a site management plan which proposes how the Botanics will be managed if successfully inscribed.

The public may view these documents and give their feedback on <u>www.sbg.org.sg/unesco/</u>. The nomination document is also available at the Botanics' visitor information centres. Feedback will be collected in two stages.

Both documents will be submitted to Unesco by Feb 1 next year. The World Heritage Committee will then decide whether to grant the Botanics World Heritage Site status.

Source: The Straits Times website (www.straitstimes.com)

#### SINGAPORE Public consultations begin on Botanic Gardens World Heritage Site bid

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POSTED: 11 Sep 2013 1:30 PM TREND ®

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Singapore's National Heritage Board and National Parks Board have invited the public to provide their feedback on Singapore's bid for the Botanic Gardens to be nominated as its first UNESCO World Heritage Site.





SINGAPORE: Singapore's National Heritage Board (NHB) and National Parks Board (NParks) have invited the public to provide their feedback on Singapore's bid for the Singapore Botanic Gardens to be nominated as its first UNESCO World Heritage Site.

From now to December 2013, members of the public will be able to contribute feedback to the Nomination Dossier, which will eventually be submitted to the World Heritage Committee by February 1, 2014.

The committee will then deliberate on the nomination and decide if the Gardens will be inscribed as a World Heritage Site.

Conducted in two stages, the public can contribute feedback on two key documents within the Nomination Dossier: the Nomination Document, and the Site Management Plan.

From now, the public will be able to comment on the Nomination Document, which provides supporting evidence on how the Singapore Botanic Gardens fulfils UNESCO's inscription criteria.

And from November to December, views will be sought on the Site Management Plan, which outlines how the Gardens will be managed if successfully inscribed as a UNESCO World Heritage Site

Where possible, relevant feedback and information gathered from the public consultation process will be included in the Nomination Document.

The consultation process marks the culmination of a wider engagement on the nomination since 2010, when the government started its engagement of a number of stakeholders, such as the Singapore Heritage Society and the Nature Society (Singapore).

Underlining the importance placed on public consultations, Ms Jean Wee, director of the preservation of sites and monuments at NHB said, "The Singapore Botanic Gardens has been, and continues to be an important site of memory, and we would very much appreciate Singaporeans contributing their input in ways that they feel will support its successful inscription."

Dr Nigel Taylor, director of the Singapore Botanic Gardens, also hoped that members of the public would contribute historical information and ideas about the Botanic Gardens, which could also be used to make the heritage tours of the Gardens more meaningful for visitors.

Members of the public will be able to view the documents, and submit their views at www.sbg.org.sg/unesco. The Nomination Document will also be available for viewing at the three Visitor Information Counters at the Gardens.

Source: Channel News Asia Website - CNA/fa (www.channelnewsasia.com/singapore)

### Public feedback invited on Botanic Gardens management plan for UNESCO bid

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The National Heritage Board (NHB) and National Parks Board (NParks) have unveiled their proposed five-year site management plan for the Singapore Botanic Gardens.

PHOTOS



SINGAPORE: The National Heritage Board (NHB) and National Parks Board (NParks) have unveiled their proposed five-year site management plan for the Singapore Botanic Gardens.

A joint statement from the three parties issued Wednesday said the plan is part of the dossier that it will submit to UNESCO for the Gardens' World Heritage Site nomination.

Members of the public are invited to contribute their feedback on the plan.

Hard copies of the plan can be obtained from the three visitor service counters at the Gardens and the soft copy is available online at the Gardens' **website**.

The statement said where possible, feedback from the public will be incorporated into the nomination dossier, which will submitted to UNESCO by February 2014.

The World Heritage Committee will then deliberate on the nomination and decide if the Gardens is worthy of inscription as a World Heritage Site.

The statement also said that NHB and NParks have received over 100 feedback submissions on the nomination document -- the part of the dossier which was already made available to the public for feedback in September.

Most of the comments received either express support for the Gardens' nomination, or share memories of time spent at the Gardens.

The Gardens is Singapore's first nomination for inscription as a World Heritage Site.

- CNA/ec



Public Consultation Begins on Singapore Botanic Gardens World Heritage Site Bid Source: Channel News Asia, September 2013



Source: Channel 5 News, November 2013



Botanic gardens to have Heritage Museum and 'Green' Gallery' Source: Channel News Asia, May 2013

ENDORSEMENT OF THE SINGAPORE BOTANIC GARDENS CANDIDATE WORLD HERITAGE SITE MANAGEMENT PLAN



A committee with representatives from non-government and government groups met to endorse the Botanic Gardens' site management plan this month. The plan sets out actions to conserve the 154-year-old attraction. ST PHOTO: DESMOND WEE

# Botanic Gardens gets boost in UN bid

### Nature, heritage societies back site plan in campaign for Unesco status

#### By FENG ZENGKUN ENVIRONMENT CORRESPONDENT

THE campaign for the Singapore Botanic Gardens to become a Unesco World Heritage Site has received a boost from local nature and heritage societies.

Earlier this month, a new committee with representatives from non-government and government groups met to endorse the Gardens' site management plan, which sets out actions to conserve it.

The site management plan will form part of the 154-year-old attraction's nomination dossier to be submitted to the United Nations by February for the global body to assess if the Gardens should get World Heritage Site status. The Gardens will learn the results of its application in 2015.

Botanic Gardens director Nigel Taylor said the experts' endorsement "sends a very good message to Unesco", adding: "It shows that we are really serious about doing this properly and with the support of the community."

The 15-member committee includes people from the Nature Society, Singapore Heritage Society, Singapore Institute of Architects and the local chapter of the International Council on Monuments and Sites (Icomos), which helps to evaluate World Heritage Site nominees.

While it is not a requirement, the UN encourages applicants to bring together a wide variety of participants including site managers, local communities and non-government groups to identify, nominate and protect World Heritage Sites. It also recommends bringing them together regularly to discuss the site's conservation plans.

Dr Taylor said the 15 representatives who endorsed the plan will try and meet every six months to review the Gardens' progress. "The meetings can also be used as a forum to handle any concerns, for example, if the rise in visitorship causes traffic and parking woes for nearby residents," he said.

Icomos Singapore president Kevin Tan said that the group is especially focused on maintaining the historical authenticity of the Gardens. He said: "Over the years, there may have been alterations to the site and its buildings. We have a team of architectural historians who can study old photos, drawings and building plans to see whether features have been changed and if they could be restored."

Nature Society president Shawn Lum added that the Gardens could be further used as a bank for endangered plant species in the region, in case natural disasters or developments wipe them out. "Hopefully, the Gardens can really embrace this as one of its roles, with a comprehensive strategic and long-term plan," he said.

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Source: The Straits Times Newspaper (print) Dec 2013

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01 Apr 2013	Straits Times Interactive Online	This could be Singapore's first World Heritage Site	Online
01 Apr 2013	The Straits Times	This could be Singapore's first World Heritage Site	A01
01 Apr 2013	Eco-business.com	This could be Singapore's first World Heritage Site	Online
02 Apr 2013	The Star Online	Bidding for World Heritage status	Online
02 Apr 2013	Facebook	Singapore Heritage Society Press Release on Singapore Botanic Gardens as UNESCO World Heritage Site	Online
03 Apr 2013	Yahoo Online	Singapore gardens aim for UNESCO heritage status	Online
03 Apr 2013	Swissinfo	Singapore gardens aim for UNESCO heritage status	Online
03 Apr 2013	My Sin Chew Online	Singapore gardens aim for UNESCO heritage status	Online
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03 Apr 2013	Tengrinews	Singapore gardens aim for UNESCO heritage status	Online
03 Apr 2013	PhysOrg	Singapore gardens aim for UNESCO heritage status	Online
03 Apr 2013	France24	Singapore gardens aim for UNESCO heritage status	Online
03 Apr 2013	Channel News Asia Online	Singapore gardens aim for UNESCO heritage status	Online
03 Apr 2013	Business Times (Malaysia)	S'pore Botanic Gardens aim for Unesco heritage status	Online
03 Apr 2013	Bangkok Post Online	Singapore gardens aim for UNESCO heritage status	Online
03 Apr 2013	Relax	Singapore gardens aim for UNESCO heritage status	Online
03 Apr 2013	New Straits Times Online	Singapore gardens aim for UNESCO heritage status	Online
03 Apr 2013	The Phuket news	Singapore gardens aim for UNESCO heritage status	Online
04 Apr 2013	Tamil Murasu	Botanic Gardens targets accreditation for Unesco World Heritage Site	
04 Apr 2013	The Borneo Post	Singapore gardens aim for UNESCO heritage status	Online
04 Apr 2013	Xinhua.Net (China)	Singapore gardens aim for UNESCO heritage status	Online
05 Apr 2013	The Straits Times	Botanic Gardens gears up for World Heritage Site listings	
05 Apr 2013	Cbgol	Singapore gardens aim for UNESCO heritage status	Online
05 Apr 2013	Lvping	City jewel: Singapore Botanic Gardens	Online
06 Apr 2013	Today Online	Bukit Timah forests, SIT flats worthy of World Heritage status too	Online
06 Apr 2013	The Straits Times	What World Heritage status would mean for the Botanic Gardens	B10, B11
06 Apr 2013	Lianhe ZaoBao	Overview of various issues to be debated in Parliament	12
06 Apr 2013	Razor.TV	Singaporeans support UNESCO bid	Online
08 Apr 2013	Today Online	Botanic Gardens could be World Heritage Site by 2015: NParks	Online
08 Apr 2013	Hindustantimes	Singapore gardens aim for UNESCO heritage status	Online
08 Apr 2013	Warna 94.2FM	Botanic Gardens could be World Heritage Site by 2015: NParks	

#### THE SINGAPORE BOTANIC GARDENS WORLD HERITAGE SITE BID IN THE PRESS

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08 Apr 2013	Channel News Asia Online	S'pore Botanic Gardens has "outstanding universal value", says Lawrence Wong	Online
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08 Apr 2013	Channel 5	S'pore Botanical Gardens has outstanding universal value, says Lawrence Wong	
08 Apr 2013	Central	S'pore Botanical Gardens has outstanding universal value, says Lawrence Wong	
08 Apr 2013	Channel News Asia	S'pore Botanical Gardens has outstanding universal value, says Lawrence Wong	
08 Apr 2013	93.8 LIVE	Botanic Gardens could be World Heritage Site in two years NParks	
08 Apr 2013	The Straits Times	Garden city's bid for heritage listing	A20
08 Apr 2013	Today	Beyond the Botanic Gardens	9
08 Apr 2013	The Straits Times	Gardens City's bid for Heritage listing	A04
08 Apr 2013	Xinhua.Net (China)	Singapore Botanic Gardens eyes UNESCO heritage status	Online
08 Apr 2013	Capital 95.8	S'pore Botanic Gardens has "outstanding universal value", says Lawrence Wong	
08 Apr 2013	Channel U	S'pore Botanical Gardens has outstanding universal value, says Lawrence Wong	
08 Apr 2013	Channel 8	S'pore Botanical Gardens has outstanding universal value, says Lawrence Wong	
09 Apr 2013	Straits Times Interactive Online	A museum to tell story of Botanic Gardens	Online
09 Apr 2013	Oli 96.8FM	S'pore Botanic Gardens could be first tropical garden in Asia to be UNESCO World Heritage Site	
09 Apr 2013	AsiaOne	What World Heritage status would mean for the Botanic Gardens	Online
09 Apr 2013	93.8 LIVE	Singapore Botanic Garden's bid for UNESCO World Heritage Site: Callers' views on whether SBG is representative of Singapore's culture and heritage?	
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09 Apr 2013	The Straits Times	A museum to tell story of Botanic Gardens	A03
09 Apr 2013	The Straits Times	New museum at Botanic Gardens	B02
09 Apr 2013	Berita Harian	Singapore Botanic Gardens meets criteria to be a World Heritage Site	2
09 Apr 2013	Lianhe ZaoBao	Singapore Botanic Gardens to be nominated as UNESCO World Heritage Site next year	3

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11 Apr 2013	AsiaOne	A museum to tell story of Botanic Gardens	Online
14 Apr 2013	The Sunday Times	Unesco bid: How about Tiong Bahru, Bukit Brown?	08, 09
14 Apr 2013	Shin Min Daily	Ms Indranee hopes for Tiong Bahru to be listed as UNESCO World Heritage Site	2
15 Apr 2013	Sanluisobispo	Planting roots in Singapore	Online
15 Apr 2013	The Straits Times	Green honcho	C01, C02
15 Apr 2013	The Straits Times	An estate steeped in history	B02
15 Apr 2013	2 bearbear	Singapore Botanic Gardens : Relax Amidst Nature	Online
16 Apr 2013	AsiaOne	Unesco bid: How about Tiong Bahru, Bukit Brown?	Online
19 Apr 2013	Straits Times Interactive Online	Botanic Gardens' type specimens take root in cyberspace	Online
19 Apr 2013	The Straits Times	Botanic Gardens' type specimens take root in cyberspace	Online
19 Apr 2013	Lianhe ZaoBao	Singapore Botanic Gardens digitises plant type specimens to allow international scientists access for research	6
24 Apr 2013	Adventuresofaranga	Singapore Botanic Gardens	Online
25 Apr 2013	Channel News Asia	Feature on Singapore Botanic Gardens Heritage	
08 May 2013	Lianhe ZaoBao (NOW)	Cultural heritage hidden within Singapore Botanic Gardens	1
09 May 2013	Lianhe ZaoBao (NOW)	Free guided tour at Singapore Botanic Gardens this Saturday	5
10 May 2013	AsiaOne	Botanic Gardens to have heritage museum and green exhibit gallery	
10 May 2013	Channel News Asia Online	Botanic Gardens to have heritage museum, "green" gallery	Online
10 May 2013	Straits Times Interactive Online	Botanic Gardens to have heritage museum and green exhibit gallery	Online
10 May 2013	Xinmsn	Singapore Botanic Gardens to have two new attractions from end November	Online
10 May 2013	AsiaOne	Botanic Gardens to have heritage museum and green exhibit gallery	Online
10 May 2013	Channel News Asia Online	Botanic Gardens to have heritage museum, "green" gallery	Online
10 May 2013	Straits Times Interactive Online	Botanic Gardens to have heritage museum and green exhibit gallery	Online
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11 May 2013	Lianhe ZaoBao	Botanic Gardens to have heritage museum	16
12 May 2013	Lianhe WanBao	Botanic Gardens to build heritage museum	P10
13 May 2013	Propertyguru	Singapore Botanic Gardens to get two new attractions	Online
13 May 2013	Yahoo Online	Singapore Botanic Gardens to get two new attractions	Online
01 Jun 2013	The Straits Times	Trees worth keeping	A04
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02 Jun 2013	The Sunday Times	Lets learn about dragonflies	10
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21 Jun 2013	93.8 LIVE	Singapore Botanic Gardens heritage	Online
24 Jun 2013	Others	Visit the children's garden in Singapore	Online
26 Jun 2013	The Straits Times	Botanic Gardens tops list of Asia's parks	B04
26 Jun 2013	The Business	Botanic Gardens named top Asian park	9
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26 Jun 2013	The Star	A garden for young 'uns	7
26 Jun 2013	Travel Daily	TripAdvisor presents Travellers' Choice Attractions	Online
27 Jun 2013	My Paper (Eng)	Dry weather causes lake to shrink	A08
27 Jun 2013	AsiaOne	Dry weather causes lake to shrink	Online
27 Jun 2013	Straits Times	Botanic Gardens' heritage tree falls	Online
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27 Jun 2013	Lianhe WanBao	Singapore Botanic Gardens' heritage tree falls	P04
30 Jun 2013	Shin Min Daily	Singapore Botanic Gardens one of the top ten parks in the	2
		world	
08 Jul 2013	anneything	Get in Touch with Nature at Singapore Botanic Gardens	Online
08 Jul 2013	Examiner	Singapore: Where the flowers bloom (Photos)	Online
09 Jul 2013	AsiaOne	No plans to nominate Bukit Brown for World Heritage site	Online
10 Jul 2013	The Straits Times	Bukit Brown site not Unesco contender	B05
12 Jul 2013	The Straits Times	Peek behind the scenes	C01,
			C06,C

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12 Jul 2013	The Straits Times	Writer-in-the-Gardens Residency Programme	C11
17 Jul 2013	The Horticulturist Article	Tropics East	4 to 08
17 Jul 2013	Expat Living	Top ten green spaces	186 to 191
26 Jul 2013	Channel News Asia Online	Orchid hybrid named in honour of US Vice President Biden & wife	Online
26 Jul 2013	Straits Times Interactive Online	Meet the Bidens, the orchid hybrid named after US VP and wife	Online
26 Jul 2013	Today Online	Biden to visit Singapore	Online
26 Jul 2013	Xinmsn	US Vice President Biden arrives in Singapore	Online
26 Jul 2013	Xinmsn	Bidens have orchid named after them in Singapore	Online
26 Jul 2013	Xinmsn	Singapore orchids named after VIPs	Online
26 Jul 2013	Xinmsn	Orchid hybrid named in honour of US Vice President Biden & wife	Online
27 Jul 2013	Tamil Murasu	A new orchid hybrid plant named "Joe and Jill Biden"	3
27 Jul 2013	Xinmsn	Singapore orchids named after VIPs	
09-Aug-13	Channel NewsAsia	Interview with Dr. Nigel Taylor, D/SBG	AM Live -730am
18-Aug-13	Channel 8	Heritage Hunters( Feature on JBCG)	
18-Sep-13	Channel U	Shoot It (Feature on SBG - interview with Dr Wilson Wong	Shoot It- 8pm
11-Sep-13	The Straits Times	Help in Botanic Gardens' Unesco site bid	Home/ B06
11-Sep-13	The Straits Times Online	Help in Botanic Gardens' Unesco site bid	Online
12-Sep-13	Today	Botanic Gardens a World Heritage site?	Singapore /26
12-Sep-13	MyPaper (English)	Help Botanic Gardens attain Unesco status	News/ A04
11-Sep-13	The Straits Times Online	Public feedback wanted on nomination of Botanic Gardens for World Heritage Site	Online
11-Sep-13	Today Online	Botanic Gardens a World Heritage site?	Online
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11-Sep-13	Xinmsn	Public consultations begin on Botanic Gardens World Heritage Site bid	Online
11-Sep-13	AsiaOne	Public feedback wanted on nomination of Botanic Gardens for World Heritage Site	Online
11-Sep-13	Channel NewsAsia Online	Public consultations begin on Botanic Gardens World Heritage Site bid	Online
11-Sep-13	Channel NewsAsia	Public consultations begin on Botanic Gardens World Heritage Site bid	Singapore Tonight -6pm, 10pm

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06-Oct-13	Channel NewsAsia	Feature on the nomination of SBG as a UNESCO World Heritage Site. Interviews for the feature include Mr Lawrence Wong, Acting Minister/CCY, Dr Nigel Taylor, D/ SBG, Tony O'Dempsey, NUS and other park users.	Spore Tonight -10pm
06-Oct-13	Channel 5	Feature on the nomination of SBG as a UNESCO World Heritage Site. Interviews for the feature include Mr Lawrence Wong, Acting Minister/CCY, Dr Nigel Taylor, D/ SBG, Tony O'Dempsey, NUS and other park users.	News 5 Tonight -930pm
04-Oct-13	Channel NewsAsia	Introduction to feature on Singapore Botanic Gardens Spore	Connect -6pm
03-Oct-13	RTL	Singapur - Land der Superlative (NOG featured)	Online
20-Oct-13	The Sunday Times	More than 100 butterfly species extinct (NParks, SBG, FCP & Dr Geoffrey Davison mentioned)	Home/16
19-Oct-13	The Straits Times Online	More than 100 butterfly species extinct	Online
19-Oct-13	Wild Singapore	More than 100 butterfly species extinct	Online
24-Oct-13	The New Paper	'Green Lady'	Career Choice /31, 33
		(NParks, SBG & & 1963 Commemorative Tree Planting mentioned)	
29-Oct-13	The Straits Times	Botanic Gardens gets pioneer's artefacts	Home/ C03
29-Oct-13	The Straits Times Online	Botanic Gardens gets pioneer's artefacts	Online
29-Oct-13	Lianhe Zaobao	Botanic Gardens gets pioneer's artefacts	Front Page/01, 04
28-Oct-13	AsiaOne	Artefacts from Whampoa's private garden for botanic gardens' new heritage museum	Online
28-Oct-13	The Straits Times Online	Artefacts from Whampoa's private garden for botanic gardens' new heritage museum	Online
27-Oct-13	The Sunday Times	Green activist	Recruit/ C22
26-Oct-13	The Straits Times	New unit plays mediator on heritage issues	Home/ B05
26-Oct-13	The Straits Times Online	New National Heritage Board unit plays mediator on heritage issues (SBG UNESCO bid mentioned)	Online

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29-Oct-13	AsiaOne	Botanic Gardens gets pioneer Hoo Ah Kay's artefacts	Online
31-Oct-13	938Live	Interview with Dr Nigel Taylor on the rich heritage of SBG	News -5pm, 8pm
02-Nov-13	The Straits Times	The trees of Singapore	Saturday/ D12
02-Nov-13	Xinmsn	Great-granddaughter of Whampoa to donate artefacts to Botanic Gardens	Online
02-Nov-13	Channel NewsAsia Online	Great-granddaughter of Whampoa to donate artefacts to Botanic Gardens	Online
02-Nov-13	Channel NewsAsia	Great-granddaughter of Whampoa to donate artefacts to Botanic Gardens	Spore Tonight -10pm
02-Nov-13	Channel 5	Great-granddaughter of Whampoa to donate artefacts to Botanic Gardens	News 5 Tonight -930pm
02-Nov-13	Channel 8	Great-granddaughter of Whampoa to donate artefacts to Botanic Gardens	Spore Today -630pm
02-Nov-13	The Business Times	The 'crazy' gardener	Design/ L05
03-Nov-13	Sunday Mail (Australia)	City in the jungle (SGF, SBG, NOG and PCN mentioned.	Gardening / 82
16-Nov-13	The Straits Times	Unique experiences - Best visitor attraction experience	News / E03
Nov-13	The Beam	Singapore Botanic Garden no ordinary walk in the park	News /32 - 35
21-Nov-13	The Straits Times	Rooting for Unesco heritage status	Front Page / B01
21-Nov-13	MyPaper (English)	Too much love for iconic Tembusu trees	News / A04
21-Nov-13	Lianhe Zaobao	Singapore Botanic Gardens invites public feedback on five- year plan to prepare for UNESCO's bid	Singapore /14
20-Nov-13	The Straits Times Online	More than 100 submissions from the public in support of Unesco heritage site bid	Online
20-Nov-13	AsiaOne	More than 100 submissions from the public in support of Unesco heritage site bid	Online
21-Nov-13	AsiaOne	Too much love for iconic Tembusu trees	Online
20-Nov-13	Xinmsn	Public feedback invited on Botanic Gardens management plan for UNESCO bid	Online
20-Nov-13	Channel NewsAsia Online	Public feedback invited on Botanic Gardens management plan for UNESCO bid	Online
25-Nov-13	zbNOW	Singing birds in Singapore Botanic Gardens	Crossroads /05
23-Nov-13	AsiaOne	Rooting for UNESCO heritage status	Online

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30-Nov-13	Today Online	Singapore will preserve its green lungs: PM Lee	Online
30-Nov-13	AsiaOne	NParks sees more active volunteers in 2013	Online
30-Nov-13	Xinmsn	New attractions at Singapore Botanic Gardens from Saturday	Online
30-Nov-13	Channel NewsAsia	New attractions at Singapore Botanic Gardens from	Online
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30-Nov-13	Suria	New attractions at Singapore Botanic Gardens from Saturday	News -8pm
30-Nov-13	Xinmsn	New attractions at Singapore Botanic Gardens from Saturday	Online
30-Nov-13	Channel NewsAsia	New attractions at Singapore Botanic Gardens from	Online
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30-Nov-13	Suria	New attractions at Singapore Botanic Gardens from Saturday	News -8pm
30-Nov-13	93.8 LIVE	New attractions at Singapore Botanic Gardens from Saturday	News -8pm
30-Nov-13	Capital 95.8	New attractions at Singapore Botanic Gardens from Saturday	News -1pm
30-Nov-13	Warna 94.2FM	New attractions at Singapore Botanic Gardens from Saturday	News -5pm
30-Nov-13	Oli 96.8FM	New attractions at Singapore Botanic Gardens from Saturday	News -10am
30-Nov-13	Today Online	Heritage museum, eco-gallery open at Botanic Gardens	Online
30-Nov-13	Xinmsn	New attractions for Botanic Gardens	Online
30-Nov-13	Xinmsn	New attractions at Singapore Botanic Gardens from Saturday	Online
30-Nov-13	Channel NewsAsia Online	New attractions at Singapore Botanic Gardens from Saturday	Online
30-Nov-13	Today	Heritage museum, eco-gallery open at Botanic Gardens	Singapore /16
30-Nov-13	Lianhe Zaobao	First zero energy building in Singapore built in Singapore Botanic Gardens	Font Page/01
30-Nov-13	Lianhe Zaobao	Three destination parks to be completed over three years from 2015	Singapore /10
01-Dec-13	The Sunday Times	A bigger Botanic Gardens in 2016	Top news/ 02, 03
01-Dec-13	The Sunday Times	S'pore to retain green spaces as city grows	Top news /03
01-Dec-13	Tamil Murasu	PM Lee gives assurance that S'pore will be a green environment	News/02
01-Dec-13	The New Paper	There will be green spaces all over the city: PM Lee	Snapshot /06
01-Dec-13	Berita Minggu	Tracing more than 150 years of Singapore Botanic Gardens' history	Local/03

APPENDIX B MANAGEMENT PLAN



# SINGAPORE BOTANIC GARDENS

## Candidate World Heritage Site

Management Plan (Appendix B to the Nomination Dossier)









# SINGAPORE BOTANIC GARDENS

Candidate World Heritage Site

Management Plan (Appendix B to the Nomination Dossier)



#### FOREWORD

I am pleased to present the Site Management Plan for the Singapore Botanic Gardens candidate World Heritage Site.

The Site Management Plan sets out effective mechanisms to ensure the authenticity and integrity of the Singapore Botanic Gardens. The Management Plan identifies ways in which the Gardens' Outstanding Universal Values may be vulnerable to change and also opportunities for how they can be enhanced and used sustainably. This includes guidelines on the long-term use and conservation of the Gardens, as well as an overarching framework for coordinated management of the Gardens across all the agencies and stakeholders involved in the protection of the site.

The Singapore Government is committed to managing the Singapore Botanic Gardens for its historical and heritage values, and will ensure that the policies outlined within the Management Plan are material considerations in future developmental decisions for the Gardens. This Management Plan is an important framework for ensuring that the rich history of the Gardens remains well preserved for the enjoyment of future generations. As the government's statutory boards leading Singapore's efforts to inscribe the Singapore Botanic Gardens on the World Heritage List, we, the National Heritage Board and the National Parks Board, wish to express our deep appreciation to the following people and agencies who have worked hard to consult on and develop the Management Plan: Urban Redevelopment Authority; Ministry of Culture, Community and Youth; Ministry of Education; Ministry of Foreign Affairs; local members of ICOMOS (International Council on Monuments and Sites); Singapore Gardening Society; Singapore Heritage Society and the Nature Society of Singapore. We will continue to work closely together on the implementation of the Site Management Plan to protect this much-loved site.

ROSA DANIEL Chief Executive Officer, National Heritage Board

POON HONG YUEN Chief Executive Officer, National Parks Board



#### EXECUTIVE SUMMARY

A nomination for inscription of the Singapore Botanic Gardens on the UNESCO World Heritage List was submitted by the Singapore Government in 2014 for consideration by UNESCO in 2015. This document is the Management Plan for the Singapore Botanic Gardens Candidate World Heritage Site (WHS). It fulfils UNESCO's requirement (as set out in paragraph 108 of the Operational Guidelines for the Implementation of the World Heritage Convention, July 2013) that 'each nominated property should have an appropriate management plan or other documented management system which must specify how the Outstanding Universal Value of a property should be preserved, preferably through participatory means.'

The Nominated Property, first established in 1859, is located in the south-central part of Singapore, in the densely populated western edge of the city centre. It comprises 49ha of the overall 74ha which make up the Singapore Botanic Gardens. All land within the Nominated Property is within the ownership of the Singapore Government. The management of the property lies with the National Parks Board, a statutory board of the Singapore Government. It contains a range of landscape and built features and living and preserved collections, which, taken as a whole, provides a world-class visitor attraction and important environment for recreation as well as a vital resource to support the Botanic Gardens' scientific and conservation work.

The main purpose of the Management Plan is to maintain the Outstanding Universal Value (OUV) of the proposed WHS, to ensure the effective protection, conservation, presentation and transmission of the WHS to existing and future generations. The Plan sets out an overarching framework for the co-ordinated management and sustainable use of the site over the long-term, which takes account of all the attributes of OUV and the need to conserve and enhance these to sustain the site's OUV. Other values, needs and interest of the WHS are also identified and taken into consideration in setting out the approach to the site's future management.

The Singapore Botanic Gardens is a multi-layered, multi-use and dynamic cultural landscape and has a

range of stakeholders with an interest in its longterm use and management. In accordance with best practice, the Management Plan seeks to recognise and, as far as possible, reconcile the different needs of stakeholders and values associated with the conservation and sustainable use of the property. It also seeks to encourage greater local and international awareness and appreciation of the Nominated Property's OUV.

The Management Plan includes an overall vision for the site, long-term aims looking forward 30 years and policies for around five years. It also includes an action plan setting out priorities and responsibilities for implementation of the Plan's policies.

#### **Structure of the Plan**

## Part One – Background & Significance of the Singapore Botanic Gardens World Heritage Site

- Introduction (Chapter 1.0) sets out the need, status, purpose and structure of the Management Plan.
- Description of the Property (Chapter 2.0) identifies the location, boundary and uses of the property, describes the historical development of the Singapore Botanic Gardens and sets out the current management and policy context.
- Significance of the Property (Chapter 3.0)
   describes the significance of the Singapore
   Botanic Gardens through the identification of its values. This includes the Outstanding Universal
   Value of the property as a World Heritage Site, as well as other national, regional and local values.

#### Part Two – Management Guidance for the Singapore Botanic Gardens World Heritage Site

- Key Management Issues (Chapter 4.0) identifies ways in which the Outstanding Universal Values, authenticity and integrity of the Singapore Botanic Gardens, and its other values, are vulnerable to change, and also opportunities for how they can be enhanced and used sustainably.
- Aims and Policies (Chapter 5.0) sets out an overall vision, long-term aims and policies for

protecting and enhancing the Outstanding Universal Values, authenticity and integrity of the Singapore Botanic Gardens, and its other values, and encouraging sustainable uses - including education, promotion and access.

 Implementation (Chapter 6.0) – presents an action plan setting out priorities and responsibilities for implementation of the policies, and sets out arrangements for monitoring and reviewing the effectiveness of the Management Plan.

#### Vision for the Singapore Botanic Gardens Candidate World Heritage Site

The Singapore Botanic Gardens will continue to be recognised as a tropical botanic garden of international renown. We will care for and safeguard this special place as an iconic world-class garden and flagship park for Singapore, and enhance it as a centre for heritage and botanical excellence. We will also ensure that its special qualities are presented, interpreted and enhanced where necessary so that visitors can better understand and appreciate the site's Outstanding Universal Value and other values.

#### Justification for Inscription

#### **Brief Synthesis**

The Singapore Botanic Gardens, originally laid out in the 1860s, is a green lung in the midst of rapid and extensive urban development. In addition to its botanic excellence today, the continued presence of the Botanic Gardens has provided generations of Singaporeans and visitors alike with a sustained sense of place and anchor to the island's local cultural history.

The Singapore Botanic Gardens is an exceptional example of a 'British tropical colonial botanic garden' which emerged during the 19th century period of global expansion, exploration and colonisation in Southeast Asia. The Botanic Gardens assumed a pre-eminent role in the promotion of economic botany in the Malay Peninsula and Straits Settlements administration during the late 19th century and early 20th century. Today the landscape of the Botanic Gardens bears testimony to the history of British colonial botanic gardens, the 19th century colonial legacy of economic botany and the long lasting history of and unique contribution to the economic, social and scientific developments of the region. In particular, the pioneering work on rubber cultivation and techniques for tapping carried out in the 1880s and 1890s set in place the foundation of the early 20th century rubber boom in Southeast Asia.

The Botanic Gardens has a well–defined cultural landscape which includes a rich variety of historic landscape features that demonstrate clearly its initial establishment as a pleasure garden in the 1860s and its subsequent evolution and continued role as a botanic garden. The extensive living collections include many veteran trees and unusually the site includes a six hectare tract of primary, lowland, equatorial rainforest within its boundaries. An ensemble of historic buildings including colonial style bungalows, built between the 1860s and 1920s for staff residences and administration, contributes to the cultural landscape of the Botanic Gardens.

Since its beginning, the Singapore Botanic Gardens has been a leading centre in plant science, research and conservation in Southeast Asia. Today it is internationally recognised as a leading institution of tropical botany and horticulture and its library and herbarium collections serve as an important reference centre for botanists all over the world. The site represents the cradle of breeding science for orchids in Asia, a hybrid programme having first been initiated in the Botanic Gardens in the 1920s, with formal orchid breeding programmes continuing to the present.

The Botanic Gardens has played an integral role in the social history of Singapore, providing a backdrop for the lives of residents, both past and present and a continual sense of place and identity in an otherwise changing city. It was and continues to be instrumental in the 'greening' and transformation of Singapore into a 'City in a Garden', successfully implementing the former Prime Minister Lee Kuan Yew's vision for this in the 1960s.

The British South and Southeast Asian colonial botanic gardens were preeminent in terms of other colonial botanic gardens, as a direct consequence of their mutually advantageous role as outposts of the Royal Botanic Gardens, Kew. Singapore Botanic Gardens was part of a wide network of over 100 other British botanic gardens, which was many times bigger than that of other colonial empires. All these sites to some degree contributed to 19th century developments in economic crop growing which established this region of Asia as an important economic power. However, Ridley's late 19th/ early 20th century extensive work on perfecting rubber cultivation and extraction, undertaken at the Singapore Botanic Gardens, combined with his relentless promotion of the crop, can be singled out as perhaps the most significant contribution to Malaya becoming the biggest rubber producer in the world and creating an entirely new and booming economy with global influence. As stated by Brockway (1979) ' between the two world wars, Singapore was the rubber capital of the world'.

Other remaining British tropical colonial botanic gardens that have survived fully or in part in South and Southeast Asia include Penang (Malaysia), Peradeniya (Sri Lanka), Calcutta (India) and Hong Kong. Only Peradeniya and Calcutta continue as significant botanic gardens today with a degree of scientific and recreation functions. The combination of Singapore Botanic Gardens' rich and diverse historic cultural landscape; long-established scientific, educational and recreational world-class functions; remarkable contribution to economic and ornamental plant research (particularly in relation to rubber production and orchid hybridisation); high level of authenticity and integrity; role in the greening of Singapore and the shaping of the island's identity; along with the presence of a tract of primary lowland rainforest make it stand out when compared to other similar properties.

Criteria under which Inscription is Proposed (and Justification)

The Singapore Botanic Gardens is proposed for inscription on the World Heritage List under Criteria (ii) and (iv) of the World Heritage Convention.

#### Criterion (ii) – "Exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town planning or landscape design".

The Singapore Botanic Gardens has been a prominent centre for plant research in Southeast Asia since the 19th century. It continues to play a leading role in the interchange of ideas, knowledge and expertise in tropical botany, agricultural economy and horticulture and represents an important reference centre for botanists all over the world. The Botanic Gardens has gained international recognition for starting and maintaining traditions in plantation agriculture, natural history, biodiversity science and conservation in the region and has also played a pivotal role in the greening of Singapore, which influenced town planning in other cities in Southeast Asia.

#### Criterion (iv) – "Be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history".

The Singapore Botanic Gardens is an outstanding example of a British tropical colonial botanic garden and the best preserved of its kind. This cultural landscape demonstrates its different stages of development since 1859 through its layout<sup>1</sup>, extant historic landscape and built features and its uses and functions. The evolution and sustained preservation of the Botanic Gardens reflects the changing shift in attitudes regarding the role and functions of botanic gardens worldwide and throughout Southeast Asia. The assemblage of historic landscape features and buildings and conserved lowland primary rainforest in combination, richly illustrate the development and mixed role of the Botanic Gardens during the



<sup>1</sup> The layout has left the unusual legacy of the English Landscape movement in a tropical environment.

period of British colonisation. These, together with more recent interventions since Singapore's independence, which respect the cultural heritage of the Gardens, continue to support the very significant scientific, educational, cultural and recreational role and offer of the Botanic Gardens in the modern citystate of Singapore.

#### **Statement of Integrity**

The Nominated Property includes within its boundary all elements necessary to express its Outstanding Universal Values. Its completeness is represented by the range of landscape features, buildings and structures most closely associated with the Singapore Botanic Gardens as a British colonial botanic garden. The layout and ensemble of landscape, buildings and structures included in the Nominated Property have high integrity, being in good condition and having survived virtually intact. The physical fabric of the property largely has not suffered from adverse effects of developments or neglect, with inappropriate changes controlled through statutory protection and management measures. In addition, late 20th century changes reflect the on-going development of the historic use of the Nominated Property and its role in public education. They do not significantly dilute the cultural landscape, strong sense of place or traditions that endure at the Singapore Botanic Gardens.

#### **Statement of Authenticity**

The key attributes that contribute to the Outstanding Universal Values of the Nominated Property meet the conditions of authenticity. The landscape, buildings and structures within the Nominated Property have high levels of surviving authentic fabric and the spatial planning and layout of the Nominated Property is authentic. Considerable elements of the Nominated Property are either still used in the manner in which they were originally intended, or are used in a manner that is sensitive to their original purpose. **Protection and Management Requirements** 

The Nominated Property is protected by laws of the Singapore Government, namely the Parks and Trees Act and the Planning Act, which provide for a range of statutory conservation designations and development control planning measures that will protect and conserve its attributes of Outstanding Universal Value. The majority of the Gardens is designated as a National Park, and the whole of the Nominated Property is designated as a Conservation Area (which includes a number of Conserved Buildings and Structures) and it is also designated as a Tree Conservation Area. Works affecting these conservation designations are strictly controlled under the relevant legislation. The visual setting of the Nominated Property within the proposed Buffer Zone is protected by stringent controls on the height and form of buildings implemented through the Singapore Master Plan.

All land within the Nominated Property is within the ownership of the State and under the management of NParks. The Singapore Botanic Gardens' current annual operating and staff budget is S\$15 million, with substantial additional funding available to support a variety of infrastructural developments and maintenance works. The Singapore Botanic Gardens employs 125 full-time staff, supported by an active volunteer base. Responsibility for the Gardens' overall management lies with its Director who is assisted by two Senior Deputy Directors and four Deputy Directors. The Management Plan submitted with the Nomination provides an overarching framework for the long-term protection and conservation of the Nominated Property. There are currently no substantial threats to the Outstanding Universal Values of the Nominated Property.

#### Issues and Opportunities Discussed in Section 4.0

i lotecung tile	
<b>Planning and</b>	Policy Context
Issue 1	The need to take into consideration the WHS status of the Singapore Botanic Gardens
	through the land use planning system and development control.
lssue 2	The need to maintain effective application of the development control system.
Setting of the	e Singapore Botanic Gardens
Issue 3	The need to protect the site's setting from inappropriate development.
Conserving th	e Site
Landscape	
Issue 4	The need to conserve and enhance the historic layout, landscape and planting framework.
Issue 5	Understanding the historic development of the landscape.
Issue 6	Conservation of Heritage Trees.
lssue 7	Display of the living plant collection.
Issue 8	Opportunities for contemporary landscape design.
Issue 9	Enhancing the nursery facilities.
Issue 10	Opportunities to enhance the public realm/hard landscape elements.
lssue 11	Training needs.
<b>Built Heritag</b>	e
lssue 12	Deterioration due to climate and pests.
Issue 13	The need for regular inspections and an ongoing maintenance programme.
lssue 14	The need for Building Conservation Plans.
lssue 15	Opportunities for contemporary architecture.
lssue 16	Building infrastructure having to meet 21st century standards and uses.
Nature Conse	ervation
Issue 17	The need to establish a baseline for monitoring biodiversity.
lssue 18	Assessing the effects of visitors on the nature conservation value of the Nominated Property.
lssue 19	Development of a site-wide Biodiversity Conservation Plan.
Issue 19 Issue 20	Development of a site-wide Biodiversity Conservation Plan. The need to conserve the Rainforest.
Issue 19 Issue 20 Issue 21	Development of a site-wide Biodiversity Conservation Plan. The need to conserve the Rainforest. Connectivity and the long-term sustainability of the site's biodiversity.
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Interpretation and Education			
Issue 36	The need for improved interpretation.		
Issue 37	The need to conserve and enhance the site's educational remit.		
Promotion			
Issue 38	The need for promotion/marketing of the WHS.		
Management of the Site			
Issue 39	The Need for regular review and monitoring.		
Issue 40	The need for adequate resources to implement the Management Plan.		
Issue 41	The need for ongoing research.		

#### Aims and Policies set out in Section 5.0

Aim 1: Protec	t the site from activities which might harm the Outstanding Universal Values,
authenticity	and integrity of the Nominated Property, either within the site itself or through the
effects of dev	velopment in its setting, including the buffer zone.
Policy 1a	Development which would impact adversely on the WHS, its Outstanding Universal Values
	or its setting should not be permitted.
Policy 1b	Following inscription, the boundary of the Singapore Botanic Gardens WHS and its buffer
	zone will be reflected on URA's Special and Detailed Control Plan.
Aim 2: Conse	rve and enhance the Outstanding Universal Values, authenticity and integrity of the
site through	implementation of positive conservation measures
Policy 2a	Conserve and enhance the site's historic landscape.
Policy 2b	Conserve and enhance the site's built heritage
Policy 2c	Conserve and enhance the site's nature conservation value in ways that are complementary
	with its Outstanding Universal Values.
Policy 2d	Maintain accreditation to ISO 14001.
Policy 2e	Carry out a study of the possible impacts of climate change and identify appropriate
	adaptation strategies.
Policy 2f	Risk management and counter-disaster preparedness strategies should be kept under
	review and updated as necessary.
Aim 3: Encou	rage sustainable uses of the site that help conserve the Site's Outstanding Universal
Values, authe	enticity and integrity, including scientific research functions and appropriate provision
of education	outreach, promotion and access for visitors.
Policy 3a	Ensure that the site's role as a leading scientific research and conservation centre is
	sustained and where possible enhanced.
Policy 3b	Management of visitors to the site should be exemplary and follow relevant national and
	international guidance on sustainable tourism, supporting the Gardens' role as a leading
	visitor attraction.
Policy 3c	Improve the sense of arrival and orientation.
Policy 3d	Deliver a high quality programme of educational events/exhibitions that are appropriate for
	the site.
Policy 3e	Balance the needs of different user groups.
Policy 3f	Enhance the visitor experience through the provision of new/improved visitor facilities and
	services without compromising the site's Outstanding Universal Values.
Policy 3g	Monitor the physical impact of visitors on the site.
Policy 3h	Encourage visitors to make sustainable choices and informed decisions about how they will
	get to the site.
Policy 3i	Promote community involvement.
Policy 3j	Interpretation of the WHS on and off site will be of a high standard, accurate, accessible and
	consistent and will enhance enjoyment and appreciation of the site's values/significance and
	roles by as wide and varied audience as possible.

Policy 3k	Enhance learning opportunities.
Policy 3l	Widely promote the site's Outstanding Universal Values and other associated values.
Aim 4: Ensure	e that effective governance arrangements are in place that involve stakeholders in the
long-term ma	anagement and monitoring of the site, and in balancing research, conservation, access,
sustainable u	ise, including tourism, and the interests of the local community.
Policy 4a	Ensure a partnership approach to the implementation of the Management Plan.
Policy 4b	Ensure sufficient resources are in place to enable effective management, conservation and
	monitoring of the WHS.
Policy 4c	Ensure regular monitoring of the WHS.
Policy 4d	Undertake research to further supplement understanding of the site's values.
Policy 4a Policy 4b Policy 4c Policy 4d	Ensure a partnership approach to the implementation of the Management Plan. Ensure sufficient resources are in place to enable effective management, conservation and monitoring of the WHS. Ensure regular monitoring of the WHS. Undertake research to further supplement understanding of the site's values.



#### ACKNOWLEDGEMENTS

The Management Plan was prepared by Chris Blandford Associates Ltd (CBA), on behalf of the Singapore Botanic Gardens World Heritage Site Management Committee. The preparation of the Plan was assisted by the Committee, which includes representatives of:

- ICOMOS Singapore Ltd
- Singapore Botanic Gardens volunteers
- The Ministry of Education
- The National Heritage Board
- The National Parks Board
- The National University of Singapore
- The Nature Society Singapore
- The Preservation of Sites and Monuments
- The Singapore Botanic Gardens
- The Singapore Gardening Society
- The Singapore Heritage Society
- The Singapore Institute of Architects
- The Singapore Tourism Board
- The Tanglin Neighbourhood Committee
- The Urban Redevelopment Authority

Thanks are also due to the members of the many organisations approached during the development of the Management Plan and to members of the public who provided comments on the Draft Management Plan.

Particular thanks go to Nigel Taylor, the Director of the Singapore Botanic Gardens, and his team for their ongoing input into the development of this Plan. **CONTENTS** FOREWORD EXECUTIVE SUMMARY ACKNOWLEDGEMENTS

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- iii LIST OF ECOLOGICAL SURVEYS
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# Need for the Plan

World Heritage Sites are places of Outstanding Universal Value, as set out in the Convention Concerning the Protection of the World Cultural and Natural Heritage (the World Heritage Convention) adopted in 1972 by the United Nations Educational, Scientific and Cultural Organisation (UNESCO). As a State Party to the Convention, the Government of Singapore is encouraged to identify, protect, conserve, present and transmit to future generations cultural and natural heritage of Outstanding Universal Value.

The Government of Singapore considers the Singapore Botanic Gardens to be cultural heritage of Outstanding Universal Value and therefore suitable for inscription as a World Heritage Site. The property was included on the Tentative List submitted in December 2012 by the Singapore National Commission for UNESCO. A nomination for inscription of the Singapore Botanic Gardens on the World Heritage List is to be submitted in 2014 for consideration by UNESCO in 2015. The boundaries of the Nominated Property's and its Buffer Zone are shown on **Figure 1**.

UNESCO's Operational Guidelines for the Implementation of the World Heritage Convention (July 2013) require nominated properties to have effective management systems in place specifying how the Outstanding Universal Value, authenticity and integrity of the site is to be maintained. As set out in the Operational Guidelines, an effective management system includes:

- A thorough shared understanding of the property and its significance by all stakeholders.
- A cycle of planning, implementation, monitoring, evaluation and feedback.
- The involvement of partners and stakeholders.
- The allocation of necessary resources.
- Capacity building.
- A transparent description of how the management system functions are discharged.

With respect to the Singapore Botanic Gardens, the Government of Singapore considers that the need for a management system should be met by the preparation of a World Heritage Site Management Plan.

# Status of the Plan

The World Heritage Site Management Plan provides a long-term, advisory policy framework for guiding appropriate uses, alterations, repairs or management that will sustain the Outstanding Universal Values, authenticity and integrity of Singapore Botanic Gardens.

Following the inscription of the Singapore Botanic Gardens on the World Heritage List, the Government of Singapore is committed to ensuring that the property's status as a World Heritage Site (WHS) is appropriately recognised.

# Purpose of the Plan

The main purpose of the Management Plan is to maintain the Outstanding Universal Values of the proposed WHS, to ensure the effective protection, conservation, presentation and transmission of the WHS to existing and future generations. It sets out an over-arching framework for the co-ordinated management and sustainable use of the site over the long-term, which takes account of all the attributes of Outstanding Universal Value and the need to conserve and enhance these to sustain the site's Outstanding Universal Values. Other values, needs and interest of the WHS are also identified and taken into consideration in setting out the approach to the site's future management.

The Singapore Botanic Gardens is a multi-layered, multi-use and dynamic cultural landscape, and has a range of stakeholders with an interest in its longterm use and management. In accordance with best



practice, the Management Plan seeks to recognise and, as far as possible, reconcile the different needs of stakeholders and values associated with the conservation and sustainable use of the property. It also seeks to encourage greater local and international awareness and appreciation of the Nominated Property's Outstanding Universal Values.

The Management Plan includes an overall vision for the site, long-term aims looking forward 30 years and policies for around five years. It also includes an action plan setting out priorities and responsibilities for implementation of the Plan's policies.

# Preparation of the Plan

The Management Plan was prepared by independent consultants (Chris Blandford Associates), who also assisted with the preparation of the Singapore Botanic Gardens World Heritage nomination to UNESCO. The nomination and the Management Plan have been informed by a process of ongoing consultations and dialogue with local stakeholders and the wider public.

The preparation of the Management Plan was overseen by representatives from the Government of Singapore's National Heritage Board (NHB), National Parks Board (NParks), Singapore Botanic Gardens and the Urban Redevelopment Authority (URA).

# Structure of the Plan

# Part One – Background & Significance of the Singapore Botanic Gardens World Heritage Site

- Introduction (Chapter 1.0) sets out the need, status, purpose and structure of the Management Plan.
- Description of the Property (Chapter 2.0) identifies the location, boundary and uses of the property, describes the historical development of the Singapore Botanic Gardens and sets out the current management and policy context.

 Significance of the Property (Chapter 3.0) – describes the significance of the Singapore Botanic Gardens through the identification of its values. This includes the Outstanding Universal Values of the property as a World Heritage Site, as well as other national, regional and local values.

# Part Two – Management Guidance for the Singapore Botanic Gardens World Heritage Site

- Key Management Issues (Chapter 4.0)
   identifies ways in which the Outstanding Universal
   Values, authenticity and integrity of the Singapore
   Botanic Gardens, and its other values, are
   vulnerable to change, and also opportunities for
   how they can be enhanced and used sustainably.
- Aims and Policies (Chapter 5.0) sets out an overall vision, long-term aims and policies for protecting and enhancing the Outstanding Universal Values, authenticity and integrity of the Singapore Botanic Gardens, and its other values, and encouraging sustainable uses
   including education, promotion and access.
- Implementation (Chapter 6.0)
   presents an action plan setting out priorities
   and responsibilities for implementation of
   the policies, and sets out arrangements for
   monitoring and reviewing the effectiveness of
   the Management Plan.

Supporting information is provided in the Appendices.

Palm Valley

# DESCRIPTION OF THE NOMINATED PROPERTY



# General

This chapter identifies the location, boundary and uses of the property, describes the historical development of the Singapore Botanic Gardens and sets out the current management and policy context.

# Location and Boundaries of the Nominated Property

The Nominated Property is located in the south– central part of Singapore (see **Figure 2**), within the compact and densely populated western edge of the city centre. Orchard Road and the Central Business District of the city are located respectively 1.5km and 4km to the south–east of the site. The southern tip of the Central Water Catchment area, which comprises a network of nature reserves/reservoirs, is located approximately 2.5km to the north.

The Nominated Property includes 49 hectares of the total 74 hectares which make up the Singapore Botanic Gardens. The boundary of the Nominated Property in relation to that of the wider Singapore Botanic Gardens is shown on Figure 3. As illustrated on this figure, the northern end of the Singapore Botanic Gardens has been excluded (this includes the Jacob Ballas Children's Garden, the Plant Resource Centre/nursery, Eco Lake and surrounding lawns/gardens, the Trellis Garden and two Mass Rapid Transport [MRT] stations – one of which is still under construction). The Nominated Property also excludes the new Tyersall Learning Forest extension to the Botanic Gardens. The latter and northern zone referred to above have not been included as they do not contain features of historic importance that are not already represented adequately.

The Nominated Property is bounded by Holland Road to the south, Tyersall Avenue/Cluny Park Road to the west, the Botanic Gardens' Bukit Timah Core to the north and the National University of Singapore's (NUS) Faculty of Law/Evans Road and Cluny Road to the east.

### **Description of the Nominated Property**

The Singapore Botanic Gardens, at the heart of the city of Singapore, is the legacy of 150 years of human and scientific achievements. The landscapes of the site represent the evolution of a British tropical colonial botanic garden to a modern and world-class botanic garden, scientific institution and place of conservation and education. Easily accessible to the people of the city and the island as a whole, from its origins to the present day, the Singapore Botanic Gardens has also always provided great pleasure, knowledge and inspiration to many generations of residents, Singaporeans and visitors. The Botanic Gardens is the most visited botanic garden in the world, having welcomed c. 4.4 million visitors in the year 2012/2013. The Chinese proverb 前人栽树, 后人乘凉 (translation: 'An earlier generation plants trees under whose shade later generations rest'), cited by Singapore's current Prime Minister, Lee Hsien Loong, when opening the Singapore Botanic Gardens' new Heritage Museum in November 2013, encapsulates the value and appreciation which Singaporeans attach to the Botanic Gardens and the work of their forefathers and earlier generations of botanists and directors.

The following paragraphs provide a detailed description of the Nominated Property (hereafter also referred to as the site, the Botanic Gardens and the Singapore Botanic Gardens<sup>2</sup>) at the date of nomination and refers to all the significant features of the property and elements that make it culturally significant. In line with Article 1 of the World Heritage Convention, the Nominated Property shall be considered as a cultural heritage site and in accordance with paragraph 47 of the Operational Guidelines for the Implementation of the World Heritage Convention (July 2012) it should also be regarded as a cultural landscape. The Guidelines state that:

<sup>2</sup> It should be noted that the full extent of the Singapore Botanic Gardens is wider than the boundary of the Nominated Property. For the purpose of this document reference to the Singapore Botanic Gardens refers to the extent of the Nominated Property only





15km

Aerial Image  $\ensuremath{\mathbb{C}}$  Microsoft product screen shot reprinted with permission from Microsoft Corporation.

# FIGURE 2 LOCATION

MANAGEMENT PLAN DESCRIPTION OF THE NOMINATED PROPERTY



Cultural landscapes are cultural properties and represent "combined works of nature and of man" designated in Article 1 of the Convention. They are illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal.

# The Singapore Botanic Gardens in the Context of the City

Rapid and continuing urbanisation and development of Singapore since the 1960s has dramatically changed the landscape and townscape character of the island, including the area within which the Singapore Botanic Gardens is located. The Botanic Gardens has however been conserved relatively unchanged. This well-preserved historic landscape (which retains six hectares of primary lowland rainforest), particularly within the context of its high density urban setting, is recognised as forming a special and important component of the city's landscape. It continues to provide Singaporeans and visitors alike with a sustained



Momentous occasions: The Botanic Gardens is popular as a location for marriage proposals



An educational school visit

sense of place and anchor to the island's local cultural history and memories gone by. In addition, it provides a valuable green oasis and essential access to nature for Singaporeans, being the main park within this part of the city. As well as its recreational, educational, research and conservation functions, it also forms a key component of a wider green infrastructure network established across Singapore, which includes over 300 parks, four nature reserves, more than 2,000 hectares of treelined streets and over 200km of park connectors.

The Singapore Botanic Gardens was named *Asia's Best Urban Jungle* by Time Magazine in 2008, Garden of the Year by the Canadian Garden Tourism Council in 2012 and *Asia's Top Park* by online travel site TripAdvisor in 2013.

**Figure 4** indicates the land use context of the site. The land immediately surrounding the Nominated Property consists of:

- Low-rise residential areas to the west/north-west and east/south-east.
- Landscaped gardens/the Eco Lake and two MRT stations (one under construction) immediately to the north (located within the Singapore Botanic Gardens).
- The Tyersall Learning Forest, an area of secondary vegetation to the south–west (which now forms part of the Singapore Botanic Gardens).
- The campus of NUS's Faculty of Law, Lee Kuan Yew's School of Public Policy and sports grounds owned by the Ministry of Education to the north–east.

#### **Topography, Geology and Climatic Conditions**

The Botanic Gardens has an undulating topography being situated on one of a series of north-south ridges and hills that underlie the Tanglin District of the city (see **Figure 5**). Its height varies between 2.2 metres and 33.6 metres above sea level. The topography and steep slopes in some parts of the site has greatly influenced its layout in the different periods of its development. The highest areas rising relatively steeply to over 30 metres above sea level include Bandstand Hill (the historic core of the



FIGURE 4 LAND USE



FIGURE 5 TOPOGRAPHY

MANAGEMENT PLAN DESCRIPTION OF THE NOMINATED PROPERTY Botanic Gardens), the tract of primary rainforest, Burkill Hall (and the National Orchid Garden), and the area now primarily occupied by NUS's Faculty of Law and associated houses (the latter were originally erected as part of the former Raffles College and today form part of the Nominated Property). The rapidly changing topography of the site enhances the constant sense of enclosure (further emphasised by tree cover and vegetation) experienced by visitors walking around the site.

The Botanic Gardens has a uniform underlying geology, the bedrock of which is granite overlain by a substantial thickness of heavy impervious clay. The root systems of trees, apart from some species which have anchoring taproots, largely remain at the surface of the clay and develop their feeding roots in the layer of decomposing leaf litter that accumulates on the forest floor. The same clay is also responsible for the creation of swamp vegetation on slopes of less than 3° and has enabled their easy modification into lakes. The climate in Singapore is tropical with mean daily minimum and maximum temperatures of 23.8° Celsius and 30.7° Celsius respectively. The wettest month is December and the driest February, though variations are large. The average annual precipitation is 2,367mm and relative humidity 84.5%.

#### **Evolution of the Botanic Gardens' Landscape**

The extent/boundary and certain components of the internal layout of the Singapore Botanic Gardens (first established in 1859) have inevitably changed over time. Indeed, botanic gardens are dynamic and living landscapes, where change is not only inevitable and continuous but also integral to their history and ability to remain relevant. The evolution of the Gardens' boundary is illustrated on **Figure 6**.

The key phases of the site's historic landscape development are:

- The 'Pleasure Gardens' of the Agri–Horticultural Society.
- Emergence of the Botanic Gardens.
- Addition of Economic Gardens.

- Impact of Higher Education College Development
- Minor Developments from the mid-1920s to 1960s.
- Spearheading the Garden City Vision.
- Modern Botanic Garden and Key Tourist Destination.

The 'Pleasure Gardens' of the Agri–Horticultural Society

In 1859 an Agri–Horticultural Society was granted c.22 hectares of land by the colonial administration to establish gardens in the Tanglin area. Under the Society's instruction, the land (partly covered by secondary vegetation) was developed into pleasure gardens for the Society's subscribers by Lawrence Niven, a Scottish born and trained gardener and local nutmeg plantation manager. By 1870, Niven had transformed the land into an attractive landscape laid out in the English Landscape Style, complete with curving paths, a lake, flower beds, a band parade area and a conserved six hectare tract of virgin rainforest. The Botanic Gardens however had little, if any, scientific input at this point in time. In 1866 it was extended by c.12 hectares to the west and north-west. A grand classic black and white bungalow (today known as Burkill Hall) as well as Swan Lake were both created on this newly acquired land. Overall, the Botanic Gardens' layout, as developed by Niven, largely survives intact today.



Tanglin Gate, main historical entrance since the site's establishment (gate posts dated c.1890)







Extent between the early 1920s and 1985





Extent between 1986 and 2003







Extent between 1879 and the early 1920s



Extent between 2004 and 2005

MANAGEMENT PLAN DESCRIPTION OF THE NOMINATED PROPERTY

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**Emergence of the Botanic Gardens** 

In 1874, the ownership and management of the Singapore Botanic Gardens was taken over by the British colonial Government, the Agri–Horticultural Society having run into serious financial difficulties. The Botanic Gardens was soon after transformed into a typical colonial botanical establishment and working botanic gardens, superintended by a qualified gardener-botanist, James Murton, appointed upon the recommendation of the Royal Botanic Gardens, Kew. Under Murton's supervision a library and herbarium were established, a wide array of new plant specimens introduced (including many trees to the south and the first economic garden to the north-west) and the Botanic Gardens' role in economic botany developed. The Botanic Gardens contained a significant zoological collection between 1875 and 1878, which was thereafter much reduced and eventually removed from the Botanic Gardens in 1905. Palm Valley and The Dell were first established in 1879 and 1882 respectively.

### **Addition of Economic Gardens**

In 1879, c.41 hectares of 'Military Reserve' land, located immediately adjacent to the Botanic Gardens' northern boundary, were annexed to the Botanic Gardens and developed into an economic/ experimental crops' area (known as the Economic Gardens). The Botanic Gardens was at its largest, encompassing c.75 hectares of land. Cantley and



subsequent Directors continued to develop this aspect of the Botanic Gardens' role until the 1920s when the majority of the Economic Gardens were redeveloped into Singapore's first higher education college. Extant buildings/structures constructed between 1880 and the early 1920s include Ridley Hall (1882), E.J.H. Corner House (1910), House 6 (the Field Assistant's House, 1919) and Holttum Hall (1921). Superintendent Nathaniel Cantley (1880– 87) developed the Potting Yard nursery to supply trees for city parks and forest reserves in c.1882–84.

# Impact of Higher Education College Development

In a bid to conserve some of the Economic Gardens' most valuable collections, a number of plants were moved to the Botanic Gardens' historic core between 1918 and the mid–1920s. Following the loss of most of the Economic Gardens, the Botanic Gardens shrank back in size to c.40 hectares. Extant buildings/structures associated with the former Raffles College include Houses 1–5 (1924–28), the Garage (1924–28) and Raffles Hall (now known as Raffles Building, dated 1958). Approximately 13 hectares of land, which had formed part of the Economic Gardens, was eventually returned to the Botanic Gardens in 1986 and a further 12 hectares in 2004/05.

# Minor Developments from the mid- 1920s to 1960s

Only relatively minor landscape developments took place between the mid–1920s and 1960s. These included, for example, the creation of an Orchid Enclosure (where the Ginger Garden now stands) and the redevelopment of a former Rose Garden<sup>3</sup> in 1929 into the Sundial Garden. An active orchid hybridisation programme was started in the late 1920s and the now iconic bandstand erected in 1930.

#### **Spearheading the Garden City Vision**

Between the early 1960s and late 1980s the Botanic Gardens revised its mission and focus from a

Holttum Hall, 1921

<sup>3</sup> Originally developed by Cantley in 1882 on the site of Murton's previous orchid/plant house

largely research–oriented organisation to one that would spearhead and be the driving force behind Singapore's 'Garden City' vision – this, in a sense, was similar to the Botanic Gardens' role in the 1880s when they assumed the role of propagating trees for planting in Singapore's streets and parks. Taxonomic research was temporarily de–emphasised during this period and the Botanic Gardens' expertise and resources redirected to support the Garden City movement. Parts of the Botanic Gardens were turned into nurseries and a School of Ornamental Horticulture was opened in Burkill Hall.

A number of new features, such as a Japanese Garden and miniature waterfall, were added to the Botanic Gardens during the 1970s but, with the exception of Symphony Lake, these were later removed (when the Botanic Gardens underwent a major programme of works in line with NParks' Masterplan, unveiled in 1989).

Modern Botanic Garden and Key Tourist Destination

A 30-year masterplan for the Botanic Gardens was unveiled by NParks in 1989, one year after the appointment of Dr Kiat W. Tan as its new Director. It enabled his new vision for the site to be articulated through a range of proposals grouped according to three core areas (the Bukit Timah, Central and Tanglin Cores) and delivered in three phases. Excellence in botanical research and conservation, education programmes and the preservation of the site's heritage features all underpinned the Masterplan. Under Dr Tan's directorship the Botanic Gardens' regained its status as a premier institution for botanical and horticultural research, whilst providing a key tourist destination and flagship park.



**Evolution Garden** 

Extant works that were carried out within the Nominated Property as part of the masterplan include the creation of the National Orchid Garden (1995), Visitor Centre/NParks' Headquarters (1998), Ginger Garden (2001), Evolution Garden (2005) and Healing Garden (2011). The scientific collections and facilities were also enhanced through the construction of the Botany Centre (2006), which houses the herbarium, library and various laboratories. Under Nigel Taylor's directorship works have included the creation of the Fragrant Garden (2013) and Heritage Museum (2013). The development of the Tyersall Learning Forest on approximately nine hectares of land added to the Botanic Gardens' south-western boundary in 2006, is expected to be completed by 2015.

By the late 1980s, the Botanic Gardens' activities relating to the greening of the island had been substantially realised and remaining activities redistributed to other new branches of what subsequently became the National Parks Board (NParks).

#### **Existing Landscape of the Botanic Gardens**

**Overall Character of the Landscape** 

The Botanic Gardens has a range of landscape features, living collections, themed gardens and spaces, which, taken as a whole, provides a worldclass visitor attraction and important environment for recreation as well as a vital resource to support the Botanic Gardens' scientific research. The locations of the Botanic Gardens' primary landscape features are shown on **Figure 7**.

The existing landscape of the Botanic Gardens gives visitors and users the overall impression of a lush tropical garden. A rich assemblage of planting (the predominant land cover) provides an intense diversity of green tones and textures with exotic splashes of colour for the observer, both in the wider landscape and in more close examination of the planting.

The extensive existing tree cover and thick vegetation along most of the boundaries of the Botanic Gardens provide a strong sense of enclosure, insulation and relief, from the surrounding urban areas. There are therefore only intermittent views of surrounding urban development and high-rise buildings



FIGURE 7 LANDSCAPE FEATURES

(see **Figure 8**). Within the site the complex combination of the mature tree cover and plant collections, as well as the pronounced and changing landform, generally limits the opportunity for an overview of the Gardens. However, a number of key internal view corridors within the site, from higher ground, provide vantage points and a local sense of openness in some areas as well as orientation for visitors. These more open areas include the lawns above Swan Lake (in the historic Tanglin Core), Palm Valley (in the Central Core) and the less mature landscape of the Bukit Timah Core in the north of the site (see **Figure 8**).

The undulating topography, distribution of diverse vegetation, historic features, a limited number of structures and buildings, man-made lakes, several display gardens and view corridors all combine to create in detail the distinctive character of the many different parts of the Botanic Gardens that give it its sense of place and history. Figure 9 defines these different 'character areas' (i.e. areas or zones that have a relatively uniform and distinctive visual character in terms of landform, vegetation, features and experience. They are described in detail in **Appendix i. Figure 9** defines all the character areas that form part of the Botanic Gardens even though some of these are excluded from the Nominated Property. They are included here for completeness since they all contribute to the overall character and history of the Botanic Gardens.

#### **Botanic Gardens Core Zones**

NParks' 1980s masterplan for the Botanic Gardens acknowledged the large scale of the site and the long walking distance needed for visiting both ends of it. It also recognised the landscape diversity and multi-faceted character of different parts of the site together with the wide range of user types, including the local community, schools, tours, researchers, exercise groups and tourists. In providing for the latter in particular, the masterplan proposed and ultimately implemented improvements within the framework of three 'core zones', which now include a fourth one - the recently added Tyersall Learning Forest zone (learning zone). Today, each of the core zones still broadly provide access, amenities and facilities for different user groups and include in detail a range of different landscapes of varying character.

Figure 9 therefore indicates the zones as follows:

- Tanglin Core historic zone.
- Central Core tourism/administration zone.
- Bukit Timah Core education/learning zone.
- Tyersall Learning Forest Core education/ learning zone.

In reality there is inevitably some overlap in zone management, functions, uses and character but the zones remain a useful way to understand and describe the complex existing landscape of the site at the broad level. It is important to note that the extant historic features (see **Figure 11**) that are the heritage attributes of the Nominated Property, whilst concentrated in the Tanglin Core, are also represented in all the other core zones, with the exception of the Tyersall Forest zone.

### **Tanglin Core Zone**

This zone was the approximate site of the original pleasure gardens/Botanic Gardens and includes the Tanglin Gate (current gates dated 2006), the main historical entrance to the Gardens (originally a road entrance but now restricted to pedestrians). A new MRT station is planned opposite this gate. Throughout the zone the historic landscape and layout remains clearly evident. Niven's paths, ring roads, sweeping lawns and Swan Lake (1860s) still reflect his response to the topography and the influence of the English Landscape Style of the time.

**Display gardens** (the 1980s Vanda 'Miss Joaquim' display, 2004 Sun Garden, 2005 Bonsai Garden and 1929 Sundial Garden) and a frangipani collection (to the east, dated 1920s) have been laid out on the gently sloping sides of Bandstand Hill (Character Area 5), on the top of which sits the decorative white painted Bandstand (1930), which is the focal but secluded point among the veteran tree canopies ad lawns. **Bandstand Hill**, which formed part of the 1860s design of the then pleasure gardens, commands the highest point in the original area of the Nominated Property. The layouts of the Sundial Garden, Sun garden and Bonsai collections all contrast with the more informal landscape surrounding them.



FIGURE 8 VIEWS



MANAGEMENT PLAN DESCRIPTION OF THE NOMINATED PROPERTY



Bandstand Hill



Swan Lake and surrounding lawns



The Botany Centre



Ginger Garden

**Swan Lake** (Character Area 1) nestles at the foot of sloping lawns peppered with a wide variety of specimen and veteran trees. Although tropical in appearance, the lake setting reflects its historic character, which was intended to emulate British pleasure gardens/public parks, with a wide promenade following a large water body and scattered trees set within mown grass. The Marsh Garden, laid out in 1969, is located to the south and incorporates the remnants of a rhinoceros wallow and alligator ponds present in the Botanic Gardens during the late 19th century, when the Botanic Gardens contained such zoological collections.

The **Ginger Garden** (Character Area 6) is filled with lush tropical planting showcasing over 550 different types of gingers and species in the related families of the heliconias, bird–of–paradise, bananas and arrowroot. The Halia restaurant complex, opened in April 2001, occupies the northern end of this Ginger Garden and serves some of the visitors going to the National Orchid Garden from the coach drop off.

The water supply for Swan Lake originates from the Tyersall Learning Forest, entering the site in the area known as The Dell, located by the Swan Lake's northern extremity. First developed as a fernery in the early 1880s, it has retained its distinctive character. The sheltered, humid environment favours certain unusual plants, such as *Monophyllaea horsfieldii*, though it does not have a taxonomic collections focus. There is an abundance of tall Dracaena along the various paths and a number of large and climbing Araceae. Attractive ferns and fern allies can be found in the shadiest spots.

The **Botany Centre** and Green Pavilion (Character Area 3), which were built in 2006, feature Singapore's first pitched green roof and accommodate research facilities and the visitor information centre for arrivals at the Tanglin Gate or Botany Centre itself. An imposing veteran tree, *Callophyllum inophyllum*, which influenced the layout of the Botany Centre, stands tall at its centre. A large lawn slopes southwards to the west of the Centre, with the Green Gallery (2013) and Holttum Hall (1921, today housing the Heritage Museum) on the crest of the slope. Ridley Hall (1882) is located immediately to the north of the Botany Centre. The administrative/research centre of the Botanic Gardens has been located in this part of the Botanic Gardens since the late 19th century. The **Potting Yard** area (dating back to the 1880s), **Fernery Garden** (1980), **Aroid Garden** (1999) and Plant House Garden (first established in 1882 and redesigned in the 1950s) are located at the foot of an east facing slope enclosed in dense vegetation, close to Cluny Road (Character Area 4).

The shady **Plant House Garden** is more symmetrical and formal in appearance/design than most of the rest of the Botanic Gardens (with the exception of the Sundial Garden). It originally contained a large rectangular 'plant/exhibition house' (completed in 1882 and roofed in 1885) erected to accommodate public flower shows and displays of potted plants and annuals (some of which were for sale). It now comprises a grass quadrangle surrounded by pergolas, with a central water lily pond (completed 1958).



#### The Plant House

North of Bandstand Hill, a raised boardwalk leads visitors through a tract of dense and tall **primary rainforest**. Only limited glimpses of the sky can be achieved through small openings in the canopy of the mature forest trees. A total of 300 tree species have been recorded in the Rainforest by the Botanic Gardens' scientists, but many of these



Rainforest

#### **Central Core Zone**

Once part of the Economic Gardens, this zone now includes primary tourist attractions - **Visitor Welcome Centre Plaza/Palm Court** and amenity facilities, closely related to a parking and drop-off zone (at the Nassim Gate on Cluny Road); NParks' headquarters buildings; the National Orchid Gardens and the historic Palm Valley. Most of this area was redeveloped during the 90s following the 1980's masterplan. Key veteran trees, other heritage features and buildings were carefully retained.

**E.J.H. Corner House**, a traditional Black and White style bungalow completed in 1910, dominates a small grass hill to the west. It is set among lush tropical planting and includes a small domestic scale garden immediately adjacent to the house. A diverse collection of palms contiguous with those of the nearby Palm Valley is located on the south side of the house.

Palm Valley (Character Area 8), planted from 1879 (where an Economic Garden developed under Murton's superintendence once stood), stretches northwards from Orchid Plaza, gently sloping down to Symphony Lake. This large expanse of grass, with multiple scattered mature palms of varying sizes (c.220 species represented) and other tree species, is nestled in a shallow valley between the Rainforest and the National Orchid Garden (whose eastern side once included part of the original extent of Palm Valley). While being more open in character than other parts of the Botanic Gardens, the many palms and topography still limit full panoramic views. Symphony Lake dominates the northern end of this character area, with its iconic stage (the Shaw Symphony Stage, built in 2005 to replace an earlier stage erected in 1995) providing a focal point in views along the valley. An arrow (installed in 1974-76) emerges from the lake, pointing towards Greenwich, London. This marks the location of a temporary station for the observation of terrestrial magnetism set up in the Gardens in 1914. Broad



Palm Court



Symphony Lake



Palm Valley

views to the south are afforded from the Viewing Terrace. A series of beds located along Heliconia Walk (to the east, dated 1998) showcase the larger growing and more spectacular species of this genus. This strengthens the lush tropical character of Palm Valley.

The National Orchid Garden (Character Area 9), which represents the largest permanent display of orchids in the world, was designed to showcase the products of the Botanic Gardens' orchid breeding programme.. It was completed in 1995 and is sited on the side of the hill upon which Burkill Hall (1868), a black and white plantation style bungalow is located. The winding paths of the orchid gardens lead visitors through this secluded and lush landscape showcasing a tapestry of orchid blooms of all shapes, shades and sizes. The misthouse (1995), bromeliad enclosure (1995) and cool house (2004) provide further specialist tropical display gardens within the National Orchid Garden. The latter houses an artificially controlled montane tropical cloud forest display with trees and rocks draped with orchids and carnivorous plants. The Orchid Plaza at the entrance to the National Orchid Garden provides a key meeting place, overlooking Palm Valley and providing access into the National Orchid Garden to the west and Ginger Garden to the south.

A small semi–wild remnant of freshwater swamp (where water runs through throughout the year), the **Orchid Nursery** and mature trees are located to the north. The latter are mostly assumed to have been transplanted from the former Economic Gardens. Indeed, from 1918 until the early 1920s a number of valuable fruit and timber species were transplanted from the Economic Gardens, which were expected to be lost. Transplanted trees included durian,



Orchid Garden

tamarind, *Diospyros blancoi*, mahoganies (African and American), *Erythrophleum guineense* and *Sterculia foetida*. These are now the largest examples of these species in the Botanic Gardens and will be made accessible to the public after the National Orchid Garden undergoes refurbishment during 2014–2018.

The Raffles Building (Character Area 11) completed in 1958 and adjacent carpark/food and beverage facility dominate the north-east corner of this zone.



**Raffles Building** 

#### **Bukit Timah Core Zone**

This zone includes the redevelopment of the old Economic Gardens and later the former Raffles College Grounds. Most parts of the zone have relatively recently been recreated as a family landscape for the participation and demonstration of active living and learning through the appreciation of themed plant areas, speciality gardens and play. The zone has public access with parking at the Cluny Park Gate or via the existing MRT Station at the junction of Cluny Road and Bukit Timah Road. Another MRT station for a different MRT line is also under construction along the northern boundary of this zone. The Botanic Gardens' plant resource centre (1995, located outside the boundary of the Nominated Property) for rare plant propagation and acclimatisation, staff training, conservation and education is also located on the northern boundary.

The **Eco Lake** and its surroundings (Character Area 15) have a gently undulating topography, with small grass man–made mounds topped with wooden

shelters overlooking the Eco Lake. It is generally open with views possible across it and to high rise buildings located beyond the site boundary. The Eco Lake, a naturalistic lake with a shingle shore and swamp plants along its margins, dominates the area. A number of plant collections/display gardens (fruit trees, spices, bamboo/reflexology, trellis garden and foliage garden) are dotted around the lake providing variety and ornamental interest. Planting here is generally not yet fully mature.

The **Jacob Ballas Children's Garden** (Character Area 16) was designed and planted from 2004 to 2007 to provide a unique discovery and learning experience in a garden setting for children of up to 12 years of age. Set in woodland it includes interactive play equipment, indoor and outdoor living classrooms, hands-on gardens, sensory garden and maze. A reception centre and car park are located to the east of the area.

The **Evolution Garden** (Character Area 13) was laid out in 2005 on a small open hill, once the site of the Economic Gardens' worker housing. It is visually enclosed by dense tree planting. A winding path takes the visitor on a journey revealing different epochs of time and exhibits the evolution of plant life. Specimens, outcrops of rocks, large boulders and fossils (some real and some artificial) border both sides of the main path spiralling to the base of the hill, giving it a distinctive character. Its south–western and eastern edges contain older plantings of timber trees.

Completed as a new speciality garden in 2011, the Healing Garden (Character Area 12) replaced college land bearing derelict university outbuildings, a few large trees (retained) and some smaller trees, shrubs and lawn. The Healing Garden is located adjacent to the old university houses and is laid out over sloping and terraced ground facing south-east. A complex of winding paths leads the visitors through generally new plantings (which includes highly floriferous herbaceous species) interspersed with tall tree specimens (including veteran trees such as Palaquium obovatum, planted by Ridley in the then Economic Gardens) which give it a distinctive character. 500 species of plants used for traditional medicine in Southeast Asia are laid out in the shape of the human body, the plantings corresponding to those body areas the plants are used to treat. This garden surrounds the



Eco Lake



Jacob Ballas Childrens' Garden



Evolution Garden

former Economic Gardens' historic Field Assistant's House (**House 6**, completed in 1919) and includes mature oil palms dating from c.1920, likely to have been planted as sources of seed for the nascent plantation industry at the time.

Five houses and their setting (Character Area 14), originally constructed between 1924 and 1928 for the **former Raffles College**, are located along the edge of a hilltop (set back against the Botanic Garden's boundary), which slopes down steeply to the west. This part of the zone, unlike the younger planting to the north, contains numerous mature trees (including old tembusu trees and palms dating back to the 1920s). The Garage (built sometime 1924 and 1928) is located at the foot of the hill below the five houses, with old nutmeg and durian trees in between. The Fragrant Garden completed in 2013 (replacing derelict university out-buildings) wraps around House 5 and contains new planting including diverse shrubs and herbs with sweetsmelling flowers. Chinese tombs (1842-81) set within an open grass lawn with scattered shrubs and trees are located to the north-east of the zone.



Steep slopes below Old College Houses



Healing Garden



Fragrant Garden

#### **Tyersall Learning Forest Core Zone**

This whole zone comprises century-old dense secondary forest overgrown with laurel, Albizia and towering tembusu trees, some of which were planted in 1862. Vegetation currently blocks views in and out. Recently added as an extension to the Botanic Gardens, this zone will be developed into a 'learning forest'. This will involve the conservation of existing biodiversity, curation of botanical collections, establishment of better connectivity with the Rainforest, repositioning of the existing Tyersall Avenue, restructuring of visitor access to the National Orchid Garden/Ginger Garden, creation of fresh water swamp forest and extension of the National Orchid Garden nursery. It is anticipated that this project will be completed by the end of 2015.



Tyersall Forest

#### Trees

Trees are an important component of the Nominated Property, contributing strongly to its character and overall structure. The site contains a wide variety of trees, of varying ages, planted for scientific/botanical research, conservation and/ or horticultural/aesthetic purposes. A number of trees are over 100 years old and some pre-date the site's creation. 44 trees have been designated as Heritage Trees (qualifying criteria include: a girth of more than 5 metres, rarity of species and historical significance).

#### **Buildings and Structures in the Landscape**

**Historic Buildings in the Botanic Gardens** 

Many of the historic buildings of the Singapore Botanic Gardens reflect a tradition of providing housing for officials and administrators during the colonial era. While Burkill Hall and E.J.H. Corner House were constructed as residences for the Botanic Gardens' Directors and Assistants, Holttum Hall and Ridley Hall were constructed as administrative buildings (offices, laboratories and library/ herbarium). House 6 and the Garage were built in 1919 and 1924–28, serving as the residence of the Field Assistant and parking space for College staff respectively. Houses 1–5, on the other hand, were built between 1924-28 to provide accommodation and offices for academics working in the then newly constructed Raffles College, Singapore's first tertiary college (later these were used as the bases for various university faculties), built on land which had previously formed part of the Botanic Gardens.

Raffles Hall was not built until the 1950s and was intended as a residence for college students. Extant as well as lost historic buildings in the Botanic Gardens were generally modest, wooden and domestic in scale and were often placed in locations deemed convenient for the operational requirements of the site at the time. The early institutional buildings of the Botanic Gardens were also domestic in scale and were built in the styles popularly used for residential buildings of their time.

#### **Built Features**

**Figure 10** indicates the location of all built features in the Singapore Botanic Gardens including those located outside of the boundary of the Nominated Property. The Nominated Property contains a range of built heritage features which are living testaments to the site's different phases of development, the renowned figures that lived in them and also the architectural history of Singapore. The earliest structure to have been erected within the Nominated Property is Burkill Hall (1868) and the most recent City Development Limited (CDL) Green Gallery outside Holttum Hall (2013). The following sections consider all built features located within the Nominated Property.



FIGURE 10 BUILT FEATURES

#### Chinese Graves (Figure 10 – No. 6)

Three historic tombs are located close to the entrance to NUS' Faculty of Law. The oldest tomb is that of a husband and wife buried together in 1842. The tablet was erected by the couple's grandson. A second tomb (with two separate tombstones) is located nearby, where another couple was buried next to one another, by their daughter and grandsons in 1881. Research has revealed that it is likely that the descendants of the tomb dated 1842 and those dated 1881 were related. A third tomb is also located nearby but is missing its tablet. The site where the tombs were erected is likely to have formed part of a series of gambier plantations (as described in J.T. Thompson's 1841–45 working map and D. Coleman's 1836 Map of Singapore). These heritage features are important in their own right but also provide a link to an earlier use and occupants of this part of the Botanic Gardens.

The tombs possibly represent the oldest surviving evidence of the presence of Chinese settlers in the early 19th century. Older burials are present in Bukit Brown, but the 1842 grave found in the Botanic Gardens is the oldest in situ burial since those at Bukit Timah were moved there during the 1940s. Very few intact artefacts pre-dating 1842 survive in Singapore, with the exception of one or two Chinese temples.



Chinese Grave

Buildings of the Former Raffles College (Figure 10 – Nos. 7–12 and 14)

Buildings of the former Raffles College include Houses 1–5 (designated as Conserved Buildings in 2006), the Raffles Building (Hall) (designated as a Conserved Building in 2006) and the Garage (designated as a Conserved Building in 2013).

#### Houses 1–5

Although located within the Botanic Gardens, this group of five houses, positioned in a crescent form around the former Raffles College (which was gazetted as a National Monument in 2009), were built sometime between 1924 and 1928 as part of the staff housing provision for the College (by the 1960s, they had become faculty buildings). The land on which the former college is located originally formed part of the Botanic Gardens' Economic Gardens.

The former Raffles College, officially opened in 1929, was designed by the architects Cyril A. Farey (1988– 1954) and Graham R. Dawbarn (1893–1976), London–based architects who won the commission in an (British) empire–wide architectural competition held in 1922. Local architectural firm Swan and Maclaren supervised the construction. It can be assumed that Farey and Dawbarn were also the architects of Houses 1–5. Both architects have housing schemes that have been published in England.

The five houses (bungalows) are in the then prevalent Arts and Crafts style with some Art Deco elements. The sheer architectonic expression and response to the tropical climate makes them somewhat severe. No single house has survived intact with all of its original features, but the survival of different features in the various houses provides a good understanding of their original layout and character. These blockish double-storey houses, with bays numbered in an octastyle, are modest but well-proportioned, combining characteristics of the traditional Singapore colonial bungalow with features of English domestic houses of the time, such as a prominent central staircase and various decorative finishes. Their design calls for an over-sailing gable-hip roof with extensive eaves, supported on timber shoulders. This in turn creates impressive shadows that fall on the walls and sideshoulders.

Within the context of the Singapore/Straits Settlements bungalow, they share some but not all of the characteristics of the Art Deco bungalow, which is of the same period. Unlike the Art Deco bungalow, these houses have a symmetrical layout and retain the entrance hallway and the separate outhouse/ancillary building. The verandah, however, is no longer visible on the front of the house, but appears only on the first floor facing the rear. All the houses are situated so that their gardens look down onto the Botanic Gardens and are largely secluded by vegetation. On the front the houses look onto what has become a ring road around the college buildings.

Houses 1–5 do not strictly conform to the defined forms of the Singapore/Straits Settlements bungalow but rather represent a unique type that should be considered in the evolutionary history of the bungalow between the Black and White and the Art Deco types. These well–proportioned and well–built domestic residences uniquely combine elements of the traditional bungalow with British Edwardian period features at a key evolutionary stage of the Singapore/Straits Settlements bungalow.

#### House 1 (originally named Kedah House)

House 1 is a two-storey, seven-bay house, with a hipped tiled roof and rendered finish, currently occupied by the offices of the Centre for Urban Greenery and Ecology (CUGE). It comprises a simple porch at its centre with half-round arches to the side, a balcony above and distinct water sprouts to either side. The windows on the front and side elevations are side-hung casements, with a glazed double door with side-lights and overlight onto the balcony. The front door has a lattice pattern with glazing and overlight, with a narrow window to either side, also with the same lattice pattern.

The machine-tiled roof has deep sprocketed eaves supported by timber brackets. On the rear (garden) elevation the central staircase tower is defined by a blank base and high-level casement windows, some with shutters, up to the distinctly pointed eaves. The upper floor windows are a continuous run of casement windows on both sides with louvers to the top pane. On the ground floor on each side a central glazed double door with side-lights and overlight of louvered vents is flanked by a casement window on either side, also with louvered vents at the top. The ancillary building to the southwest shown on a 1950s aerial photograph no longer remains. House 1 is lower than the road level and a large modern canopy has been erected in front of the building. It also now faces a number of modern college buildings.

#### House 2

House 2 is a two-storey, seven-bay house, with a hipped tiled roof and rendered finish, currently occupied by NUS' Faculty of Law's Society Guild House. It comprises a simple porch at its centre with half-round arches to the side, balcony above and distinct water sprouts to either side. The windows on the front and side elevations are side-hung casements with shutters. There is a glazed double door with side-lights and overlight with lattice pattern onto the balcony. The front door has a lattice pattern with glazing and overlight, with a narrow window to either side, also with the same lattice pattern. The machine-tiled roof has deep sprocketed eaves supported by timber brackets. On the rear (garden) elevation the central staircase tower is defined by a blank base and high-level casement windows up to the distinctly pointed eaves.

The upper floor verandah of House 2 remains open with louvered shading to the top part. On the ground floor there are three openings to each side, with louvered vents on one side and with double doors and overlight with the lattice pattern on the other side (possibly added later). A single–storey covered walkway on the north–west with a scalloped concrete trellis and tiled roof connects the property to a single–storey ancillary building. This building is shown on a 1950 aerial photograph and is likely to be part of the original design. House 2 now faces a number of modern college buildings.

#### House 3 (originally named Johore House)

House 3 is a two-storey, seven-bay house, with a hipped tiled roof and rendered finish, currently occupied by NParks Facilities Management Team. It comprises a simple porch at its centre with halfround arches to the side, balcony above and distinct water sprouts to either side. The windows on the front and side elevations are side-hung casements, with a glazed double door with side-lights and overlight onto the balcony. The front door has a lattice pattern with glazing and overlight, with a narrow window to either side, also with the same lattice pattern. The machine-tiled roof has deep sprocketed eaves supported by timber brackets. On the rear (garden) elevation the central staircase tower is defined by a blank base and high-level casement windows up to the distinctly pointed eaves.



House 1



House 2



House 3





The upper floor windows are a continuous run of casement windows on both sides. On the ground floor, on each side, a central glazed double door with side–lights and overlight is flanked by a casement window on either side. A single–storey covered walkway on the east with a scalloped concrete trellis and tiled roof connects the property to a single– storey ancillary building running north south. This building is shown on a 1950 aerial photograph and is likely to be part of the original design. House 3 remains in close proximity to the historic college buildings with which it still forms a discernible group.

#### House 4 (originally named Mansfield Lodge)

House 4 is the slightly larger and grander of the five houses, originally intended for the College President. In the layout of the crescent it is positioned very slightly off centre to the college buildings, shown with a circular driveway with 'in' and 'out' access on a 1950 aerial photo, where all the other houses have a single driveway entrance.

It is a two-storey, seven-bay house, with a hipped tiled roof and rendered finish, currently used as a restaurant. It includes a porch with half-round arches to the side and front, with a glazed verandah above positioned at the centre. The windows on the front and side elevations are side-hung casements, the ground floor ones having shutters. The windows on the first floor verandah are modern with shutters. The front door has a lattice pattern with glazing and overlight, with a narrow window on either side. The machine-tiled roof has deep sprocketed eaves supported by timber brackets. On the rear (garden) elevation the central staircase tower is defined by a blank base and high-level casement windows up to the eaves with louvered shutters. The upper floor windows are a continuous run of casement windows, though much altered or replaced.

A single–storey covered walkway survives on the north–west with a scalloped concrete trellis and tiled roof connecting the property to a single–storey ancillary building. This building is one of two, one on each side, seen on a 1950 aerial photograph. The building to the north–east has since been removed and replaced by a single–storey extension. House 4, being placed on the same axis as the President's house, remains in close proximity to the historic college buildings with which it still forms a discernible group.

#### House 5

House 5 is a two-storey, seven-bay house, with a hipped tiled roof and rendered finish, currently occupied by the Institute of Policy Studies. It comprises a simple porch at its centre with half-round arches to the side, a balcony above and distinct water sprouts to either side. The windows on the front and side elevations are side-hung casements, with a glazed double door with side-lights and overlight onto the balcony. The front door has a lattice pattern with glazing and overlight, with a narrow window to either side, also with the same lattice pattern. The machine-tiled roof has deep sprocketed eaves supported by timber brackets. On the rear (garden) elevation the central staircase tower is defined by a blank base and high level casement windows up to the distinctly pointed eaves. The upper floor windows are a continuous run of casement windows on both sides with shutters. On the ground floor the walls are largely blank with small ventilation openings. A single-storey ancillary building to the southwest shown on a 1950 aerial photograph has been replaced by a new twostorey building. House 5 remains in close proximity to the historic college buildings with which it still forms a discernible group. To its side a new two-storey building has been erected.

#### Raffles Hall (now known as the Raffles Building)

Founded in 1958, Raffles Hall was the first residential hall for students to be established at the Bukit Timah campus, along Evans Road (on the outer edges of the Botanic Gardens). The building is mainly constructed in reinforced concrete with three connecting wings. It is raised off the ground on thin round pilotis, a characteristic architectural feature of the era. The circulation cores are well-ventilated and finished with differentiated patterns across the building which add visual interest to the façades. At one wing, the façade is composed of windows that are angled to give better ventilation and privacy. The windows also have a decorative infill metal panel beneath them, with solid colours that contrast with the walls. Overall, a different variety of materials and textures are used across the different façades of the well-proportioned building, resulting in a pleasing visual composition.

#### The Garage (Figure 10 – No. 7)

The Garage, located by the Foliage Garden, was completed sometime between 1924 and 1928. Used today as storage space, it was originally intended to be used by a number of college professors/high ranking officials to park their vehicles. The Garage is a seven-bay, two-storey service building with a rendered finish and a hipped machine-tiled roof, constructed against a slope. It is well-proportioned and executed in a distinctly Art Deco style, with a modernist aesthetic. The ground floor is formed of a plinth with half-round arched entrances to the garages. The first floor is set back from the front and sides and accessed by a staircase from either side. The windows to the front are casements with overlights. The rear elevation opens onto a small courtyard with the service rooms (kitchen and bathroom) located to either side. The rear elevation is glazed with long strips of casement windows intercepted by structural columns. The ground floor is made up of individual garage spaces with new metal roller doors. The first floor is a single open space with an exposed timber truss roof. It should be noted that the building has some termite damage and a leaking roof, issues which are scheduled to be addressed during 2014.

#### House 6 (Figure 10 – No. 13)

This property was built as the Field Assistant's house and was competed in 1919. It is however unclear how long it was used for this purpose as the Field Assistant position became redundant with the replacement of most of the Economic Gardens with the former Raffles College. It is currently occupied by the National Biodiversity Centre and is largely secluded by vegetation. It consists of a two-storey, five-bay house with a hipped tiled roof and rendered finish. Concrete string courses run beneath and above the windows, extending into shade canopies over the windows. There is a porch at the centre with half-round arches to the side and front, glazed in above. The windows on the front and side elevations are side-hung casements. The front door, up five steps, is a modern replacement with a narrow window to either side. On the rear elevation the central staircase tower projects out. A singlestorey ancillary building to the rear is connected to the house by a covered walkway.

This modest domestic building illustrates a transition from the traditional 19th century colonial bungalow to the later period of Public Works Department housing. It was designated a Conserved Building in 2013.



House 5



Raffles Building



The Garage

# The visitor centre and NParks Headquarters buildings were both constructed in 1998. They are

located close to the Nassim Gate. The visitor centre is a timber structure with shingle roof tiles and decorative motives in coloured glass while the NParks headquarters is a partly concrete, partly timber structure with shingle roof tiles. The latter comprises two floors and a basement carpark.

# E.J.H. Corner House (Figure 10 – No. 17)

Visitor Centre and National Parks Board Headquarters (Figure 10 – Nos. 15 and 16)

This house was built in 1910 and was intended as the residence of the Botanic Gardens' serving Assistant Curators – it is currently used as a restaurant. It is named after Edred John Henry Corner (Assistant Director and its occupant between 1929 and 1946) who specialised in mycology including the collection and study of local fungi. His most famous botanical work, however, is Wayside Trees of Malaya, still the key reference for those interested in the region's trees. During the war Kiyohiko Watanabe (the then assistant of Director Koriba) resided in the house. He is known



Visitor Centre and National Parks Board Headquarters



House 6





E.J.H. Corner House

for having produced over 400 pen and ink drawings of economic plants during his time in Singapore (Tinsley, 2009).

E.J.H. Corner House belongs to a generic group of two-storey Black and White style timber bungalows that government engineers and architects built during the colonial days. It however has its own peculiarity such as the gable-hip roof with front shoulders and attached lean-to-to projections on three sides.

The rendered masonry base with a porte–cochere in the centre of four plain classical style pilasters and pilasters on either side forming the ground floor verandah, supports the first floor timber frame structure with elegantly shaped timber brackets. The half–hipped roof with a gable end to the front has Singapore tiles. The gable end is half–timbered with a simple bargeboard. There are also boarded eaves in the black and white fashion.

The house is organised around interior rooms at the rear, a wide porch at the front and verandah to the side on the ground floor and a large open verandah (lounge verandah) over the porch and to the side on the first floor (which is glassed in). A timber staircase to the side of the entrance porch with square newel posts, half–round handrail and stick balusters connects the two floors. A narrow balcony/verandah at the rear with a second staircase in a similar style connects to the ancillary service block at the rear.

The house was originally located on Cluny Road when this formed the boundary of the Botanic Gardens and was known as 30 Cluny Road. Today it is set among lush vegetation – but it is unclear if this was always the case or the design intention. It is executed to a high level of craftsmanship and is of a climatically sensitive design, with a 'harmonious expression of solid and void on the external façades'. The interior has been restored and updated to accommodate a modern restaurant function, though the main elements of the layout have been retained. It was designated a Conserved Building in May 2008.

#### Symphony Stage (Figure 10 – No. 18)

The Symphony Stage (also known as the Shaw Foundation Symphony Stage) is a prominent feature built on an islet at the southern end of Symphony Lake (an artificial lake located at the northern end of Palm Valley). It plays host to different concerts and performances throughout the year including concerts by the Singapore Symphony Orchestra. The stage's design is inspired by its setting in the Palm Valley. Echoing the organic forms of flowers and leaves, the structure consists of two overlapping petal-like forms growing out of a floral stem. The bigger petal shelters the stage while the smaller one at the rear houses the changing area and support services. The petal-like form of the roof is constructed from free-standing steel ribs and cladded with a titanium zinc roof which allows the complex curvature to be achieved. The ribbed texture of the roof also evokes the venation of flowers and leaves. The stage was completed in 2005, replacing an earlier stage (1995).



Symphony Stage



Cool House

# National Orchid Garden Structures and Nursery (Figure 10 – No. 19–21 and 23)

The National Orchid Garden zone contains the following structures/buildings:

- Entrance Pavilion a one–storey timber pavilion with shingle roof tiles, completed in 1995, forms the ticket office/entrance to the National Orchid Garden and houses a shop (renovation/ remodelling works are planned for 2014–16).
- Tan Hoon Siang misthouse and Yuen–Peng McNeice bromeliad enclosure, both erected in 1995 when the National Orchid Garden was first laid out. Both of these structures are approximately 3m high, have green painted steel frames and green coloured knitted wire mesh. The misthouse has wire mesh walls and ceiling, while the bromeliad structure only has a wire mesh ceiling.
- A metal and glass cool house, accessed via a raised wooden boardwalk with metal railings, which also runs through the cool house itself. Completed in 2004 (as prototypes to test its viability prior to use in other Singaporean gardens such as Gardens by the Bay) it provides a refrigerated space (often filled with mist) which allows a selection of tropical mountain species of various plant families to be grown at the Botanic Gardens.
- The National Orchid Garden's nursery is located immediately adjacent to its northern boundary.
   It includes a small office building and two caged shade houses (renovation/remodelling works are planned for 2014–16).

#### Burkill Hall (Figure 10 – No. 22)

Built in 1868, Burkill Hall was intended as the residence of the serving Manager, Superintendent or Director of the Botanic Gardens. It was named after two of the directors, Isaac Henry Burkill (Director between 1912 and 1925) and Humphrey Morrison Burkill (Director between 1957 and 1969), both of whom resided at the house. The latter was also born there.

Botanic Garden superintendents who lived at Burkill Hall included Laurence Niven (who lived there between 1868 and 1875), followed by James Murton (1875–1880), Nathaniel Cantley (1880/01–1887) and then Henry Ridley (1888–1912) as the first director, all of whom were influential in the introduction of plantation crops to Southeast Asia. Isaac Henry Burkill was the author of the Dictionary of the Economic Products of the Malaya Peninsula (1935), which is to this day one of the most comprehensive texts on the uses of tropical plants. His son Humphrey Morrison Burkill (Director between 1957– 1969) is best known for his research into Malayan seaweeds and steering the Botanic Gardens through tough times in the 1960s. The property was slightly damaged during the Japanese occupation, having been shelled. This fractured the ceiling and left a hole in a corner near the roof (Tinsley, 2009).

Burkill Hall is a two-storey symmetrical Black and White bungalow of the plantation style (Davison, 2010). The square ground floor is made up of  $4 \times$ 4 square classical style pilasters, partly filled in with masonry around the external boundary. A central forward-projecting entrance porch also with stuccoed pilasters and stuccoed Tuscan order columns above it supports the first floor timber frame and open central verandah. Double-height timber columns on a masonry base support the roof structure as well as the narrow verandas to the side. The near pyramidal hipped roof is made of Singapore tiles laid directly onto the timber roof structure. The walls are rendered with the timber frame visible around the edges and the visible gable walls are half-timbered. The verandah railings are timber and the windows are casements with louvered shutters. A covered walkway leads to a two-storey ancillary service building to the rear. The 'sitting-verandas' are an outstanding feature, suspended under the broad-eaves along a longitudinal axis. The arrangement uniquely conveys a 'wind-tunnel effect' via the central hall that opens to bedrooms on both sides.



Burkill Hall

Burkill Hall is not only the oldest surviving building in the Botanic Gardens but also a good and rare example of a plantation style Black and White Straits Settlements bungalow. As such it also exemplifies the climatic functionality of the colonial bungalow with its overhanging eaves and internal air circulation, leading one commentator to describe it as being 'one of Singapore's most environment–friendly buildings' (Powell, 1994). Moreover, it was the home of successive superintendents/directors of the Botanic Gardens, all of whom not only played a key role in the development of the Botanic Gardens, but also contributed significantly to accomplishments in tropical biodiversity research/understanding. It was designated a Conserved Building in May 2008.

#### Halia Restaurant Complex (Figure 10 – No. 24)

The Halia restaurant complex, a one–storey complex including a restaurant and separate function rooms (located either side of the main path through the Ginger Garden) was opened at the northern end of the Ginger Garden in April 2001. These are fairly simple buildings, with a rendered finish and clay roof tiles, and are due to be modified in 2013/14.

# Potting Yard Buildings (Figure 10 – No. 25)

A nursery was opened in 1882 in the area currently known as the potting yard. The old building, constructed in wood, which is now used as an office and storeroom, was re-roofed with a corrugated metal roof in 2007. A number of buildings have been added in the potting yard area including:

- Training facilities added in 1999 for the School of Horticulture, in the form of a temporary shed–like structure. This structure has a modular metal sheet wall finish and corrugated metal roof. It was enhanced with additional classrooms in 2005 by CUGE and is still used by them for conducting training/educational courses.
- An enclosed building with a modular metal sheet wall finish and corrugated metal roof, built in late 1980s. It currently houses the Landscape Technician's office and a storeroom for exhibition materials.
- Two cool houses with air-conditioning and misting for orchids, gingers, Hoya and Gesneriaceae (year of construction currently unknown).



Halia Restaurant complex



Potting yard buildings (the logs are used for chainsaw training)



Brick steps detail



Pergola in the Plant House Garden

- A block of metal sheds built in 2009 to store golf carts.
- A toilet block with a corrugated metal roof finish, built in 2009.
- Two rows of metal sheds built in 2007 to store landscape tools and leaf mulch.

# Pergolas and Brick Steps in the Plant House Garden (Figure 10 – No. 26)

The Plant House Garden (which originally contained a large 'plant/exhibition house' constructed in 1882 and roofed in 1885, to accommodate public flower shows and displays of potted plants and annuals, some of which were for sale), now comprises a grass quadrangle with a central water lily pond (completed 1958). Pergolas draped in plants provide a shaded walkway around all four sides of the quadrangle. The eastern and western pergolas consist of brick pillars supporting cross-beams and a sturdy open lattice. The northern and southern pergolas are made of steel. The raised beds edged with coral limestones are the oldest features of this garden area but it remains unclear whether they are contemporary with the original plant/exhibition house. The original 'plant/exhibition house' structure also included an extension for orchids at its northern extremity (erected in 1889), which is now a fernery. Brick steps, made during World War II by Australian prisoners of war, provide access down to the Plant House Garden.

#### Pergola by Sun Garden (Figure 10 – No. 27)

A pergola consisting of re–used bricks and timber is located close to the Sun Garden, connecting the Upper and Lower Ring roads to the south–west part of Bandstand Hill. Originally erected in 1935, the pergola was rebuilt in 1957.

#### Bandstand (Figure 10 - No. 29)

The Bandstand, which was completed in 1930, is located in a prominent location in one of the earliest parts of the Botanic Gardens. It was erected on the band parade area (the highest point in the southern part of the Botanic Gardens), which was first laid out by Niven during the early 1860s. The parade area and later the Bandstand were used continuously for concerts until the mid–1970s, when they were transferred to the island in Symphony Lake (1976). The Bandstand is octagonal, raised on a brick base and accessed via timber steps. Simple latticework columns support the octagonal slate tiled roof. The lattice pattern is repeated on the balustrades and cornice. Bandstands were a key feature of Victorian British public parks. It is well–executed and has become a 'picturesque' and symbolic feature within the Botanic Gardens and a favourite site for bridal couples to be photographed. It was designated a Conserved Structure in December 2009.

# Sun Garden, Bonsai Garden and Sundial Garden Structures (Figure 10 – Nos. 28, 30 and 31)

The Sun Garden contains a green painted steel structure, erected in 2005, with a glass roof which provides shelter for some of the garden's collections. The Bonsai Garden includes a modern concrete and steel semi–circular shaped structure, which houses some of the bonsai collection. The structure includes a steel and glass roof, which has some openings. It was erected in 2005. A small wooden pergola is located at the top of a short set of steps along the Sundial Garden's eastern boundary.



Bandstand



Sun Garden
### Shelter and Toilet Block (Figure 10 – No. 32)

A modern shelter and toilet block is located close to Holttum Hall. These facilities are in good condition.

### Holttum Hall (Figure 10 – No. 33)

Holttum Hall is a fine example of a colonial bungalow in Singapore. Although 'domestic' in scale, this building, completed in 1921, was intended as an office. It is named after Eric Holttum (appointed Director in 1925) who is best known for developing methods of propagating orchids which allowed the mass production of orchid hybrids. Holttum Hall was his office and, on the upper floor, his orchid laboratory. It ceased to be used as offices/ research laboratories in 2010 and has housed the site's Heritage Museum since 2013. It was designated a Conserved Building in May 2008.

The building is rectangular with a three-bay frontage. It is rare that Edwardian Architecture in Singapore is so clean-cut and trimmed by an elegant stucco work and joinery details. It has a rendered finish with double-height pilasters dividing each bay, the centre bay being wider. Mouldings are located beneath and above the ground and first floor windows. A single-storey pitched roof porch, supported by timber columns on a masonry base, is located in the centre of the hall and is in a vernacular of Arts and Crafts style compared to the more classical features of the building itself. Holttum Hall is the only building in the Botanic Gardens in a more distinctly European style, though still incorporating features such as roof vents and louvered vents over the windows to cope with the tropical climate.

### CDL Green Gallery (Figure 10 – No. 34)

The CDL Green Gallery, located just south of Holttum Hall (where a former herbarium building once stood), is a temporary exhibition centre showcasing botanical and greening–related exhibits, which will be present for at least the next 10 years. It is Singapore's first purpose–built zero–energy gallery and includes for the first time in Singapore, two eco–innovative technologies (a fully complete prefabricated modular system for quick construction and the use of the durable biomaterial Hempcrete). Other sustainable features include green walls, a green roof, solar photovoltaic cladded roof panels and energy efficient



Holttum Hall



Ridley Hall



Green Pavilion



Tanglin Gate (decorated with red banners for National Day)

interior fittings. The Building and Construction Authority (BCA) has accorded this gallery the BCA Green Mark Platinum status (the highest tier for green buildings in Singapore).

### Ridley Hall (Figure 10 – No. 35)

Built in 1881–82, Ridley Hall is one of the oldest properties in the Botanic Gardens and the earliest surviving administrative building. Although originally constructed during Nathaniel Cantley's tenure as Superintendent to house the Herbarium and Library collections, it was later named after the Botanic Gardens' first Director, Henry Nicholas Ridley, who used it as his office and laboratory. Ridley is best known for his extensive work on rubber cultivation – his work having been pivotal to the development and expansion of the Malayan/ Southeast Asian rubber industry. The herbarium/ library collections were rehoused in a new building erected immediately south of where Holttum Hall stands. Today, Ridley Hall serves as a meeting space and the rear part of it as accommodation for visiting scientists and exchange programmes. It was designated a Conserved Building in May 2008.

It consists of two blocks, a Hall itself, set apart by an open lobby and a service wing. The impact comes from a reductive front elevation, via a sunken piazza, adjacent to a new annex wing. Here the facade is flanked by two pylon-like shoulders and leavened by a pair of doors and timber louvers flushed to the underside of the eaves. The scale is unusually intimate, matched by express details, like a ventilator slit justified above the stiles of the central doorways. There is evidence of Chinese joinery details that support the roof structure and broad eaves in the form of chunky top-plate and carved timber brackets. It is a craft form that no longer exists today in Singapore. The construction of the side elevation constitutes an Anglo-Malayan tradition, like a semi-basement, comprised of five semi-elliptical arches. The five window bays correspond with the semi-basement arcade below.

## Botany Centre and Green Pavilion (Figure 10 – Nos. 36 and 37)

The Botany Centre, completed in 2005 and officially opened the following year, was designed around a heritage *Calophyllum* tree and provides a

range of facilities arranged on five floors. The two basement floors contain a carpark, store rooms, a restaurant and mechanical and electrical rooms. A function hall, toilets, laboratories, offices, library and herbarium and mechanical and electrical rooms are located at Level 1, which extends under Holttum Lawn. Level 2 and 3 provide access to offices, laboratories, function/meeting rooms, toilets and a mechanical and electrical room.

The Green Pavilion, located to the south of the main Botany Centre, features Singapore's first pitched green roof. It houses the visitor services desk at ground level (which is open on four sides, the pitched roof supported by concrete pillars) and a restaurant in its basement. There are plans to convert part of the visitor service area into a retail outlet.

### Tanglin Main Gate (Figure 10 – No. 38)

A new aluminium gate, replacing gates dating from the 1980s (which have been reused at the Bukit Timah MRT gateway), was erected in 2006 at the main historical entrance to the Botanic Gardens (located at the junction of Holland, Napier and Cluny Roads). The gate's motif is based on the flowering climber, *Bauhinia kockiana*.

#### Swan Lake Gazebo (Figure 10 – No. 39)

The Swan Lake gazebo, which is believed to date back to the 1850s, originates from Old Admiralty House on Grange Road. It was brought to the Singapore Botanic Gardens in 1969 and has since been re–located a number of times within the Botanic Gardens. This cast iron three–bay by three–bay garden structure is in the Gothic Revival style, with slender columns, decorative brackets and railings. The tiled roof, acroteria and ridge casting decoration formed part of repair works carried out after a tree fell on the gazebo.

Since 2001 the gazebo has been located on the south–east edge of Swan Lake. Although this is a new location, it was typical in parks and gardens of the English Landscape tradition for shelters to be placed on the side of lakes and water features. Its cast iron elements are standard pieces produced at a time when they were commonly used for a variety of functions, including railway stations. It was designated a Conserved Structure in December 2009.

### Historic Gazebo (Figure 10 – No. 40)

A second gazebo/shelter is located to the north–east of Swan Lake. This feature accentuates the 19th century origins of the Botanic Gardens although little is known of its actual history. It is made up of cast iron columns and decorative brackets in the Gothic style. The columns support new rolled steel joists (RSJ) beams to which the brackets are fixed with modern fixings. Its hipped roof is new. Although the cast iron components are original, the structure into which they have been formed with modern RSJs is new. Whether the components originally formed a gazebo–like structure is unknown.

### Sculptures

The Botanic Gardens includes a number of sculptures, named: Girl on a Swing (1984), Girl on a Bicycle (1987), Lady on a Hammock (1989), the Swiss Granite Fountain (1991), Swing Me Mama (1999), Passing of Knowledge (2003), Joy (2005), Flight of Swans (2006), Chopin (2008), Chang Kuda (2011), Conservation with Nature (2011) and the Book Reader (2006). The corner statues in the Sundial Garden were added in 2006.

### Shelters

In addition to the two shelters/gazebos already described, the Botanic Gardens contain 21 shelters, which are predominantly simple wooden shelters. These are peppered across the site as a whole. The shelter south–west of Holttum Hall is made up of three individual concrete rendered shelters with tiled roofs and a toilet block in the same style.



Swan Lake Gazebo



Historic Gazebo



Girl on a Bicycle sculpture



Shelter by Swan Lake

### The Botanic Gardens' Collections

**Relevance of the Collections** 

Since at least the late 19th century, the Botanic Gardens' diverse and comprehensive collections have underpinned its continued role as a leading centre for plant research and conservation in Southeast Asia and key community green space/ visitor attraction. Today, the site is internationally recognised for its importance in relation to tropical botany and horticulture and as a world–class visitor attraction. Its collections are used daily at many different levels, supporting the work of scientists and researchers (employed by the Botanic Gardens and visiting) as well as the site's educational and recreational functions.

The site's Research and Conservation Branch focuses on three core areas: plant systematics research led by the Herbarium Team; orchid breeding and native plant conservation research and development conducted by the Conservation and Molecular Biology Team; and the continuing development of research support capabilities led by the Library of Botany and Horticulture Team. The collections are important research tools which are studied by the Singapore Botanic Gardens' researchers (and other international, regional and local researchers), leading to advancements in the scientific understanding of plant and fungal diversity and the publication of research in scientific journals, conference proceedings, books etc. (42 scientific papers were published by the Botanic Gardens' staff in refereed journals in 2012–13). The living collections are also used for reintroductions to natural and semi-natural habitats as part of the Botanic Gardens' conservation efforts. The most important preserved collections (nomenclatural types) are being image-scanned at high resolution and made available via the Internet for remote access.

The Singapore Botanic Gardens has and continues to run a range of activities/training programmes which contribute to capacity building and technology transfer. Recent examples include:

 2008 and 2010: the Singapore Botanic Gardens, in collaboration with the Royal Botanic Garden Edinburgh, actively supported the French funded Botanical study of Zingiberaceae in Cambodia, Laos and Vietnam by preparing and delivering training workshops.

- 2009: The Singapore Botanic Gardens organised the 1st International Working Group Meeting on the Taxonomy of Convolvulaceae.
- 2010: The Singapore Botanic Gardens, in collaboration with the Flora Malesiana Foundation, organised the 8th International Flora Malesiana Symposium.
- 2010: The Singapore Botanic Gardens hosted a Botanic Gardens Management Training Course for the Southeast Asian region, run by Botanic Gardens Conservation International (BGCI) which at the time had an office in the Botanic Gardens.
- 2012: Two weeks training was provided to five members of staff from the Pha Tad Ke Botanic Garden (Laos) at the Singapore Botanic Gardens. Two scientists from the Singapore Botanic Gardens later visited the Pha Tad Ke Botanic Garden to train local staff in field survey and collection techniques.
- 2012: Two members of staff from the Singapore Botanic Gardens provided training in field survey, collection techniques and living collections to six employees from the Biotechnology and Ecology Institute (Ministry of Science & Technology, Laos) over a six day period.
- 2012: A member of staff from the Singapore Botanic Gardens trained 12 local students/staff in Thailand and Laos over a one week period.
- 2012/2013: Three French horticultural interns trained at the Singapore Botanic Gardens over a period of two months.
- 2013: A member of staff from the Singapore Botanic Gardens trained 57 individuals over six days in Laos on orchid cultivation and breeding.
- 2013: 13 members of staff from the Tambling Tiger Reserve (Sumatra) received two days of training at the Singapore Botanic Gardens. Eight members of staff subsequently received training in Sumatra.

- 2013: The Singapore Botanic Gardens hosted a United Nations Environment Programme (UNEP) Global Strategy for Plant Conservation workshop for ASEAN countries.
- A member of staff from Singapore Botanic
   Gardens provided training on herbarium
   collection management to staff at the Brunei
   Herbarium.

Collaborative work takes place between the Singapore Botanic Gardens and other Gardens/ scientific institutions, which is reflected in the recent Memorandum of Understanding (MoU) on joint botanical surveying signed by NParks and Brunei's Forestry Department. Whilst NParks/the Singapore Botanic Gardens has collaborated with Brunei in the past on occasional field trips, the MoU outlines a more specialised and planned programme for research and training over five years, extendable for a further five years.

The site's educational remit is aligned with the Global Strategy for Plant Conservation. It aims to connect people and plants and to increase public awareness, appreciation and knowledge of plants, nature and environmental conservation through a wide range of quality educational programmes. The Botanic Gardens works closely with the Ministry of Education (MOE) to develop programmes that meet the curriculum needs of schools for subjects such as geography, national education, history, science and social studies. For example, the Jacob Ballas Children's Garden (located outside of the Nominated Property but within the proposed Buffer Zone) and National Orchid Garden (located within the Nominated Property) are recommended sites for field-based learning in the Social Studies Syllabus for Primary 1 and Primary 2 students respectively.

746 educational activities were run at the site between April 2012 and March 2013. The site offers approximately 50 different educational programmes for schools (guided tours, talks and workshops), over 20 for adults and monthly talks by local and international speakers focused on botany, biodiversity and conservation. 89,000 school children visited the Botanic Gardens in 2012/13 (83,000 visited the Royal Botanic Gardens, Kew in that same year), 24,000 of which received programmed educational activities. A further 9,000 adults benefitted from such programmes. Much can also be learned informally at the Botanic Gardens through the interpretation provided across the site. There is an aspiration, for example, that individuals visiting the Healing Garden will become more aware of the fast disappearing knowledge of medicinal plants and their uses. It should be noted that the Botanic Gardens' living collections are used by some tertiary institutions for teaching (e.g. students from the Ngee Ann Polytechnic and National Institute of Education use the living collections for Plant Identification Classes, Certified Practising Horticulturist Course and Certified Arborist Course). University students also make use of the reference collections.

The collections underpin the site's important role as a public recreational space and visitor attraction. Welcoming approximately 4.4 million visitors annually, it is the most visited botanic garden in the world. The Botanic Gardens provides much needed access to nature and open space for many Singaporeans, for whom the natural world is only generally present in the street trees, urban greenery and the city's all–important public parks. Visitors come to the Botanic Gardens for many different reasons including, for example, to exercise, have a stroll, learn about the plant world, see specific horticultural attractions/displays, observe nature, meet friends/family and celebrate a momentous occasion.

The Botanic Gardens is also a venue for the arts (Zadok Ben–David's exhibition in 2012/13 being an example) and musical performances. In addition, the VIP Orchid Naming programme plays a role in bolstering international relations. To date nearly 200 orchid hybrids have been specially bred and named in honour of visiting heads of state and dignitaries from a wide range of countries). These include:

- Rhyncattleanthe Juan Manuel Santos Calderon, named in honour of the President of the Republic of Columbia (2012).
- Dendrobium Tarja Halonen, named in honour of the then President of Finland (2008).
- Dendrobium Angela Merkel, named in honour of the Chancellor of Federal Republic of Germany (2011).

- Vanda Usha, named in honour of the then First Lady of India (2000).
- Renantanda Akihito, named in honour of the Emperor of Japan (1970).
- Dendrobium Karim Massimov, named in honour of the Prime Minister of the Republic of Kazakhstan (2010).
- Dendrobium Roh Moo-Hyun, named in honour of the then First Lady of South Korea (2003).
- Dendrobium Najib Rosmah, named in honour of the Prime Minister and Spouse of Malaysia (2009).
- Ascocenda Benigno S Aquino III, named in honour of the President of the Republic of the Philippines (2011).
- Ascocenda Donald Malgorzata, named in honour of the Prime Minister and Spouse of Poland (2012).
- Rhyncholaeliocattleya Maria Cavaco Silva, named in honour of the First Lady of the Republic of Portugal (2012).
- Dendrobium Sheikh Abdullah, named in honour of the Prime Minister and Minister of Interior of the State of Qatar (2013).
- Dendrobium Recep Tayyip-Emine Erdogan, named in honour of the Prime Minister of the Republic of Turkey and Mrs Emine Erdogan (2014).

 Cahuzacara Hanh Sang, named in honour of the President and Spouse of Vietnam (2011).

The National Orchid Garden, a paid attraction within the Botanic Gardens, receives between 500,000 and 600,000 visitors annually, of which c.90% are foreign tourists.

The Singapore Botanic Gardens is the custodian of three main types of collections (preserved, living/ genetic and documentary/visual), commenced at different points in time for different purposes. A summary of the collections held at the Garden is presented in **Table 1**.

Further information regarding each of the three main types of collections held at the Botanic Gardens is provided in the following sections.



Educational activities



Art in the Gardens (by Zadok Ben-David)

Collection	Location	Size	Nature		
Preserved Collections					
Herbarium	Herbarium/Botany Centre	750,000	Dried pressed plants (general collection Malesia) (includes 8,000 type specimens)		
		24,000	Dried pressed plants (Singapore Botanic Gardens collection)		
Mycology	Herbarium/Botany Centre	6,000	Dried fungi		
Spirit	Herbarium/Botany Centre	6,200	Plants and fungi preserved in alcohol		
Living and Genetic	Resource Collections				
Living	Singapore Botanic Gardens	36,400	Living plants accessions		
Micropropagation	Laboratories/Botany Centre	92,000	Orchid seedlings and plantlets and native and ornamental plantlets		
DNA	Laboratories/Botany Centre	200	Individual DNA aliquots/samples		
<b>Documentary and</b>	Visual Reference Collectio	ns			
Library	Library/Botany Centre	28,000	Books and pamphlets		
		300	Journal titles		
Archive	Library/Botany Centre	214	Published/unpublished maps		
		290	DVDs		
		50	Microfilm		
		100	Microfiche		
		95	Annual Reports		
		_	Other (e.g. unpublished notes/ letters)		
Photographs	Library Archive/Botany Centre	1,307	Photographs of flora and fauna species, Singapore Botanic Gardens, people		
Photographs	Botany Centre/Living Collections database	18,000	High resolution images of the living collections		
Photographs	Herbarium/Botany Centre	5,000	High resolution images of type specimens		
Artwork	Library Archive/Botany Centre	2,000	Paintings and illustrations of the Botanic Gardens and flora/fauna		
Artefacts	Library/Botany Centre	_	Including historic furniture and botanical equipment		

## TABLE 1 COLLECTIONS HELD AT THE SINGAPORE BOTANIC GARDENS

The preserved collections (herbarium, mycology and spirit collections) are located in the herbarium, which is Singapore's major archive for botanical research specimens and associated information. They primarily serve the research needs of the scientific community. Specially prepared sets of herbarium specimens of common plants found in Singapore are available for public referencing in the library but these do not form part of the herbarium collection.



Research

Preserved collections were first started at the Singapore Botanic Gardens by James Murton in 1875. Since 1882, these collections have been housed in a number of different herbarium buildings, the most recent of which being the herbarium within the Botany Centre (international acronym SING), which opened in 2006. The herbarium currently contains 750,000 dried paper mounted plant specimens, of which 8,000 are type specimens (the ultimate points of reference for the correct application of species' names); 6,000 fungal specimens and 6,200 plant/fungi specimens preserved in alcohol. The preserved collections include a comprehensive record of plants grown in the Botanic Gardens over the last 130 years or so.

The collections mainly include material from Thailand, Malaysia, Singapore, Brunei, Indonesia, the Philippines and Papua New Guinea, and adjacent regions, with the most extensive collection from Singapore and Peninsula Malaysia dating from the 1880s. Locally the herbarium provides an identification and advisory service. Internationally, it collaborates with all institutions worldwide that maintain active research programmes for research into the spectacularly rich flora of the tropical and subtropical regions. Current taxonomic and plant systematic specialisation at the herbarium involves studies of plant form and adaptation and useful features for their classification, including modern techniques analysing molecular-based evidence. The taxonomic research programme (revisions and monographs) focuses particularly on the following: the woody flora of Southeast Asia, the Southeast Asian *Bambusinae* alliance; the *Fagraea* complex (Gentianaceae) in Southeast Asia; the Gardenia alliance (Rubiaceae) in Asia-Pacific; Hoya and related Apocynaceae in South and Southeast Asia; Orchids (various studies on Orchidaceae are being conducted, continuing a historically significant attachment to the study of orchid biodiversity and culture at the Singapore Botanic Gardens); and Zingiberales in Asia (with a particular focus on the Indochinese floristic region and genera Curcuma and Zingiber). The systematics research programme focuses particularly on the following: the systematics and evolution of the tribe Merremieae (Convolvulaceae); the phylogeny, polyploidy and evolution of the genome size in economically important gingers especially Curcuma; and the Southeast Asian Bambusinge alliance. Researchers undertake fieldwork and, as mentioned previously, capacity training and joint collaborative work.

Whilst clearer identifications and character assessments of plants depend greatly on detailed morphological studies, their natural relationship and lineages often form an overarching interest at the Singapore Botanic Gardens. Clearer assessments of inheritance or lineage patterns for natural groups of plants are often a useful platform for other sciences and applications, including horticulture and breeding. The aggregated knowledge on the region's flora, especially that of the Malay Peninsula and Borneo, helps inform the study of distribution patterns (including such aspects as species endemism) - the Singapore Botanic Gardens' research expertise thus includes biogeography and related conservation perspectives on plant endemism, rarity and endangerment.

The herbarium is internationally accredited and has significant archival and research value. It is a key component of over a century and a half of botanical field exploration, collection and documentation in Southeast Asia; it was the major starting point, became the primary resource centre and maintains current importance as the lead holdings for the plant biodiversity/floristic archives of the Malay Peninsula (today's Peninsula Malaysia and Singapore); and is central to on–going accomplishments in tropical biodiversity research and inventorying (more specifically within the Malay Peninsula). All herbaria are valuable scientific facilities, but the Singapore Botanic Gardens herbarium can be singled out as having been fundamental to, and still continuing to play a key role in the only well–documented flora in super–rich ever wet Southeast Asia. 572 foreign scientists/ visitors came to the Herbarium between 2008 and June 2013.

The preserved collections have formed the basis for floristic studies over long periods of time by many of the principal researchers in the region (e.g. Flora of the Malay Peninsula by Ridley 1922–25; A Dictionary of Economic Products by Burkill 1935; Orchids of Malaya by Holttum 1953).

# Living (in vivo) and Genetic (in vitro) Resource Collections

The *in vivo* collections at Singapore Botanic Gardens are a remarkable asset and underpin its crucial role as a scientific institution, centre for learning and visitor attraction/amenity space. The Singapore Botanic Gardens is the most visited botanic garden in the world. The in vivo collections include 36,400 living plant accessions which vary in age and origin. These represent 226 plant families, 1,739 genera, 6,544 species and 9,021 taxa. Some accessions, such as Adenanthera malayana (00/7038\*A) are thought to pre-date the Botanic Gardens' establishment in 1859. The Botanic Gardens has a rich collection of palms, water plants and trees as well as specialist collections such as 200 kinds of bromeliads and 250 species of gingers and related families. Its largest collection is of orchids, which number over 1,200 species and about 2,000 hybrids. Alongside the more recent Fragrant Garden (2013) and Evolution Garden (2005), a tract of approximately six hectares of primary rainforest survives in the Botanic Gardens, which includes critically endangered species. The Rainforest was an important source of specimens (nomenclatural types) of newly described plant species from the

Southeast Asian region. The Singapore Botanic Gardens was historically sub-divided into 'Lawns', which defined management areas for the site. The living collections are still managed according to these (see **Appendix ii**).

The in vivo and in vitro collections together support the Botanic Gardens' research and conservation programmes acting as a 'research plant collection' available for staff, students and external colleagues to use in this capacity. Specific groups of plants currently being used for 'active' research projects include, for example *Dipterocarpaceae*, *Myristicaceae*, *Orchidaceae*, *Zingiberales* (especially *Zingiberaceae*), *Apocynaceae* (Hoya) and *Begoniaceae*.



The Ginger Garden

Current *in situ* conservation work focuses on the propagation and reintroduction of orchids and gingers (and their relatives) in Singapore and the reinforcement of rainforest reserves (in Singapore, but also potentially in other parts of the region), with ex situ collections going back in situ. Some of the plants propagated for *in situ* and *ex situ* conservation are grown in vitro. Research on cryo-preservation of orchid seeds and cytological studies for artificial induction of tetraploids is also being carried out. The Botanic Gardens' living collections also form an important nexus for in situ conservation of plants and wildlife as part of the Singapore–wide network of nature reserves and nature parks connected via 'green' corridors (some of which rely on community support stimulated through the Botanic Gardens' outreach programmes).

The Conservation and Molecular Biology Team, which operates the specialised orchid breeding and conservation biotechnology laboratory, is responsible for raising a variety of plants (especially orchids and ferns) which are difficult to propagate (until they can be weaned back to cultivation using conventional nursery techniques outside of the laboratory) and looking after plants precariously cared for under conventional nursery conditions as well as plants that are prone to viral infections or need to be 'cleaned up' from such infections. The Conservation and Molecular Biology Team is also responsible for producing colourful, unique orchids for display in the National Orchid Garden and the Botanic Gardens' programmes. More than 500 hybrids have so far been registered with the International Registration Authority for Orchid Hybrids. The breeding programme focuses on two major groups, dendrobiums and vandaceous orchids. Besides creating new hybrids, selected orchids of superior quality are identified and mass produced through tissue culture techniques (cloning). Molecular biology research is thus far involved with phylogenetic analysis of wild taxa (various families) and parental or lineage analysis for orchid hybrids and forms for which the origins are unclear, including the horticulturally important orchid genera Vanda (sensu lato) and Paphiopedilum. Molecular phylogenetic work is carried out in conjunction with the taxonomic research undertaken at the Herbarium and significant enhancements to the laboratories equipment are taking place (2013/14) in support of such studies. A new development for a seed bank is being initiated, which would strengthen the conservation support for the region's plant life.



Shaker room in the Botany Centre, visible to visitors

**Bibliographic and Visual Reference Collections** 

The site contains a botanical and horticultural library, located in the Botany Centre. It is sub–divided into two sections: the public reference centre and the reference library. Altogether it contains approximately 30,000 accessions, which include journals, books, botanical illustrations, CDs, slides, photographs, audiovisuals and other media. The main function of these collections is to support research, both of the Singapore Botanic Gardens and of visiting scientists. It includes a 'rare books' room protected from fire by inert gas.



Cypripedium tonsum

The public reference centre serves as the public face for the library and is open to the general public Monday to Friday. It includes materials on botany and horticulture in the form of books, magazines, CDs and specially prepared sets of herbarium specimens of common plants found in Singapore (for referencing). A changing exhibition of dried carpological (fruit) exhibits, botanical artefacts and rare books is also on display. Materials available are only for reference in the public area of the library.

The reference library is a specialist research library, only available to members of staff from NParks, visiting researchers and other authorised users. It is one of the oldest libraries in Southeast Asia, having been in existence at the Botanic Gardens since 1875,

albeit in different buildings. It includes journals (c.300 titles), books and pamphlets (c.28,000, including c.2,000 rare books<sup>4</sup>), botanical illustrations (c.2,000 mostly painted by Singapore Botanic Gardens artists between 1890 and 1950), DVDs (290), microfiche/ microfilm (150 on natures reserves and some titles in the rare collection), maps (214) and old photographs (1,307). Many important international scientific journals, reference books, bibliographies, botanical reprints, monographs on botany and taxonomic studies, unique research papers and unpublished material are available here. The library's rich collections play a key role in strengthening the taxonomic and systematic research works carried out at the Botanic Gardens, providing essential references for modern-day taxonomy.

The Singapore Botanic Gardens' century-old scientific journal, The Garden's Bulletin Singapore, is a peerreviewed journal published twice a year by NParks, which has an international scope. It publishes original papers and reviews on plant structure and taxonomy, evolution and biogeography, floristics, ecology and conservation, as well as related fields such as botanical biography, horticulture and ethnobotany, with emphasis on the plant life of the Southeast Asian-Pacific region. The Singapore Botanic Gardens' Gardenwise magazine is also published twice a year, bringing recent research (including into the Botanic Gardens' heritage) and horticultural perspectives from the Singapore Botanic Gardens to a wider audience as part of Singapore Botanic Gardens' public outreach programmes. Both are available online. This strong publications programme supports on-going and new projects on flora of the region. The Botanic Gardens is a member of the Biodiversity Heritage Library, which provides free access to biodiversity knowledge. The Botanic Gardens' historic journals are available online via this library.

#### **Biodiversity of the Botanic Gardens**

The Botanic Gardens is of high biodiversity/nature conservation value.

The flora of the Botanic Gardens is very well documented, from at least Cantley's time onwards. Study of contemporary maps and historical reports relating to the area now occupied by the Singapore Botanic Gardens indicates that, upon the major acquisitions of its land in 1859, 1866 and 1879, the landscape was covered in a series of different vegetation types. Subsequently, as the Botanic Gardens' living collections and landscapes were developed and managed, a further man–made, semi–natural environment has influenced the inherent ecology of the area until the present day.

The initial 22 hectares of land acquired for the establishment of the Botanic Gardens in 1859 comprised approximately six hectares of 'virgin' rainforest to its eastern side and an undetermined area of fresh water swamp along its western boundary (subsequently Swan Lake). This extant area of primary lowland rainforest is one of the few remnants of its kind in Singapore and a rare example of primary rainforest reserve within the limits of a major city. Its biodiversity value is reflected in its designation as a Nature Area. This multi-layered habitat comprises over 300 species of native plants (some of which are of economic importance, such as rattans, fruit trees and jelutong), including the previously presumed extinct in Singapore (and elsewhere rare) Planchonia grandis. Three main layers of trees are present: emergent trees (45m), canopy trees (35m) and lower trees (25m). The under-storey layer comprises plants able to survive heavy shading imposed by the canopy above. More than 80% of the Rainforest's plant species are rare or endangered, not only in the Botanic Gardens, but also in Singapore. The Rainforest contains a range of tropical animals, including species that have largely disappeared from other cities in the region (due to the city environment typically being incompatible with their requirements), such as Racket-tailed Drongo, Long-tailed Parakeet, Hill Myna, Changeable Hawkeagle, Crested Goshawk, Oriental Honey-buzzard and Reticulated Python.

It is important to note that despite some change and likely some deterioration of the former natural forest (most likely due to the drying influence of the surrounding urban environment and 'edge effects' – i.e. ecological imbalances caused by its small size) having been observed by staff, the Rainforest has nonetheless survived. The Singapore Botanic Gardens has an active programme of strengthening its natural areas with appropriate species when stock becomes available, as well as removing alien species that tend to invade its margins from the immediate surroundings.

<sup>4</sup> The oldest book is named Pavli Aegi and is dated 1531

The remainder and major part of the Botanic Gardens (at the time of its acquisition) was described as belukar, the local term for scrubby secondary vegetation that succeeded the unsustainable cultivation of crops such as gambier and pepper in the first half of the 19th century. It seems there were also a few pre-1859 plantings of economic or medicinal value that survived Niven's development of the site (1860–1875), such as the sago palms (Character Area 1) and penaga laut (Calophyllum inophyllum, Character Area 2). Niven also allowed at least two other native species that were already present or regenerating to remain, namely the pulai basong (Alstonia pneumatophora, Character Area 1) and various tembusu (Cyrtophyllum fragrans), the most abundant tree species at the Botanic Gardens.

The land acquisitions in 1866 and 1879 added more fresh water swamp (which were later transformed into Cluny Lake and Symphony Lake and Eco Lake), or ground that had borne it, along the western and northern edges of the site. The 1879 area (the 'Military Reserve') had been under cultivation by Chinese occupants for fruit and vegetables before its conversion into the Economic Gardens with plantations of rubber, pineapple, etc. These latter additions are thus of lesser importance from the standpoint of their contribution to biodiversity at the time. In each case, areas that formerly bore fresh water swamp have been converted into lakes, adding a new habitat for wildlife.

The Tyersall Learning Forest (located outside but immediately adjacent to the Nominated Property) is of great biodiversity importance as it includes regenerated forest of up to 100 years of age, whose diversity positively enhances the area of extant rainforest referred to earlier. The Rainforest and Tyersall Learning Forest complement one another and aid species exchange. Both have been the subject of detailed botanical surveys during the past four years.

The Botanic Gardens is the type locality for a range of plant species collected by Cantley and Ridley from 1880 onwards and is also the type locality for the Singapore Roundleaf Bat (now lost locally, though widespread but rare in Southeast Asia). The biodiversity importance of the Botanic Gardens as a refuge for fauna is reflected in the many



Rainforest



Common Imperial (Cheritra freja friggia)



Lesser Whistling Duck (Dendrocygna javanica)



Red-Legged Crake (Rallina fasciata)

species found there (see various ecological surveys provided in **Appendix iii**). Fauna highlights include a thriving population of the Critically Endangered (in Singapore) Lesser Whistling Duck on Eco Lake and the rare snail, *Amphidromus inversus*, regularly recorded in the Rainforest since its discovery there in 1961. A list of 137 kinds of birds was recorded in the Botanic Gardens in 2008 (an early study of birds<sup>5</sup> allows comparisons to be made between the 19th and early 20th centuries and now) and a list of 68 species of butterflies in 2009.

The mosaic of habitats found at the Botanic Gardens (including, for example, open areas of lawn, water bodies, forest and mature trees) supports a wide diversity of fauna species. Moreover, as available habitats immediately outside the overall area of the Botanic Gardens (74 hectares) have diminished/deteriorated through urban development, the Botanic Gardens have undoubtedly become a wildlife refuge and one that NParks is nowadays striving to connect with more distant refuges in the central water catchment reservoir area and associated nature reserves, via community greening schemes, such as that launched for Kheam Hock in 2013 (north of the site).

Staff and managers are aware of the Botanic Gardens' ecological importance and practice sustainable management methods, such as minimising the use of pesticides, encouraging the use of dead leaves as mulch (rather than removing them) and relying on the 'biological controls' on pests that the Rainforest remnants on site provide by way of what might be termed 'ecosystem services'.

## History and Development

This section provides a brief overview of British colonial botanic gardens followed by an overview of the Singapore Botanic Gardens' development up until the present day (including those parts of the Botanic Gardens which fall outside the boundary of the Nominated Property). A detailed chronology of the site's history is provided in **Appendix iv.** 

### **British Colonial Botanic Gardens**

It is widely accepted that the world's first 'botanic gardens' were the 16th century university physic/ medicinal gardens of Italy. 'Modern' botanic gardens were a product of the Enlightenment, an 18th century intellectual movement which combined a consideration for the aesthetic, inspired by the landscape movement, with a new concern for rational scientific endeavour. It was now acceptable to combine beauty with science, which heralded the age of the botanic gardens (McCracken, 1997). The 18th century brought a new interest in distant lands, and the expansion of political supremacy across the globe brought a new awareness of exotic cultures, climates, flora and fauna. This growing European consciousness stirred interest in the plant kingdom and resulted in the birth of gardening. Unsurprisingly, the excitement relating to botanic gardens spread to the new colonies of the European powers.

It was not until the Victorian era that the central role of botanic gardens in advancing the interests of the British Empire was truly recognised. A surge in the number of British botanic gardens laid out in the tropics during this era ensued. These were more than merely imperial gardens, they were part of a botanical network centred on the Royal Botanic Gardens at Kew (1759, London), with even wider international ramifications. McCracken describes how 'by the time Queen Victoria ascended the throne in 1837 over 22 botanic gardens had existed at one time or another in the empire, although only about ten were still functioning. This number



Royal Botanic Gardens, Kew – Palm House



is small compared with the 100 or so which were operational later in the Victorian empire, yet considerably greater than the number of botanic gardens run by rival European imperial powers in their empires'. By the turn of the century (early 1900s) botanic gardens were seen as an integral part of the Empire and were arguably as vital to the prosperity of the British Empire as military power.

In glorious settings, Britain's colonial botanic gardens performed the essential dual function of advancing scientific knowledge and colonial economic development. McCracken describes how 'as befitted the imperial spirit of the Victorian age, many of these British colonial botanic gardens were awe inspiring even to those used to Kew, Le Jardin des Plantes in Paris or the Schonbrunn gardens in imperial Vienna. They were, in the words of the Director of Peradeniya in 1883, "somewhat bewildering".

The British were not the only colonial power to be increasingly exploiting the commercial possibilities of botanic gardens. France was a strong rival to Georgian Britain in botanical and horticultural innovation. However, in terms of the scale of its botanical network and through the pre–eminence of Kew as a nerve centre of botanical innovation and a centre of horticultural research, Britain was undoubtedly foremost in the utilisation of botanic gardens as a tool for colonial expansion.

Whilst many British tropical botanic gardens were established in South/Southeast Asia, others were laid out in Africa (e.g. Cape Town and Kampala), Australia (e.g. Sydney), Hong Kong and the West Indies (e.g. St Vincent) among other locations, with Kew acting as the great botanical exchange house of the British Empire. The British War Department and the Honourable East India Company sent seeds and plants from all over the world, creating a plant seed diaspora of unrivalled proportions. It is unsurprising therefore that the late 18th to the early 20th century represented an era of immense scientific advance in the field of taxonomy and the beginnings of economic botany as a driving force behind the British Empire.

### **Evolution of the Singapore Botanic Gardens**

The Establishment of the Singapore Botanic Gardens (1859–1875)

The history of botanic gardens in Singapore began on Government Hill in 1819, when Sir Stamford Raffles, the founder of Singapore and a keen naturalist, planted nutmeg and subsequently laid out a botanical and experimental/economic garden there, which was later closed in 1829, following a lack of official support after Raffles' departure in 1823. The British government and major trading companies of the early 19th century encouraged the development of experimental gardens in the colonies to cultivate, research and preserve native (and non–native) plants as useful revenue–earning commercial crops.

The existing Botanic Gardens were first established in 1859 by an Agri–Horticultural Society, on a c.22 hectare bottle–shaped piece of land within the Tanglin district. The government had facilitated the acquisition of this land, having been offered in exchange a redundant nutmeg plantation in the Tanglin area, which would house the army's main barracks. The influential Chinese businessman, Hoo Ah Kay, better known by his trading name of 'Whampoa' had negotiated this deal, himself being a leading member of the Agri–Horticultural Society.

The Botanic Gardens were originally planned as pleasure gardens and used as an amenity for the enjoyment of the society's members. They were developed by Lawrence Niven from the 1860s. Niven had been the manager of a nutmeg plantation and the descendent of a well-known Scottish family of gardeners. His work at the Botanic Gardens reflected the 'English Landscape Garden Movement' that had influenced the emergence of numerous English landscape gardens and public parks from the 18th century until this period. The colonial government provided convict labour for Niven to manage and from 1866 were also contributing to his salary. Works carried out included the creation of interconnecting curving pathways and promenades, a levelled parade area for military bands to play music (known as Bandstand Hill) and the establishment of ornamental planting. Today this layout remains almost entirely intact. The northern part of the site contained approximately six hectares of primary rainforest, which survive today - one of only two

remaining undisturbed areas of original rainforest which would have covered the entire island. Niven cleared the site of belukar (secondary vegetation), but carefully preserved the rainforest and a number of trees/palms – the extant Penaga laut (*Calophyllum inophyllum*, Botany Centre), Pulai basong (*Alstonia pneumatophora*), tembusu (*Cyrtophyllum fragrans*, featured on the Singapore \$5 currency note and in postage stamps) and sago palm (Metroxylon sagu, near Tanglin Gate) are all thought to be pre–1859 survivors.

The Botanic Gardens was extended by c.12 hectares to the north–west/west in 1866 (see map below) and Swan Lake excavated and landscaped that same year. The Agri–Horticultural Society entered into a contract in 1867 for the construction of a residence for Niven, using borrowed funds.

This colonial plantation style bungalow, which still exists today (known as Burkill Hall), was used as the official residence of the Botanic Gardens' Superintendents and Directors up until 1969. The Society subsequently ran into financial difficulties, largely as a consequence of having built the Superintendent's house and in late 1874, handed over the management and maintenance of the site to the government in return for the settlement of its debt.



Map of the Gardens 1866

The Development of the Botanic Gardens under Murton's Superintendence (1875–1880)

Following a recommendation from Joseph Hooker, director of the Royal Botanic Gardens, Kew, James Murton, a Kew-trained botanist and horticulturist, assumed the role of Superintendent in 1875, having stopped en route to gain three months of tropical experience at the Peradeniya Botanical Gardens in Sri Lanka. This reflected the first step in a historic collaboration between the Kew and the Singapore Botanic Gardens, which extended the remit of the Botanic Gardens from a pleasure park to a place of cutting edge study and scientific/botanical experimentation and established Singapore Botanic Gardens as a nerve centre for plant exchange at the heart of a worldwide network of botanical gardens. The Royal Botanic Gardens at Kew, already preeminent in the 18th century as a seat of learning and botanical research, was responsible for much of the inspiration, administration and plant exchanges that drove the early development of Singapore Botanic Gardens and other gardens.



Burkill Hall built 1867-68



Bandstand Hill 1877

At the request of the authorities, Murton travelled in Peninsula Malaysia collecting material for the Botanic Gardens and soon set up a herbarium and library. He was also a driving force behind the establishment of economic gardens in the late 1870s, which later became famous for a wide range of economic crops including rubber. Having first established relatively basic economic gardens in the north–west extension of the Botanic Gardens, he subsequently laid out new economic gardens on a major land extension (c.41 hectares) to the north, granted in 1879.

This land extension was physically separated by Cluny Road from the earlier acquired land for the Botanic Gardens. Also begun in 1879 was the extant Palm Valley, located in a gently northward–sloping depression between the hill upon which Burkill Hall stands and the Rainforest. Today the valley displays some 220 species of palms.

In line with recommendations made by the colonial governor, Murton was charged with establishing a zoological collection in the Botanic Gardens. Animals of all kinds were donated (including tigers, monkeys, kangaroos, white eagles, a rhinoceros and a bear) and the zoo rapidly grew, enclosures being dotted around the southern part of the Botanic Gardens. However, in 1878, only three years after having been started, the zoo had to be substantially downsized, with mainly small animals retained (the tiger given to Ridley in 1895 for the zoo was retained for some time) as the funding was inadequate for such a large zoological collection which required the creation of



Palm Valley and Rainforest c 1900

elaborate pens for the various animals. The zoo was formally closed in 1905. The zoo has however left its mark on the landscape, for example, the marsh garden developed in 1969 to the south–west of Swan Lake, is in fact the remains of a wallow dug for a short–lived rhinoceros and planned alligator pens.

The Development of the Botanic Gardens under Cantley's Superintendence (1880–1888)

Poor financial management caused Murton to be relieved of his duties in 1880 and replaced by Nathaniel Cantley, another Kew-trained Superintendent who came to Singapore from Mauritius. Cantley's remit quickly became broader than Murton's, expanding beyond the Botanic Gardens into the Straits Settlements' forests, which the government realised were in decline<sup>6</sup>. During his tenure, Cantley focused on labelling the living collections and rationalising the buildings (removing the ad hoc assortment constructed during Murton's time and grouping all the workers' accommodation in the southern end of the Economic Gardens, where they remained until c.1974). He filled the Economic Gardens with Malaysian timber and latex producing trees, built a herbarium and library in what is now known as Ridley Hall and a plant/ exhibition house (used to display plants requiring protection and to host public flower shows and plant sales in support of the Botanic Gardens' finances).

The Botanic Gardens also assumed the role of propagating trees for planting in Singapore's streets and parks. Nurseries were established, one of which, the potting yard beside Cluny Road, survives today. A classic street tree introduced at this time was the tropical American rain tree (Samanea saman), raised from seed in the Botanic Gardens in 1882 and now found along many roads on both the island and in the region. In 1885, Cantley received four plants of ipecacuanha (Carapichea ipecacuanha), the standard drug for dysentery, for trial cultivation. Trials had previously failed in India, but success was immediate at the Singapore Botanic Gardens and within only two years the first commercial consignment appeared on the London market. Cantley's last conspicuous achievement

<sup>6</sup> Cantley was also Director of the newly formed Forest Department from 1883 – much of the surviving remnants of primary rainforest vegetation in Singapore owe their existence to Cantley and his successor Ridley

at the Botanic Gardens was the construction of the Main (Tanglin) Gate pillars, completed in 1886 – the modern pillars have the same spacing today but are not in exactly the same location (due to the realignment of Cluny Road eastwards).

The Development of the Botanic Gardens under Ridley's Directorship (1888–1912)

In 1888, Henry Ridley (latterly one of the world's greatest botanists and plantsmen) took over as the first Director of the Botanic Gardens and succeeded in drawing international attention to the possibilities afforded by rubber production, subsequently selecting the most productive strains and inventing a revolutionary tapping technique which represented the single most important innovation in the history of the rubber industry and the economic history of Southeast Asia. Ridley came to Singapore from the Natural History Museum in London, but it is certain that his appointment was recommended by Kew's then Director Sir William Thistleton–Dyer. His interests were wide ranging, encompassing zoology, geology and botany, especially orchids. For an academic he was exceptionally focused on practical applications, inventing new methods for tapping and curing rubber and perfecting its cultivation and that of oil palm, while publishing his results and advice at the same time. For this purpose, he launched the first scientific journal in the Malay peninsula in 1891, which the Botanic Gardens continues to publish today (albeit under a different name). Under his directorship, the Botanic Gardens entered into a new era, becoming a regional centre for understanding the flora of Southeast Asia, for forestry and for economic botany and plantation agriculture.



Rain tree at Nassim Gate, possibly dating from 1882

Ridley was known to fill his jacket pockets with fresh rubber seeds from the Botanic Gardens when visiting plantation managers in the Straits Settlements, hoping they would consider planting the crop which he believed was a valuable new investment. He was largely ignored until a tapioca estate owner, Tan Chay Yan, agreed to plant a modest 16 hectares with rubber at Bukit Lintang in 1895 (the rubber seeds had been given to Tan Chay Yan by Dr Lim Boom Keng, who himself had acquired the seeds from Ridley).

By 1901, Tan Chay Yan had extended his rubber plantation to 1,200 hectares and was encouraging others to do the same – and so the Southeast Asian rubber boom began. By 1917, the Botanic Gardens had supplied and sold seven million rubber seeds from its Economic Gardens, an income that supported this part of the Botanic Gardens' work. By 1920, Malaya was supplying half of the world's demand for rubber, much of it being exported from the port of Singapore. To this day, Tan Chay Yan and his descendants have maintained a close relationship with the Botanic Gardens. Tan Chay Yan's grandson, John Tan Jiew Hoe, is a keen supporter of the Botanic Gardens.

Ridley also experimented with other crops such as oil, sugar and sago palms and latex-producing gutta



Ridley with rubber tree

trees (some White gutta specimens survive in the Botanic Gardens today). Latex from the latter was later used to coat the first undersea cables, enabling international telecommunications. Beyond testing and introducing new crops, Ridley also carried out research relating to the monitoring and control of pests and diseases in the Straits Settlements. He carried out many field expeditions across Southeast Asia, bringing back plants for the Botanic Gardens' living and preserved collections; he built a new herbarium/library south-west of Ridley Hall, artists' accommodation in the Economic Gardens, a residence for the Assistant Curator (now known as E.J.H. Corner House) and an extension to Cantley's plant/exhibition house (for housing orchids); and instructed that a second lake be excavated (Cluny Lake) from the swamp in the 1866 north-west extension. The latter subsequently grew and shrank in size, finally being reinstated as the modern Symphony Lake in 1974. Ridley was approached by Miss Agnes Joachim, in whose famous Tanjong Pagar garden an interesting and beautiful orchid hybrid had appeared. This, he named as Vanda 'Miss Joaquim' in 1893, now Singapore's national flower represented at the Botanic Gardens by an extensive planting comprising some 20,000 specimens densely arranged on wooden posts below the west side of the Bandstand.

The Development of the Botanic Gardens under I.H. Burkill's Directorship (1912–1925)

Ridley retired in January 1912 and was succeeded by Isaac Henry Burkill, an outstanding scientist who reinforced the Botanic Gardens' scientific team and was to be the last to preside over the Singapore Botanic Gardens as a typical tropical colonial garden. It was under his directorship that a large portion (c.35 ha) of the Economic Gardens (now known as the Bukit Timah Core) was transferred for the building of the former Raffles College (Figure 6 illustrates the extent of the Botanic Gardens following the loss of most of this land). The former Raffles College was Singapore's first tertiary education institution and was constructed as part of a scheme to celebrate the centenary of Singapore's founding. It opened its doors to an initial 43 students in June 1928 and was formally opened on 22 July 1929. The College was dedicated to "the promotion of arts, science and learning and the provision of higher education for students without distinction of sex, race, nationality or religion." After a series of mergers, Raffles College eventually became the National University of Singapore. NUS moved out of the Bukit Timah site to its current location at Kent Ridge in 1981. The site was subsequently occupied by several other tertiary institutions before being returned to NUS in 2005 and becoming its Bukit Timah Faculty of Law Campus.

A bungalow (House 6) and a garage, which survive today, were completed in 1919 and 1924–28. House 6 was originally intended to be the residence of the Economic Gardens' Field Assistant, but this position was made redundant soon after the building was completed due to the loss of the Economic Gardens. During the 1920s, five bungalows were constructed on the periphery of the present Botanic Gardens, positioned in a crescent around the College buildings, to house university staff – these survive today and are known as Houses 1–5.

In anticipation of the clear felling of trees required for the construction of the former Raffles College a proportion of the younger plantings of trees were rescued from 1918 onwards and transferred to the pre–1879 part of the Botanic Gardens, specifically to the area which is nowadays the orchid nursery (behind the National Orchid Garden). The old specimens of American and African mahoganies (Swietenia, Khaya), durian, Velvet Persimmon (*Diospyros blancoi*) and tamarind in and around the nursery are believed to be survivors from the original Economic Gardens. Propagations of two of the highest yielding second generation rubber trees were also made and one of these survives near the Botany Centre.



House 6 (Former Economic Gardens' Field Assistant's residence)

The Development of the Botanic Gardens under Holttum's Directorship (1925–1949)

I.H. Burkill was succeeded by Eric Holttum in 1925. Holttum was also a scientist but soon developed an emphasis on horticulture. His botanical interests were varied, but ferns and orchids became a focus and in 1928 he set up an in vitro propagation unit for orchids on the upper floor of a two-storey building completed in 1921 and now known as Holttum Hall. An active orchid hybridisation programme was run at the Botanic Gardens from the 1930s onward. Whilst Holttum had not invented the in vitro technique, he recognised its merits and was able to demonstrate them in his laboratory, permitting hybrids to be raised with confidence and in greater quantity, the first being named in 1932 as Spathoglottis 'Primrose'. Over subsequent decades the technique was perfected and soon led to a new industry in Singapore and eventually in various other Southeast Asian countries. Orchid breeding at the Botanic Gardens became an important activity and resulted in 1956 in the establishment of a unique programme of 'VIP Orchid Namings', the first of more than 190 being Aranthera 'Anne Black', after Lady Black, the colonial governor's wife. Visitors to the Botanic Gardens can see elements of the in vitro laboratory-based propagation technique through a series of windows on the ground floor of the Botany Centre (completed in 2006) and living specimens in the National Orchid Garden (developed in 1995). The Botanic Gardens' orchid specialists today attempt on average 1,000 new hybridisations each year.

Holttum's contribution was in no way restricted to orchids. Ferns, bamboo and gingers were his other interests and he is credited with popularising two of the most commonly seen plants in Singapore's parks, gardens and road bridges, namely the frangipani (various Plumeria species) and *Bougainvillea*. Both have spectacular large–scale plantings in the Botanic Gardens. The following landscape/built features, which survive in the Botanic Gardens today were developed under Holttum's directorship: the sundial garden in 1929 (where it is thought Cantley had planted roses in 1882)<sup>7</sup>, the formal Bandstand structure (1930), water lily tanks (1932) at the base of the steps down to the Plant House Garden and the pergola (1935) adjacent to the Sun Garden.

Holttum and his Assistant Director, E. J. H. Corner (appointed 1929), remained in the Botanic Gardens for the duration of the Japanese occupation during World War II. The British Governor, Sir Shenton Thomas, had persuaded the commander of the Japanese forces that the Botanic Gardens and museum collections should be preserved and although the two countries remained at war the Botanic Gardens' senior scientists were allowed to continue their work under the direction of an imposed but benevolent Japanese botanist, Professor Kwan Koriba. What happened during the 1942–1945 occupation is not well recorded beyond the statements in Corner's The Marquis and the briefest of post-war Director's annual reports (1947). One interesting development during the occupation was the construction of two flights of brick steps leading down from the Lower Ring Road to the Plant House Garden by Australian Prisonersof–War.

The Botanic Gardens somewhat struggled after the war, as many of its best gardeners had died building



Sundial Garden 1959



Holttum laboratory 1958

<sup>7</sup> Four lily ponds and Grecian statues were added in the 1970s and 2000 respectively

the Burma–Siam railway and talent recruitment was limited by the British colonial rule and localisation of the public service. Amongst the few developments in the Botanic Gardens that are recorded is an avenue of Caribbean royal palms (Roystonea oleracea), planted along Office Gate Road in 1950 and now towering above a modern pergola. The Orchid Enclosure established during the 1950s by Purseglove (1954-1957) (and removed in 1995) was an important precursor of the National Orchid Garden. The 'Nature Reserves Ordinance' of 1951 placed some 3,250 hectares of land under the charge of the Botanic Gardens, 'set aside for the purpose of the propagation, protection and preservation of the indigenous fauna and flora of the Colony'. This included the Bukit Timah Reserve, nowadays administered as a Nature Reserve by the NParks Board, of which the Botanic Gardens is a part.



Brick Steps, made by Australian Prisoners of War during the 1940s

The Development of the Botanic Gardens under Humphrey Burkill's Directorship (1957–1969)

After various changes of directors, Humphrey Burkill (the son of I.H. Burkill, born in Burkill Hall), was appointed in 1957. In that same year Malaya was granted independence and the following year the British Parliament elevated the status of Singapore from colony to state, providing new local elections. Subsequently, between 1963 and 1965, Singapore formed an integral part of the Federation of Malaysia. After separation from Malaysia in 1965, Singapore became the Republic of Singapore.

In relation to developments in the Botanic Gardens, the water feature in the centre of the Plant House Garden quadrangle was begun in 1957 and over the following decade the herbarium building was renewed and enlarged, a large tea kiosk (now removed) built in Swan Lake's vicinity (Character Area 1) and the Raffles Hall (now known as the Raffles Building) constructed to house student accommodation (NParks' public service counter is now located within part of the building). Little else of note happened to the Botanic Gardens' physical structure until the 'greening' of Singapore was initiated in the 1960s.

A series of noteworthy large–scale public events, in the form of concerts and shows (referred to as the people's cultural concerts), took place in the Botanic Gardens in 1959 (the year of the Botanic Gardens' 100th anniversary) and continued into 1960. These had been organised by the Ministry of Culture and were opened by Prime Minister Lee Kuan Yew in front of an audience of 22,000. These celebrations were partly aimed at promoting racial harmony in Singapore and at encouraging unity among the people of Singapore and the development of a national culture as the island manoeuvred towards independence.

The Singapore Botanic Gardens revised its mission during the 1960s in response to the launch of the former Prime Minister Lee Kuan Yew's tree planting campaign in 1963 and 'Garden City' vision in 1967. Its regional and international work in taxonomic research was temporarily de-emphasised. Expertise and resources for the campaign resided in the Botanic Gardens, the focus of which was thus redefined from that of a largely research-orientated organisation to one that would spearhead and be the driving force behind the national 'greening' effort. This, in a sense, was a repeat of Cantley's role in the 1880s. In support of this, the area subsequently occupied by Symphony Lake (1974) was turned into a large nursery ground. To meet the need for trained personnel to maintain the greenery, the School of Ornamental Horticulture was opened in the Botanic Gardens in 1972 and housed in Burkill Hall, which offered a Diploma in Ornamental Horticulture and Garden design, the first of its kind in Southeast Asia. The new diploma was modelled on the Diploma in Horticulture established at Kew in 1963. Over the following 20 years the greening programme matured and Singapore gained an international reputation for its clean and green environment. Through the development of a

world–class educational programme, the Botanic Gardens was able to achieve its mission to provide the botanical and horticultural expertise needed to transform Singapore into the Garden City vision. Key industry professionals who trained at the Botanic Gardens include, for example, J. Tan (President of the Landscape Industry Association of Singapore), Mahendran Chakrapani (Managing Director of Urbanscapes Pte Ltd) and R.P. Jickky (Director of Tropical Environment Ptd Ltd).

The greening of Singapore did not just focus on trees. It also coincided with an expansion of orchid breeding and commercial production, once again led by the Botanic Gardens and its Kew-trained chief administrator, Arthur George Alphonso, during whose tenure as Botanic Gardens Chief administrator (1970–1976) the *in vitro* laboratory facilities were augmented and moved from the upper floor of Holttum Hall. His influence continued after retirement when he was re–employed for two years as 'Senior Curator' in charge of Orchid Breeding.

During the late 1960s/1970s a number of trees were planted/transplanted, including in the southern Tanglin Core, where tall–growing native and Southeast Asian rainforest Dipterocarps (Hopea spp.) were placed to hide the city's expanding high– rise buildings.



Training in the Botanic Gardens during the 1960s

# The Development of the Botanic Gardens between 1970 and 1988

Chew Wee Lek was appointed Director in 1970. Following his premature resignation the role of director ceased until the late 1980s. Through the 1970s the Botanic Gardens' public facilities and landscape were upgraded as it assumed the role of a public park focused on local amenity needs. A second lake (now known as Symphony Lake) was created in 1974 (where Cluny Lake had previously been sited) and various new garden features installed such as a Japanese Garden, plant houses for cacti/succulents/temperate species (in cooled glasshouses) and a miniature waterfall. With the exception of Symphony Lake, these improvements were later swept away following major redevelopments which formed part of a new Masterplan for the Botanic Gardens (NParks' Masterplan).

A range of important behind-the-scenes enhancements to science and horticultural capabilities however took place during the 1970s. This included the expansion of plant entomology, pathology and nursery facilities, especially in support of a unit charged with the search for, experimentation with and introduction of new plants to Singapore's parks and gardens. In 1976 the Botanic Gardens became the Parks and Recreation Department of the Ministry of National Development and its success was measured in terms of its advancement of horticulture in Singapore. For example, in the fiscal year 1979/80 the Botanic Gardens was responsible for planting 56,000 ornamental trees, 10,000 fruit trees and 400,000 shrubs; a feat maintained over a decade until the ministry parcelled out some of these activities to other new branches supplementary to the Botanic Gardens. By then, the greening of the island through the Garden City vision had been substantially realised, though its originator, Minister Mentor Lee Kuan Yew, has continued to publicly emphasize its importance well into the 21st century (in 2013, NParks celebrated the 50th anniversary of the greening movement with an exhibition in the Botanic Gardens). Regional and international taxonomic research led by the Botanic Gardens' staff resumed again in the 1980s.

In 1983, some 60 years after the annexation of the major part of the Economic Gardens, c.13 hectares of that land was returned to the Botanic Gardens and the development commenced of what would later be called the Bukit Timah Core. This parcel of land soon included a large hard–edged pond, a new arboretum, footpaths, rest areas and a modern innovation – the provision of jogging tracks for the



benefit of office–bound Singaporeans in need of physical exercise. Back in the historic southern end of the Botanic Gardens a rose garden was installed in 1985 between the Bandstand and the Sundial Garden, near to where Cantley had planted roses a hundred years before. While orchid breeding continued, the Botanic Gardens also hosted orchid shows for the Orchid Society of Southeast Asia and gained awards for its own hybrids, such as Dendrobium 'Margaret Thatcher' (1987). By the late 1980s, the Botanic Gardens was about to undergo major redevelopments and enter what can be termed its 'modern phase'.

Dr Kiat W. Tan joined the Singapore Botanic Gardens' senior staff in 1983 from the Marie Selby Botanical Gardens in Florida, where he was an accomplished orchid specialist and Director of the Museum of Botany and the Arts. His role at the Botanic Gardens began with an overhaul of its orchid breeding programme, focusing on high quality orchid hybrids with commercial value. It was during this time that the Botanic Gardens' role in the greening of Singapore started to be gradually de–emphasised.

The Development of the Botanic Gardens under Dr Tan's (1988 – 1996) and Dr Chin's (1996– 2011) Directorships

In 1988 the role of Director was reinstated and Dr Tan appointed. The following year, Dr Tan was given funds to develop a Masterplan that would enable the realisation of his new vision for the Botanic Gardens. Perhaps for the first time, 130 years of somewhat ad hoc development was rationalised in an overall plan and most of the additions of the 1950s to 1980s replaced by new landscape features. Under Dr Tan's directorship the Singapore Botanic



Botany Centre, opened in 2006

Gardens regained its status as a premier institution for tropical botany and horticulture, whilst also fulfilling its role of attracting and engaging visitors.

With these improvements Dr Tan's revitalisation of Singapore Botanic Gardens drew to a close. Dr Chin See Chung took over the role of Director of the Botanic Gardens in 1996, overseeing some of the developments discussed in Phase 3 above, besides continuing the Botanic Gardens' traditional roles in research, education and conservation. In 1999 the School of Horticulture closed at the Botanic Gardens. The Diploma in Ornamental Horticulture and Garden Design was taken over by the Ngee Ann Polytechnic, but practical work experience continues to be offered at the Botanic Gardens.

Around 12 hectares of land was added to the Bukit Timah Core from Singapore's Management University in 2003. An additional 8.6 hectares were added to the Singapore Botanic Gardens in 2009 in the form of the 'Tyersall Learning Forest' to the south-west of the existing Botanic Gardens.



National Orchid Garden, opened in 1995

The Development of the Botanic Gardens under Dr Taylor's Directorship (2011 – present)

The Botanic Gardens has continued to be developed under the directorship of Dr Nigel Taylor, who came to Singapore from the Royal Botanic Gardens, Kew, where he was Head/Curator of Horticulture and Public Education (1995–2010) and spokesperson on the Kew Gardens' history.

Under his directorship a Healing Garden (2011) and a Fragrant Garden (2013), which replaced derelict university out-buildings, have been laid out on land which once formed part of the Economic Gardens and later the former Raffles College grounds. A Heritage Museum (2013) has been established in Holttum Hall and a temporary building immediately south of it, which houses a rolling programme of exhibitions. Enhanced interpretation of the Gardens' heritage is now also in place. A new MRT station along the Circle Line, named Botanic Gardens, was opened in October 2011 in the northwestern corner of the Botanic Gardens, outside of



Heritage Museum housed in Holttum Hall



Heritage interpretation

the Nominated Property. It brings visitors from the station precinct (which is a garden in itself) through into the Trellis Garden, planted with a wide variety of climbers. A Foliage Garden, also located outside of the Nominated Property, was opened to the public in 2013.

Some further developments are planned, mostly outside of the Nominated Property, and are described in Section 4b. The conservation of the Botanic Gardens' cultural and natural heritage features continues to be central to its future management. A key aspect of the Botanic Gardens' work, which largely goes undetected by visitors, is the steady acquisition of endangered plants (especially tree species) by the Botanic Gardens' staff, especially from the Southeast Asian region. These are sometimes planted in the Rainforest or raised in the Botanic Gardens' nurseries in the hope that they can be reintroduced to the wild one day, or at least their genetic resources conserved ex situ for as long as possible. Behind-the-scenes nursery facilities are undergoing refurbishment and enhancement in support of such work.

# Extant Historic Features of the Botanic Gardens as a Cultural Landscape

The Nominated Property contains an assemblage of extant historic landscape features, buildings and structures that, as an integrated whole, contribute to its heritage significance as a cultural landscape. They also represent the different eras of the Botanic Gardens' development as a British tropical colonial botanic garden, between 1859 and 1958. These are shown on **Figure 11** and listed in chronological order in **Table 2** (with landscape and built elements grouped separately). The date, current state of conservation (defined as Good, Fair and Poor) and relevant statutory protective designation(s) of each feature is also provided in this table. Further information about each feature can be found in the preceding two sub–sections.



## FIGURE 11 EXTANT HISTORIC FEATURES

MANAGEMENT PLAN DESCRIPTION OF THE NOMINATED PROPERTY

Name of Feature	Date	State of Condition	Supplementary Information	Statutory Protection/ Designation
Landscape Features				
Rainforest	Pre 1859	Fair	Suffers from "edge effects" and needs constant attention to reduce and, ideally, eliminate invasive weed species that enter around its margins, and to control the rampant growth of lianas that thrive in the disturbed areas, where ecological balance is lacking. Heritage and tall trees are protected by lightning conductors.	Falls within a National Park and Tree Conservation Area
Path/previous road layout in southern part of the Botanic Gardens	1860s	Good	N/A	Falls within a National Park
Bandstand Hill	1860/61	Good	Bandstand erected in 1930, some modern planting located around its base.	Falls within a National Park and Tree Conservation Area
Tanglin Entrance	1864	Good	Main historical entrance still present albeit posts and gate having been replaced. Spacing of the four new gate posts aligned to match the spacing of those of the original Main Gate but gateway not in the exact historic location since Cluny Road has been slightly re–aligned.	Falls within a National Park
Swan Lake (and island planting dated 1891) and surroundings	1866	Fair	Earliest extant designed/ornamental water body in Singapore.	Falls within a National Park and Tree Conservation Area
Remains of rhino wallow incorporated into the Marsh Garden	1870s (Marsh garden, 1969)	Good	N/A	Falls within a National Park and Tree Conservation Area
Palm Valley	1879	Good	A small part of Palm Valley now sits within the National Orchid Garden. Used as a venue for weekend concerts. Some recurring problems with rhinoceros beetle and other pests attacking the palms.	Falls within a National Park and Tree Conservation Area
Potting Yard Area	1880s	Good	Existing buildings dated 1997–2009.	Falls within a National Park and Tree Conservation Area

## TABLE 2 EXTANT HISTORIC FEATURES

Name of Feature	Date	State of Condition	Supplementary Information	Statutory Protection/ Designation
The Dell	1882	Good	Character largely retained although this area has undergone various modifications.	Falls within a National Park and Tree Conservation Area
Sundial Garden	1929	Good	Four rectangular tanks for water plants added in 1971 and classical statues in 2006.	Falls within a National Park and Tree Conservation Area
Brick Steps west of Plant House Garden	Early– mid 1940s	Good	The steps which descend to the Plant House Garden from the Lower Ring Road were made by Prisoners of War held at Changi Prison during the Japanese occupation (1942–45).	Falls within a National Park
Plant House Garden	1950s	Good	First laid out in 1882. Some remnants (coral rock walls) incorporated into the current display garden (which is on the same footprint as the original Plant House Garden). Structures date from 1954 to 1958.	Falls within a National Park and Tree Conservation Area
Symphony Lake, located in Cluny Lake's historic location	1974	Good	Cluny Lake, excavated in 1891, occupied part of the location where Symphony Lake was later created.	Falls within a National Park
Arrow emerging from Symphony Lake	1974-76	Good	Marks the location of a temporary station for the observation of terrestrial magnetism set up in the Gardens in 1914.	Falls within a National Park
Historic planting	Various	Overall good	Includes a number of veteran trees (some pre-dating the establishment of the Gardens in 1859) and historic plant collections such as palms, frangipanis and orchids. The clump of tiger orchid ( <i>Grammatophyllum</i> <i>speciosum</i> ) by the former junction of Office Gate Road and Main Gate Road, for example, was originally planted in 1861. Heritage and tall trees are protected by lightning conductors.	Falls within a National Park and Tree Conservation Area

Name of Feature	Date	State of Condition	Supplementary Information	Statutory Protection/ Designation
Buildings and Structures				
Chinese graves	1842, 1881 and unknown date	Good	N/A	No designation
Gazebo 1	1850s, brought to the Botanic Gardens in 1969	Good	Roof replaced following damage by falling tree.	Conserved structure
Burkill Hall	1868	Good	Renovated during the 1990s.	Conserved building
Ridley Hall	1882	Good	Rear section used as short-term accommodation for visiting scientists (from 2013) following repair of termite damage.	Conserved building
E.J.H. Corner House	1910	Good	N/A	Conserved building
House 6, 'Field Assistant's House'	1919	Fair	N/A	Conserved Building
Holttum Hall	1921	Good	Houses the Heritage Museum exhibition (2013) following repair of termite damage.	Conserved building
Houses 1–5	1924–28	Good	N/A	Conserved buildings
The Garage	1924–28	Fair	N/A	Conserved Building
Sundial Garden Structure	1929	Fair	Refurbished 2004/05.	No designation
Bandstand	1930	Good	Roof renovated in 2012.	Conserved structure
Low brick wall south of the Bandstand	1937	Good	Renovated in 2012.	No designation
Pergola by Sun Garden	1935	Good	Rebuilt 1957.	No designation
Raffles Hall/ Building	1958	Good	N/A	Conserved building
Gazebo 2	Unknown	Good	N/A	No designation

### **Lost Historic Features**

Since its opening in 1859, the site has been subject to a number of changes relating to its extent/ boundary and internal features. The Botanic Gardens, which originally included c.22 hectares of land, was extended by c.12 hectares in 1866 and by a further 41 hectares in 1879. Its size was subsequently reduced from 75 hectares down to 40 hectares in the 1920s with the annexation of land for the former Raffles College. Approximately 25 hectares of land was returned to the Botanic Gardens by 2006 and 8.6 hectares added to the south–west, the entire Singapore Botanic Gardens now totalling c.74 hectares. 49 hectares of the Botanic Gardens fall within the Nominated Property.

A number of landscape/built features have come and gone during the Botanic Gardens' different phases of development. Key lost/removed features are set out in the **Table 3** below. It is important to recognise that botanic gardens are dynamic and living landscapes, where change is not only inevitable and continuous but also integral to their history and ability to remain relevant in catering to the needs and demands of visitors as well as working scientific staff.

TABLE 3	LOST HISTORIC FEATURES	

Date and description of lost feature	Date feature was lost
Ornamental planting beds laid out by Niven in the 1860s.	1875 onwards.
Croquet lawn on the side of the Bandstand Hill laid	Likely to have become Cantley's Rose Garden in 1882,
out in the 1860s.	which was subsequently replaced by the Sundial Garden in 1929 (which itself was later modified).
The Agri–Horticultural Society's orchid house,	Mid 1870s to make way for carnivore cages.
constructed during the 1860s.	
Murton's Office (likely to have housed the	1880s.
herbarium), orchid house and coolie lines/	
accommodation – erected during the 1870s south	
of Bandstand Hill.	Gradually removed from 1979 and zoo clocod in
and emu pens and carnivora house were dotted	1905
around the Botanic Gardens) and Zoo Keeper's	
house (located by the aviary) erected during the	
mid–late1870s.	
Murton's initial Economic Garden (located in the north-	1880s (when the Economic Garden was laid out on
west extension) and cut flower beds (early 1870s).	the newly acquired north extension).
Plant/Exhibition House, completed in 1885 and	Both these structures underwent extensive repairs and
orchid house constructed as an annex to the Plant/	alterations and had been largely removed by the 1950s.
Exhibition House in 1889.	
Herbarium/Library building south of Holttum	2001/02.
replaced by a two-storey building (in the same	
location) in 1930. This building gained an annex	
in 1954 and an extra floor in 1964. Its modern	
replacement is now underground.	
The majority of the Economic Garden/Arboretum	1920s (when most of the land on which the
(which included plantations of various economic	Economic Garden stood was annexed for the
crops) and some of its associated structures	development of the former Raffles College) (some
(nursery/propagation structures, offices, staff	trees survive).
accommodation) located in the northern extension.	

Date feature was lost
N/A
Closed to traffic in 1989 and removed 1990 (which
improved the visitor experience).
1990s.
Removed or converted to other uses as part of
NParks' 1989 Masterplan proposals for the Botanic
Gardens (carried out up until the present day).

# Relevance of the Botanic Gardens to Singapore's Social and Cultural History

The Site forms part of Singapore's social and cultural history, etched in the memories of generations of visitors and providing a continuous sense of place and identity in the changing landscape and psyche of the islanders. The great majority of Singaporeans visited the Botanic Gardens when they were children and have continued to do so throughout their adult lives. Singapore's current Prime Minister, Lee Hsien Loong, recently spoke about the memories he associates with the Botanic Gardens, describing how:

'As a child my parents would bring me here for outings. Later, when I was a young man courting my wife-to-be, we would come here for walks and talks. Then when we had kids, our whole family would come and enjoy ourselves here - jogging in the evening, carrying lanterns during Lantern Festival around the lake at night, or playing with the Swiss Ball Fountain. The children have grown up but my wife and I still come for walks here regularly for the greenery and the waters. And I know that many Singaporeans have similarly happy memories of this place.'

Certain cultural traditions in Singapore are associated with the Botanic Gardens such as using it as a venue for introductions associated with arranged marriages (information gathered through oral history) and as a venue for celebrating momentous occasions. The choice made by Lee Kuan Yew in 1959 to launch multi–cultural celebrations (aimed at inspiring and establishing a national culture and better racial integration) and deliver his opening speech at the Botanic Gardens (to an audience of 22,000), reinforces the value which has long been associated with the Botanic Gardens in relation to community and ethnic cohesion in Singapore and multi–cultural interchange. These celebrations were a key milestone in relation to the birth of Singapore as an independent nation and the rise of a new culture.



Former Prime Minister Lee Kuan Yew Address at the People's Cultural Concert held at the Botanic Gardens in 1959

Singaporeans and foreigners alike remain deeply attached to the Botanic Gardens and appreciate it for what it offers culturally, socially and personally, including its contribution to:

- Fostering community cohesion and social ties.
- Providing a strong link to Singapore's past and continued development.
- Providing a place for daily informal and formal recreation (e.g. play, sport/exercise, quiet contemplation, picnicking and attendance at events – especially musical performances, a tradition since c.1860<sup>8</sup>).
- Providing a meeting place/somewhere to socialise, open to all, regardless of ethnic origin, age or gender.
- Imparting educational messages (through formal and informal means).
- Access to nature.
- Forging important memories.
- The celebration of momentous occasions. The Botanic Gardens is, for example, a favourite venue for wedding photographs.

Photographs of the Botanic Gardens being used by the local community and foreign visitors for a variety of purposes are provided opposite and overleaf.

## Contribution of the Botanic Gardens to the Greening of Singapore

The Botanic Gardens played an instrumental role in the morphing of Singapore into a Garden City. Following the launch of the former Prime Minister Lee Kuan Yew's tree planting campaign in 1963 and 'Garden City' vision in 1967, the Singapore Botanic Gardens revised its mission. Its regional and international work in taxonomic research was temporarily de–emphasised to allow the Botanic Gardens to spearhead the greening movement and provide the expertise and resources needed to accomplish the greening vision. Plants suitable for planting across the island were grown and distributed from the Botanic Gardens and training

8 Recorded in the Botanic Gardens' Annual Reports

provided for those who would ultimately maintain the greenery.

Over the following 20 years the greening programme matured and Singapore gained an international reputation for its clean and green environment. Through the development of a world class educational programme, the Botanic Gardens was able to achieve its mission to provide the botanical and horticultural expertise needed to transform Singapore into the Garden City vision.

Whilst the Botanic Gardens no longer acts as a nursery and central horticultural training centre for the greening of Singapore, it continues to epitomise the 'City in a Garden' movement and its vision. It also continues to play an important educational role through the delivery of a varied educational programme aimed at connecting people and plants and increasing children and adults' awareness, appreciation and knowledge of plants, nature and environmental conservation. The Botany Centre frequently hosts exhibitions and professional training courses led by CUGE. Also, whilst the Diploma in Ornamental Horticulture and Garden Design moved to the Ngee Ann Polytechnic, students still complete part of their practical work at the Botanic Gardens.

The Botanic Gardens remains central to the propagation and re-introduction of native orchids and gingers as part of the island-wide greening programme (which includes objectives to restore natural habitats and reinforce Singapore's biodiversity). Staff also work closely with different departments within NParks, which has taken on the role of spearheading the greening of Singapore. For example, proposals, trials and already implemented methods for more sustainable practices at the Botanic Gardens (developed by the Gardens' staff) will shortly be showcased to the rest of NParks and to Singapore's horticultural industry. The decision to locate NParks' headquarters at the centre of the Singapore Botanic Gardens echoes the enduring link between the Botanic Gardens and the greening movement









- A Exercise group
- $B \qquad \text{Jogging in the Botanic Gardens}$
- C One-off mass wedding event in 2009
- D Wedding photography is very popular in the Gardens
- E Visitors enjoying the National Orchid Garden
- F Watching a concert on the Symphony Stage
- $G \quad \ \ {\rm Guided \ tour \ and \ children's \ treasure \ hunt}$
- H Bandstand performance in 1957
- I Workshop in plant research



























- A Easter holiday makers
- B Hari Raya Puasa celebrations
- C People strolling on the first day of the Chinese New Year, Year of the Rooster
- D New Year Holiday Crowds
- E A father and son, Mr Goh Seng Fong and Mr Goh Hin Ngim, visiting the Gardens in the 1980s
- F People doing their early morning exercises
- G Chinese New Year celebrations and children feeding the monkeys

## Current Management and Policy Context

## Ownership

All land within the Nominated Property is within the ownership of the Singapore Government. As illustrated on **Figure 12** the majority of the State land within the property is leased to NParks (under a 99 year lease, in force between 1990 and 2089), a statutory board of the Ministry of National Development. The remainder of the property is allocated to the Ministry of National Development and managed by NParks.

Within the proposed Buffer Zone, the State land immediately to the north and south–west of the Nominated Property is under the direct management of NParks as part of the Singapore Botanic Gardens. Beyond the Singapore Botanic Gardens' boundary, the remainder of land within the proposed Buffer Zone is under a mix of private and State ownership.

## **Staffing Levels**

The Singapore Botanic Gardens currently employs 125 full-time members of staff. The responsibility for the Botanic Gardens' overall management lies with its Director who is assisted by two Senior Deputy Directors and four Deputy Directors. Garden staff are employed in the following five departments: Research and Conservation (RC); Horticulture, Exhibitions and Events (HEE); Education, Development and Administration Support (EDA); Visitor Management, Security and Operations (VMSO); and Singapore Garden Festival (SGF).

This represents a substantial body of on-site knowledge and expertise, which underpins the successful development and management of the Nominated Property and its associated functions. Staff benefit from external specialist expertise and knowledge from a range of organisations/ individuals including the National Archive, CUGE and the National Biodiversity Centre (the latter two are based at the Botanic Gardens). Government agencies, such as the Urban Redevelopment Authority's Conservation department, give their views and advice on applications for planning consents involving changes to or restorations of the historic landscape and buildings. Appropriately qualified grounds and buildings maintenance contractors carry out maintenance tasks across the site and specialist restoration contractors are called upon as and when necessary. A valuable volunteer base lead walks around the Gardens, including a specialist heritage walk.

## **Sources and Levels of Finance**

The Botanic Gardens' current annual operating and staff budget amounts to S\$15 million. Prior to setting budgets for its various divisions each year, NParks asks Divisional Directors to prepare cases for any additional funding required, whether for maintenance or events. If needs arise during the course of the fiscal year, the Botanic Gardens can also request additional funds from NParks' Central Pool fund. As regards to infrastructural maintenance, large items/projects are handled and funded through NParks' Facilities Management and Parks Development teams, so do not figure in the Botanic Gardens' annual budget.

NParks also receives a dedicated budget from the Singapore Government for capital maintenance of specifically the Singapore Botanic Gardens and Fort Canning Park, in view of these being leased to NParks (i.e. under NParks direct control). These funds are accumulated in the Sinking Fund and can only be used for the Botanic Gardens and Fort Canning.

The Botanic Gardens can also seek approval from NParks' Board for funds to be released from NParks' Reserves Fund, to support a variety of infrastructural developments and maintenance works for both new and old structures as well as events.

## **Relationship to Other Plans**

Existing adopted plans that relate directly or indirectly to the protection, management and/or presentation of the Nominated Property are listed in **Table 4**.



FIGURE 12 OWNERSHIP

MANAGEMENT PLAN DESCRIPTION OF THE NOMINATED PROPERTY

Plan	Summary Description	Agency Responsible	Date Adopted
Singapore Concept Plan	The Concept Plan 2001 is the long-term vision for Singapore's physical development in the next 40 to 50 years. It is reviewed once every 10 years. The seven key thrusts of the Concept Plan 2001 are: new homes in familiar places; high-rise city living; choices for recreation; flexibility for businesses; developing a global business centre; building up an extensive rail network; and focusing on identity.	URA	2001
Singapore Master Plan	The Master Plan is the statutory land use plan which guides Singapore's development in the medium term over the next 10 to 15 years. It is reviewed every five years and translates the broad long–term strategies of the Concept Plan into detailed plans to guide development. The Master Plan shows the permissible land use and density for every parcel of land in Singapore.	URA	2008
Conservation Guidelines	This document provides the conservation principles, planning parameters and restoration guidelines for conserved shop house and bungalow building typologies, as well as planning parameters and envelope control guidelines for new buildings within conservation areas. Owners, architects and engineers intending to carry out restoration works or development within conservation areas are required to comply with the guidelines accordingly. Other building types, which do not conform to the standard shop house or bungalow typology are evaluated on a case by case basis in accordance with conservation principles. This document is to be read in conjunction with the Specific Facade Restoration Guidelines for the subject building.	URA	2011

## TABLE 4 RELEVANT EXISTING ADOPTED PLANS

# Protective Designations within the Nominated Property

Areas, buildings and features of conservation value within the Nominated Property are protected by a range of statutory and non–statutory designations (see **Figure 13**). The protective designations that apply to the Nominated Property are listed in **Table 5** overleaf.

Designation	Extent/Date of Designation	Legislation under which status is provided
National Park	Majority of the Nominated Property	The Parks and Trees Act (Cap. 216) makes
	is within a National Park (designated	provision for National Parks to be 'set aside for
	1990).	all or any of the following purposes:
		(a) the propagation, protection and
		conservation of the trees, plants, animals
		and other organisms of Singapore, whether
		indigenous or otherwise;
		(b) the study, research and preservation of objects
		and places of aesthetic, historical or scientific interest;
		(c) the study, research and dissemination
		of knowledge in botany, horticulture,
		biotechnology, or natural and local history; and
		(d) recreational and educational use by the public'.
Conservation	Entire Nominated Property is within the	The Planning Act (Cap. 232) provides for 'where
Area	Singapore Botanic Gardens which was	in the opinion of the Minister any area is of
	designated a <b>Conservation Area</b> in 2008 <sup>9</sup> .	special architectural, historic, traditional or
	Conserved Buildings within	desthetic interest, the Minister may approve
	the Singapore Botanic Gardens	Plan to designate the area as a conservation
	Conservation Area:	area. A conservation area may comprise an
	<ul> <li>Houses 1–5 of the former Baffles</li> </ul>	area, a single building or a group of buildings'.
	College (designated 2008)	
	<ul> <li>Raffles Hall (designated 2006<sup>10</sup>)</li> </ul>	
	<ul> <li>E.J.H. Corner House (designated 2008)</li> </ul>	
	<ul> <li>Burkill Hall (designated 2008)</li> </ul>	
	<ul> <li>Holttum Hall (designated 2008)</li> </ul>	
	<ul> <li>Ridley Hall (designated 2008)</li> </ul>	
	<ul> <li>House 6 (designated 2013)</li> </ul>	
	<ul> <li>The Garage (designated 2013)</li> </ul>	
	Conserved Structures within	
	the Singapore Botanic Gardens	
	Conservation Area:	
	<ul> <li>Bandstand (designated 2009)</li> </ul>	
	<ul> <li>Swan Lake Gazebo (designated 2009)</li> </ul>	

## TABLE 5 PROTECTIVE DESIGNATIONS

<sup>9</sup> The boundary of the Singapore Botanic Gardens Conservation Area is due to be adjusted in 2014 so as to include the Bukit Timah Campus

<sup>10</sup> Initially designated as part of another conservation area which was absorbed into the Singapore Botanic Gardens Conservation Area on the 23rd May 2008
Designation	Extent/Date of Designation	Legislation under which status is provided
Tree	Entire Nominated Property is	The Parks and Trees (Preservation of Trees)
Conservation	within a Tree Conservation Area	Order (Cap. 216, 01).
Area	(designated 1991).	
Nature Area	The Rainforest area is a Nature Area	A Nature Area is a non-statutory designation
	(designated 2003).	demarcated on the Parks and Waterbodies
		Plan, a special and detailed controls plan which
		is a development control plan issued by the
		Competent Authority under paragraph 2.5 of the
		Singapore (URA) Master Plan Written Statement
		2008 to elaborate on the planning intention for the
		area. Nature Areas are areas of high biodiversity.
Heritage Trees	44 Heritage Trees within the	Heritage Trees are included on a non-statutory
	Nominated Property.	register by the NParks Heritage Tree Panel under
		the 2001 Heritage Trees Scheme. Heritage Trees
		must meet certain criteria in respect of their size,
		age and quality. Heritage Trees within national
		parks, nature reserves, tree conservation areas,
		heritage road green buffers and other specified
		areas (as defined by the Parks and Trees Act) are
		protected under the Parks and Trees Act (Cap. 216).



FIGURE 13 DESIGNATIONS

74 MANAGEMENT PLAN DESCRIPTION OF THE NOMINATED PROPERTY

### Protective Designations within the Proposed Buffer Zone

As shown on **Figure 14**, much of the land within the proposed Buffer Zone is designated as 'Landed Housing Areas' (including 'Good Class Bungalow Areas') with guidelines on the height and building form of residential developments within such areas. Under these guidelines, the intention is that developments within the proposed Buffer Zone should generally maintain a low–rise/low density character. Developments in close proximity to the Botanic Gardens are also subject to more stringent height controls under the Building Height Plan such that the visual amenity of the Botanic Gardens is protected.

### **Application of Other Protective Measures**

**Works within National Parks** 

The Parks and Trees Act and its subsidiary legislation (such as the Parks and Trees Regulations) set out a number of restricted activities in National Parks. A number of specific rules apply to the Singapore Botanic Gardens which are displayed on notices within the grounds of the site. The Act states that no works can be carried out in a National Park except by authorised individuals. Part III of the Act sets out:

- Restricted activities in terms of trees and plants in National Parks, including cutting and felling trees or digging or cultivating land within a National Park.
- Restricted activities in respect of animals in National Parks, including capturing, displacing or feeding any animal.
- Restricted activities in respect of boundary notices, including removing, damaging or replacing said notices.

The carrying out of restricted activities in a National Park requires approval from the Commissioner of Parks and Recreation (currently the deputy CEO of NParks). The Commissioner may request further information in relation to the application for approval and may grant or refuse an application at his discretion. The applicant must apply for a compliance certificate from the Commissioner on completion of the works.

Applications for permission to carry out works within a National Park must also be made to the Competent Authority under the Planning Act (Cap. 232). In determining an application, the Competent Authority will take into account any relevant guidelines relating to National Parks which may be issued by NParks as well as all applicable building guidelines, relating to building height and density, building use and form, urban design, plot size and any conservation guidance where applicable.

Works Affecting Tree Conservation Areas

Trees within a Tree Conservation Area are protected under the Parks and Trees Act/Order. It is a requirement of the Act that written permission for proposals to fell any mature tree (defined as any tree with a girth measurement greater than one meter, measured half a metre from the ground) is obtained from the Commissioner of Parks and Recreation. This applies to developers as well as owners of private properties (even if no development works are being undertaken).

### **Works Affecting Heritage Trees**

Heritage Trees within the Nominated Property are protected under the Parks and Trees Act (Cap. 216). The health of Designated Heritage Trees is assessed at least once a year and each Heritage Tree is fitted with a lightning protector. An educational sign is erected in the vicinity of each Heritage Tree for educational purposes.

### **Works Affecting Nature Areas**

While there are currently no statutory planning guidelines pertaining to Nature Areas, if development falls within or in the vicinity of a demarcated Nature Area, ecological studies may be required as advised by the relevant authority before any development proceeds.



FIGURE 14 BUILDING HEIGHT CONTROL

76 MANAGEMENT PLAN DESCRIPTION OF THE NOMINATED PROPERTY Dr Yam Tim Wing Pollinating Orchids at the Orchid Nursery

## SIGNIFICANCE OF THE PROPERTY



### 3.0 SIGNIFICANCE OF THE PROPERTY

### General

This chapter describes the significance of the Singapore Botanic Gardens through the identification of its values. This includes the Outstanding Universal Value of the property as a World Heritage Site, as well as other national, regional and local values.

### Proposed Statement of Outstanding Universal Value

The proposed statement of Outstanding Universal Value of the Singapore Botanic Gardens is described in the WHS Nomination Document and repeated below. This understanding is important for informing decisions about the protection, conservation, sustainable use and management of the site.

### **Brief Synthesis**

The Singapore Botanic Gardens, originally laid out in the 1860s, is a green lung in the midst of rapid and extensive urban development. In addition to its botanic excellence today, the continued presence of the Botanic Gardens has provided generations of Singaporeans and visitors alike with a sustained sense of place and anchor to the island's local cultural history.

The Singapore Botanic Gardens is an exceptional example of a 'British tropical colonial botanic garden' which emerged during the 19th century period of global expansion, exploration and colonisation in Southeast Asia. The Botanic Gardens assumed a pre-eminent role in the promotion of economic botany in the Malay Peninsula and Straits Settlements administration during the late 19th century and early 20th century. Today the landscape of the Botanic Gardens bears testimony to the history of British colonial botanic gardens, the 19th century colonial legacy of economic botany and the long lasting history of and unique contribution to the economic, social and scientific developments of the region. In particular, the pioneering work on rubber cultivation and techniques for tapping carried out in the 1880s and 1890s set in place the foundation of the early 20th century rubber boom in Southeast Asia.

The Botanic Gardens has a well–defined cultural landscape which includes a rich variety of historic landscape features that demonstrate clearly its initial establishment as a pleasure garden in the 1860s and its subsequent evolution and continued role as a botanic garden. The extensive living collections include many veteran trees and unusually the site includes a six hectare tract of primary, lowland, equatorial rainforest within its boundaries. An ensemble of historic buildings including colonial style bungalows, built between the 1860s and 1920s for staff residences and administration, contributes to the cultural landscape of the Botanic Gardens.

Since its beginning, the Singapore Botanic Gardens has been a leading centre in plant science, research and conservation in Southeast Asia. Today it is internationally recognised as a leading institution of tropical botany and horticulture and its library and herbarium collections serve as an important reference centre for botanists all over the world. The site represents the cradle of breeding science for orchids in Asia, a hybrid programme having first been initiated in the Botanic Gardens in the 1920s, with formal orchid breeding programmes continuing to the present.

The Botanic Gardens has played an integral role in the social history of Singapore, providing a backdrop for the lives of residents, both past and present and a continual sense of place and identity in an otherwise changing city. It was and continues to be instrumental in the 'greening' and transformation of Singapore into a 'City in a Garden', successfully implementing the former Prime Minister Lee Kuan Yew's vision for this in the 1960s.

The British South and Southeast Asian colonial botanic gardens were preeminent in terms of other colonial botanic gardens, as a direct consequence

of their mutually advantageous role as outposts of the Royal Botanic Gardens, Kew. Singapore Botanic Gardens was part of a wide network of over 100 other British botanic gardens, which was many times bigger than that of other colonial empires. All these sites to some degree contributed to 19th century developments in economic crop growing which established this region of Asia as an important economic power. However, Ridley's late 19th/ early 20th century extensive work on perfecting rubber cultivation and extraction, undertaken at the Singapore Botanic Gardens, combined with his relentless promotion of the crop, can be singled out as perhaps the most significant contribution to Malaya becoming the biggest rubber producer in the world and creating an entirely new and booming economy with global influence. As stated by Brockway (1979) ' between the two world wars, Singapore was the rubber capital of the world'.

Other remaining British tropical colonial botanic gardens that have survived fully or in part in South and Southeast Asia include Penang (Malaysia), Peradeniya (Sri Lanka), Calcutta (India) and Hong Kong. Only Peradeniya and Calcutta continue as significant botanic gardens today with a degree of scientific and recreation functions. The combination of Singapore Botanic Gardens' rich and diverse historic cultural landscape; long-established scientific, educational and recreational world-class functions; remarkable contribution to economic and ornamental plant research (particularly in relation to rubber production and orchid hybridisation); high level of authenticity and integrity; role in the greening of Singapore and the shaping of the island's identity; along with the presence of a tract of primary lowland rainforest make it stand out when compared to other similar properties.

### **Criteria under which Inscription is Proposed** (and Justification)

The Singapore Botanic Gardens is proposed for inscription on the World Heritage List under Criteria (ii) and (iv) of the World Heritage Convention.

### Criterion (ii) – "Exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town planning or landscape design".

The Singapore Botanic Gardens has been a prominent centre for plant research in Southeast Asia since the 19th century. It continues to play a leading role in the interchange of ideas, knowledge and expertise in tropical botany, agricultural economy and horticulture and represents an important reference centre for botanists all over the world. The Botanic Gardens has gained international recognition for starting and maintaining traditions in plantation agriculture, natural history, biodiversity science and conservation in the region and has also played a pivotal role in the greening of Singapore, which influenced town planning in other cities in Southeast Asia.

### Criterion (iv) – "Be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history".

The Singapore Botanic Gardens is an outstanding example of a British tropical colonial botanic garden and the best preserved of its kind. This cultural landscape demonstrates its different stages of development since 1859 through its layout<sup>11</sup>, extant historic landscape and built features and its uses and functions. The evolution and sustained preservation of the Botanic Gardens reflects the changing shift in attitudes regarding the role and functions of botanic gardens worldwide and throughout Southeast Asia. The assemblage of historic landscape features and buildings and conserved lowland primary rainforest in combination, richly illustrate the development and mixed role of the Botanic Gardens during the period of British colonisation. These, together with more recent interventions since Singapore's independence, which respect the cultural heritage of the Gardens, continue to support the very significant scientific, educational, cultural and recreational role and offer of the Botanic Gardens in the modern city-state of Singapore.

<sup>11</sup> The layout has left the unusual legacy of the English Landscape movement in a tropical environment.

### **Statement of Integrity**

The Nominated Property includes within its boundary all elements necessary to express its Outstanding Universal Values. Its completeness is represented by the range of landscape features, buildings and structures most closely associated with the Singapore Botanic Gardens as a British colonial botanic garden. The layout and ensemble of landscape, buildings and structures included in the Nominated Property have high integrity, being in good condition and having survived virtually intact. The physical fabric of the property largely has not suffered from adverse effects of developments or neglect, with inappropriate changes controlled through statutory protection and management measures. In addition, late 20th century changes reflect the on-going development of the historic use of the Nominated Property and its role in public education. They do not significantly dilute the cultural landscape, strong sense of place or traditions that endure at the Singapore Botanic Gardens.

### **Statement of Authenticity**

The key attributes that contribute to the Outstanding Universal Values of the Nominated Property meet the conditions of authenticity. The landscape, buildings and structures within the Nominated Property have high levels of surviving authentic fabric and the spatial planning and layout of the Nominated Property is authentic. Considerable elements of the Nominated Property are either still used in the manner in which they were originally intended, or are used in a manner that is sensitive to their original purpose.

#### **Protection and Management Requirements**

The Nominated Property is protected by laws of the Singapore Government, namely the Parks and Trees Act and the Planning Act, which provide for a range of statutory conservation designations and development control planning measures that will protect and conserve its attributes of Outstanding Universal Value. The majority of the Gardens is designated as a National Park, and the whole of the Nominated Property is designated as a Conservation Area (which includes a number of Conserved Buildings and Structures) and it is also designated as a Tree Conservation Area. Works affecting these conservation designations are strictly controlled under the relevant legislation. The visual setting of the Nominated Property within the proposed Buffer Zone is protected by stringent controls on the height and form of buildings implemented through the Singapore Master Plan.

All land within the Nominated Property is within the ownership of the State and under the management of NParks. The Singapore Botanic Gardens' current annual operating and staff budget is S\$15 million, with substantial additional funding available to support a variety of infrastructural developments and maintenance works. The Singapore Botanic Gardens employs 125 full-time staff, supported by an active volunteer base. Responsibility for the Gardens' overall management lies with its Director who is assisted by two Senior Deputy Directors and four Deputy Directors. The Management Plan submitted with the Nomination provides an overarching framework for the long-term protection and conservation of the Nominated Property. There are currently no substantial threats to the Outstanding Universal Values of the Nominated Property.

### Attributes of Outstanding Universal Value

A summary of the key attributes that together convey the proposed Outstanding Universal Value of the Singapore Botanic Gardens, and which need to be protected, managed and monitored, is provided overleaf.

### Other Values

The significance of the Singapore Botanic Gardens includes other national and local values, in addition to the Outstanding Universal Values of the property as a World Heritage Site. It is important that these values are recognised and taken into account in decision making about the future management of the site. An overview of relevant other national/local values is thus provided below:

 Other historic/cultural values – the Singapore Botanic Gardens is one of only a few extant historic parks/gardens in Singapore and has been visited by a great number of important guests (including royalty and heads of states).

- Other community and recreational values the Botanic Gardens attract a wide range of users groups (who enjoy diverse formal and informal recreational activities) and offers popular events/ activities. Musical events, which have taken place at the site since the 1860s, remain particularly popular. The community value attached to the site is reinforced by the presence of volunteers.
- Nature conservation value besides the important conservation research/work being carried at the Botanic Gardens, the site itself is of local nature conservation importance, providing habitats for a range of species. The Rainforest is particularly valuable.
- Aesthetic and architectural values the design of the Botanic Gardens has aesthetic value, which is also true of its horticultural displays (some designed/planted for public enjoyment rather than botanical research). A range of buildings/structures within the Gardens have architectural value (e.g. Holttum Hall).
- Educational value the Botanic Gardens is of high educational value. The Gardens works closely with the Ministry of Education and have aligned their educational remit with the Global Strategy for Plant Conservation. 746 educational activities were run at the site between April 2012 and March 2013 (including formal and informal activities).
- Tourism and economic values the Singapore Botanic Gardens is the most visited botanic garden in the world. It received approximately 4.4 million visitors in 2012/13 and is a key visitor destination in Singapore.

1.) The Botanic Gardens' role as a leading centre in plant science and conservation, which has been a key function for the site since the late 19th century.

Areas of focus have included:

- Plant exchange and economic botany, associated with colonial plantation crops.
- Plant breeding/ornamental plant research.
- Plant taxonomy and systematic botany.
- Biodiversity and plant conservation.
- Capacity building and collaborative work the Botanic Gardens continues to endeavour to share its knowledge and skills widely and encourage collaborative research.

### 2.) The well-defined multi-layered cultural landscape, which includes a rich assortment of historic features and clearly demonstrates the site's evolution.

This includes:

- The site's original 1860s pleasure garden layout, an unusual landscape design in the tropics (containing interconnecting curving pathways and promenades, a levelled parade area for military bands to play music and a pocket of primary lowland rainforest. It also includes Swan Lake, created in 1866).
- Other historic landscape features including heritage trees, heritage plant collections (e.g. Frangipani collection), Palm Valley (1879), The Dell (1882), the Sundial Garden (1929) and brick steps constructed during the Second World War.
- The ensemble of surviving historic buildings and structures (e.g. Burkill Hall and the bandstand).

### 3.) The invaluable living and preserved plant collections, which underpin the site's scientific, conservation, educational and recreational functions.

These consist of:

- The living collections which include 36,400 plant accessions which represent 226 plant families; 1,739 general; 6,544 species and 9,021 taxa. A number of accessions pre-date the Gardens' establishment and some are rare. The site also has genetic collections.
- The preserved collections, housed in the internationally accredited Herbarium, which include 750,000 dried paper mounted plant specimens, of which 8,000 are type specimens; 6,000 fungi specimens and 6,200 plant/fungi specimens preserved in alcohol.
- The bibliographic and visual reference collections, housed in the library and archive, which include 28,000 books/pamphlets, 300 journal titles, 2,000 paintings/ illustrations.

## 4.) The site's key contribution to the development of Singapore's identity and social development.

- The continued presence and survival of the Botanic Gardens conveys a strong sense of place and identity to Singaporeans.
- The site provides a cherished and popular flagship green space and visitor attraction, which continues to foster community cohesion and cultural and social ties in Singapore.

### 5.) The site's key contribution to the greening of Singapore, which has influenced town planning in other cities across the world.

- The Botanic Gardens was central (in a practical, training and research capacity) to the delivery of Lee Kuan Yew's 'Garden City' (now 'City in a Garden') vision.
- Today it plays a central role in providing expertise and plant material for in situ conservation efforts in Singapore; it delivers important educational activities and also remains a key component of Singapore's green infrastructure network.





### 4.0 KEY MANAGEMENT ISSUES

### General

This chapter identifies ways in which the Outstanding Universal Values, authenticity and integrity of the Singapore Botanic Gardens, and its other values, are vulnerable to change, and also opportunities for how they can be enhanced and used sustainably.

Protecting the Site's Outstanding Universal Value

#### **Planning and Policy Framework**

The Nominated Property is protected by laws of the Singapore Government, namely the Parks and Trees Act (Cap. 198A) and the Planning Act (Cap. 232), which provide for a range of statutory conservation designations (see Section 2.5) and development control planning measures that afford protection of the site's OUV, authenticity and integrity.

### Issue 1: The need to take into consideration the WHS status of the Singapore Botanic Gardens through the land use planning system and development control

Land use planning in Singapore is carried out by URA, the national land use planning and conservation authority, in conjunction with other government agencies. A long-term approach to land use planning has enabled Singapore to achieve a balance between development and conservation of natural and cultural heritage assets. The Singapore Concept Plan is the strategic land use plan that guides Singapore's development over a 40 to 50 year period. This is supported by the Singapore (URA) Master Plan which is the statutory land use plan prepared under the Planning Act for guiding Singapore's development in the medium term over a 10 to 15 year period. The Singapore (URA) Master Plan translates the broad long-term strategies of the Concept Plan into detailed plans to guide development, and sets out land use zoning and plot ratio/intensity policies for land in Singapore. Development control plans such as Landed Housing Area plans and Building Height Plans are published to provide further elaboration and guidance of the planning intention of the Singapore (URA) Master Plan.

The Nominated Property is substantially reflected as a national park and a conservation area in the Singapore (URA) Master Plan. Under the Singapore (URA) Master Plan Written Statement, when determining a planning application, the competent authority is required to take into consideration relevant guidelines for national parks that may be issued by the National Parks Board and relevant conservation guidelines. The competent authority may also, in determining a planning application, impose requirements with regard to the Nominated Property as a national park and conservation requirements as it may deem expedient or necessary.

Following inscription, the status of the Singapore Botanic Gardens as a World Heritage Site, in addition to its status as a national park and a conservation area, should be taken into consideration by the competent authority in determining planning applications that may have implications for the protection of the Outstanding Universal Values, integrity and authenticity of the World Heritage Site.

Should the Nominated Property be inscribed on the World Heritage List, there would be an opportunity for its boundary as well as that of the proposed buffer zone to be reflected in URA's 'Special and Detailed Control Plan' (SDCP). The SDCP is a development control plan issued by the Competent Authority under paragraph 2.5 of the Master Plan Written Statement to elaborate on the planning intention of the area. Reflecting the boundary of the Nominated Property and its buffer zone in the SDCP would give recognition to the Singapore Botanic Gardens as a World Heritage Site and would help guide development within the Singapore Botanic Gardens as well as its surrounding.

The Rainforest area is designated as a Nature Area under URA's Parks and waterbodies Plan. Following inscription, the Tyersall Learning Forest, although not part of the Nominated Property, has potential to be considered for designation as a Nature Area as its high biodiversity and conservation value greatly enhances the Rainforest.

### Issue 2: The need to maintain effective application of the development control system

The principle legislation that regulates development of land and conservation in Singapore is the Planning Act. Under the Planning Act, any proposal to develop land or to carry out works in a conservation area (e.g. to erect a new building, to carry out additions or alteration to or change the use of an existing building) is required to obtain planning and/or conservation permission under the Act before the development or works are carried out. An effective regulatory system is thus in place, such that proposals for new developments, change of use or alterations to existing buildings of the Nominated Property or land within the Buffer Zone are subject to planning or conservation permission (unless otherwise exempted). This regulatory process allows URA to assess each proposal and to consciously guide developments in accordance with the intended outcomes.

The Nominated Property is zoned 'Park' in the Singapore (URA) Master Plan 2008, which requires that the land be set aside for use as a park or garden, for the enjoyment of the general public. The Nominated Property also falls within a gazetted Conservation Area. Hence, any proposal to carry out works within the Singapore Botanic Gardens (whether it is development, change of use or conservation restoration works) will be required to obtain a conservation permission under the Planning Act.

The Conservation Guidelines (URA, 2011) provide the conservation principles, planning parameters and restoration guidelines for conserved shop house and bungalow building typologies, as well as planning parameters and envelope control guidelines for new buildings within Conservation Areas. It is an owner's responsibility to upkeep a conserved building or structure. However, if the building is not in a state of good and serviceable repair or in a proper and clean condition, the Commissioner of Buildings may, by written notice, require the owner to carry out repair and maintenance works.

### **Setting of the Singapore Botanic Gardens**

### Issue 3: The need to protect the site's setting from inappropriate development

The land within the proposed Buffer Zone is zoned in the Singapore (URA) Master Plan (2008) for a mix of uses such as Residential, Education and Open Space. Development within the Buffer Zone is assessed based on the Singapore (URA) Master Plan and also detailed development control plans and guidelines.

In areas designated as 'Landed Housing Areas' (including 'Good Class Bungalow Areas'), landed housing developments are subject to lower permissible building height of not more than 2 storeys tall. For Good Class Bungalow Areas, there are also more stringent controls on site coverage, to reduce the extent of built-up areas such that the environment retains, as much as possible, an open and wooded character.

As for other non-landed residential and/or nonresidential developments within the proposed Buffer Zone, these are generally zoned with a lower plot ratio of 1.4, the intention being to maintain a low rise/low density character congruent to the Nominated Property. To safeguard the visual amenity of the Nominated Property, the Building Height Plan also provides for more stringent height controls on developments in close vicinity of the Botanic Gardens.

Given the protective heritage designations and controls that apply to the Nominated Property, proposals for new development or change that would harm its Outstanding Universal Values are not likely to be permitted.

There are no designed views between the site and the surrounding area and views out of the site are limited. The visual setting of the Nominated Property is protected by stringent controls on the height and form of existing/proposed new buildings, implemented through the Singapore (URA) Master Plan. Potential future development pressure or changes in land use within the visual setting of the Nominated Property should however be carefully monitored.

### Conserving the Site

### Landscape

### Issue 4: The need to conserve and enhance the historic layout, landscape and planting framework

The Nominated Property's landscape is central to its values and significance as a cultural landscape of Outstanding Universal Values. It includes a rich variety of landscape features from different periods that clearly demonstrate its initial establishment as a pleasure garden in the 1860s and subsequent evolution and continued role as a botanic garden. Its 1860s layout (containing interconnecting curving pathways and promenades, a levelled parade area for military bands to play music and a pocket of primary lowland rainforest<sup>12</sup>) has survived virtually intact and has left an unusual legacy of the English Landscape Garden Movement in a tropical environment. The living collection, which includes specimens pre-dating the creation of the Gardens, provides much of the character and structure of the historic and more modern landscape whilst also providing a crucial scientific resource. Central to conserving the Outstanding Universal Values, integrity and authenticity of the Singapore Botanic Gardens is a need to maintain the historic landscape layout and character whilst sustaining the Gardens' tradition of change and contemporary landscape design (see Issue 8). The site should be recognised as a living cultural landscape.

In light of the dynamic nature of plants and possible threats to the living collection (e.g. loss of plants due to age, pest and disease or the weather), it will be essential that a cyclical programme of maintenance and planting is delivered (succession planting needs to be planned for). The Botanic Gardens continues to be managed according to historic 'Lawn' areas (see **Figure 1 of Appendix ii**). An assessment of each Lawn was recently undertaken (providing information on their content, heritage value, present condition, constraints, strengths, weaknesses and potential for improvement) and individual ten year action plans devised. Together these form the 10 Year Living Collection Management Plan. Actions include, for example, the need to de-accession certain plants, enhance the water quality of some water bodies (e.g. the stream in Lawn C), enhance the condition of particular plant collections (e.g. the bonsai collection in Lawn N and some of the palms in Lawn W) and provide plant labels and interpretation. The Living collection Management Plan should be regularly reviewed and updated as and when appropriate.

As illustrated on **Figure 8** there are a number of key view corridors within the Botanic Gardens that give a sense of openness in some areas and also assist visitors in orientating themselves. These views should be conserved and the intended openness of a number of Lawns sustained both through ongoing maintenance of the existing vegetation (which typically grows very quickly and can thus rapidly change the character of a Lawn) and strict control of new planting.

The Nominated Property is predominantly inward looking. The tree cover and vegetation along its southern, eastern and western edges provides a strong sense of enclosure and insulation from the surrounding urban areas. This is re-enforced by the presence of display gardens to the north and the Tyersall Learning Forest to the west, which both form part of the Buffer Zone and the wider Singapore Botanic Gardens. There is a need to maintain, and where appropriate enhance, the existing treescape/vegetation around the periphery of the Nominated Property to sustain the Gardens' character and atmosphere and the cherished feeling of seclusion and escape from the city it affords. The western historic limit of Lawns F and G (shown on Figure 1: Appendix ii) should be carefully retained when the Tyersall Learning Forest is fully incorporated into the Singapore Botanic Gardens.

### Issue 5: Understanding the historic development of the landscape

Whilst well documented, the historic development of the Gardens is currently difficult to discern onsite and should be better interpreted. The former presence of important Economic Gardens in the northern half of the site goes mainly undetected by visitors, who are also generally unaware of the historic relationship of Houses 1-5 with the former Raffles College located just beyond the boundary of the Nominated Property.

<sup>12</sup> See issue 20 for information relating to the conservation of the Rainforest

A heritage museum, opened in 2013, provides valuable information about the site's history and its key heritage features. It includes, for example, an interactive table that allows visitors to see how the site has changed over time. A range of interpretation panels are also progressively being installed across the site.

#### **Issue 6: Conservation of Heritage Trees**

The Nominated Property includes 44 Heritage Trees<sup>13</sup> for which arboricultural assessments are currently being carried out. Each assessment includes a list of actions to enhance the health/ structural integrity of individual trees. A site wide arboricultural strategy has also been developed as part of the 10 Year Living Collection Management Plan.

Small fences are due to be erected around a number of Heritage Trees to alleviate soil compaction issues associated with visitor footfall and some damage caused by individuals climbing on the trees. It is important to implement succession plans for heritage trees in order to maintain their heritage lineage. Due to the frequency and severity of storms in Singapore, lightning conductors have been fitted on all heritage and tall trees in the Gardens.

#### Issue 7: Display of the living plant collection

The living collection is part of an ongoing and evolving curation programme, which seeks to ensure that research and conservation needs are met, keynote specimens (e.g. of heritage or horticultural value) are conserved, the historic character/ structure of the landscape is maintained and a quality visitor experience is provided. To inform decisions relating to the retention/replacement of individual plants within the living collection, each plant is assigned one or more values (e.g. heritage, scientific, horticultural). In accordance with the Gardens' Acquisition and Retention Policy, there is an intention to replace 'low value' plants with new 'higher value' ones and, wherever appropriate, to replace plants with new more accurately documented plant material (particularly in relation to provenance). There would be value, as part of the public offer, to communicate the different values attached to the living collection/specific plants. Ongoing efforts to label and interpret the living collections should be sustained.

Going forward, there is a need to take into account and accommodate the likely effects of climate change on the living collection. The most likely risks at present are an increased incidence of severe weather events leading to storm damage or prolonged droughts and changes to existing growing conditions. The selection and planting of new specimens may need to become more climate driven.

There are opportunities for the Botanic Gardens to realise its conservation mission on a local scale through the promotion of increased biodiversity within the Gardens. More information regarding opportunities to enhance the Gardens' nature conservation value is provided under Issues 17-21.

### Issue 8: Opportunities for contemporary landscape design

Botanic Gardens are dynamic and living landscapes, where change is not only inevitable and continuous but also integral to their history and continued viability. Going forward, it will be important to ensure that historic and contemporary landscape elements are represented in a balanced and cohesive way, respecting and promoting each other's significance. New additions will need to be in keeping with the context of the historic landscape framework and carefully sited. Going forward there would be benefit in considering developing a Historic Landscape Improvement Plan; which would include a detailed WHS/historic landscape vision and heritage improvement strategy, to guide this.

#### **Issue 9: Enhancing the nursery facilities**

The Gardens' nursery facilities are essential to the ongoing conservation of the living collection. The nursery facilities located within the Potting Yard and National Orchid Garden (within the Nominated property) as well as the Plant Resource

<sup>13</sup> Heritage Trees are included on a non-statutory register by the NParks Heritage Tree Panel under the 2001 Heritage Trees Scheme. The Heritage Tree Panel has a multi-agency representation and includes community representatives

Centre (immediately outside the Nominated Property, within the Buffer Zone) are all in need of refurbishment and/or expansion. Works to address this are scheduled to take place in the very near future and funding is already in place for the National Orchid Garden and Plant Resource Centre refurbishments.

### Issue 10: Opportunities to enhance the public realm/hard landscape elements

The Gardens includes a wide range of hard landscape/public realm elements (e.g. signage and markings, fencing, seating, bins, path surfaces, plant containers and lighting) which need to meet visitor requirements (in terms of their functionality and location) and contribute positively to the landscape setting. There would be value in developing sitewide public realm design guidelines to ensure that going forward all elements contribute to the visual appearance of the site and the sense of quality, are not considered in isolation but on how they work and complement one another and enhance the cohesiveness of the site; whilst providing high quality visitor infrastructure. Such guidelines could be part of a Historic Landscape Improvement Plan.

#### **Issue 11: Training needs**

It is recognised that some members of staff would benefit from receiving targeted botanical/ horticultural training, which would enrich the guidance provided to on site maintenance contractors. A training programme has been established, which should be regularly reviewed. Trainee managers also benefit from the 'master classes' delivered by visiting botanical specialists. The need for staff to gain a Workforce Skill Qualification from the Centre for Urban Greenery and Ecology should also be explored.

Ensuring that suitably skilled staff can manage and maintain the site is of high importance. There would be benefit in exploring opportunities to reestablish a School of Horticulture in the Gardens. With its internationally renowned living collections, herbarium, botanical library and expert staff, the Singapore Botanic Gardens provides an ideal environment in which to learn about horticulture and botany. This would allow individuals to gain a specialist skill set and qualification not currently on offer in Singapore or the Southeast Asian region and would support a possible shift in the maintenance of the Gardens, away from a reliance on contractors.

#### **Built Heritage**

#### **Issue 12: Deterioration due to climate and pests**

Both the humid tropical climate of Singapore and the presence of certain termite species have an impact on the condition of a range of buildings in the Gardens, contributing to faster deterioration of their fabric (particularly wooden buildings). Strategies are in place to alleviate these issues, including a regular maintenance programme and pest control (work is ongoing to identify appropriate biological control measures). Due to the frequency and severity of storms, lightning conductors have been fitted on all buildings.

### Issue 13: The need for regular inspections and an ongoing maintenance programme

The site's historic buildings are currently inspected on a quinquennial basis and subject to ongoing maintenance. It is essential that this is sustained, preventing or reducing the need for repair and deferring the need for major and expensive work. The Garage and House 6 are in need of external decoration and/or repair (The former has some termite damage and a leaking roof).

Conservation permission should be obtained from the Competent Authority prior to any refurbishment/restoration works being carried out to Conserved Buildings/Structure. All works must comply with the Conservation Guidelines issued by URA.

### Issue 14: The need for Building Conservation Plans

The ensemble of historic buildings/structures in the Botanic Gardens contributes to the significance of the cultural landscape. As such, it is crucial that the physical fabric, basic structure and setting of these structures are conserved, including any significant internal fittings/decorations. In line with best practice, individual building conservation plans should be developed, outlining the significance of a historic building/structure and how that significance will be retained in any future use, alteration, development or repair; addressing particular needs and issues. These could form part of an overall Historic Landscape Improvement Plan. A survey of the interior and surviving historic features (including the layout) of each historic building/structure should be undertaken and information fed into the relevant building conservation plan.

There would be benefit in protecting the setting of each historic building/structure through the establishment of individual buffer zones around the buildings/structures within which none or only very selective development would be permitted. Opportunities to enhance the landscape setting of the historic buildings/structures should be explored and appropriate actions included in the 10 Year Living Collection Management Plan and crossreferenced to appropriate building conservation plans (e.g. there would be benefit in removing the shrubberies surrounding the base of the bandstand and in replacing some of the plants around Corner House which are causing excess moisture to accumulate on the walls of the building).

### Issue 15: Opportunities for contemporary architecture

Apart from the historic buildings in the Gardens, there are a number of newer buildings ranging from offices and laboratories to visitor facilities (e.g. food and beverage facilities). It is inevitable that there will continue to be a need/demand for a range of new buildings and structures as the Gardens continue to develop and the visitor offer/scientific research needs are reviewed.

New additions will need to be in keeping with the context of the historic landscape framework and carefully sited. Going forward there would be benefit in considering developing a Historic Landscape Improvement Plan, which would include a detailed WHS/historic landscape vision and heritage improvement strategy, to guide this.. A set of design guidelines (on height, volume, composition, choice of materials etc) could also be developed as part of this strategy to ensure that all additions are of a high architectural quality and do not impact negatively on the OUV of the site.

### Issue 16: Building infrastructure having to meet 21st century standards and uses

Legislation and regulations relating to health and safety, equality of access and environmental standards can mean that changes are needed to heritage assets. Careful assessment and planning is essential in formulating options which will satisfy legal requirements whilst best safeguarding a historic asset's fabric and character.

All of the site's historic buildings are currently in use but no longer serve their original functions. Some functions, such as the provision of residences for senior staff, ceased decades ago, whilst others (e.g. provision of laboratory or herbarium facilities) were relocated to new buildings. Ensuring that the current and future function(s) of a building does not adversely affect its setting, character and fabric is important to its conservation.

#### **Nature Conservation**

### Issue 17: The need to establish a baseline for monitoring biodiversity

Whilst a range of ecological surveys have been undertaken at the Singapore Botanic Gardens (including bird surveys), there is a need to undertake a habitat survey of the entire property (besides the rainforest). The purpose of the survey will be to map the habitats present within the property, record the wider landscape context within which the property is positioned and provide the scope for identifying a suite of more detailed ecological surveys.

Overall, the combination of habitat and species surveys will provide the baseline from which opportunities to conserve and enhance the site's nature conservation value can be identified (including actions relating to future habitat/ creation/enhancement and management practices). Without a basic knowledge of the distribution and abundance of the floral and faunal species present within the site (including and understanding of dispersal and migratory patterns), it will be difficult to assess the risks and opportunities which either currently, or may in the future, affect the management of the site.

The suite of detailed surveys developed through the initial habitat survey and desk study will need to be incorporated into a rolling monitoring programme against which future changes in species abundance and distribution can be measured, and corresponding management work delivered.

### Issue 18: Assessing the effects of visitors on the nature conservation value of the Nominated Property

In tandem with the ecological surveys outlined above, detailed visitor survey information will also be required. The survey will need to identify numbers of visitors using the site, their distribution in terms of both preferred locations to visit and time (of day), and particular 'hot spots' i.e. areas that are particularly favoured by visitors and the use of 'desire lines' (unauthorised routes that provide a cut-through or route that is not a designated path). The effects of visitor pressure on biodiversity may have both direct (e.g. disturbance) and indirect (e.g. compaction or erosion) effects.

Without this information it will be difficult to assess the potential effects that visitors are having on the ecological interest of the site. Visitor surveys, analysed in combination with the biodiversity surveys, will help to provide an understanding of what or where visitor pressure may be affecting the site and what management or landscape design (layout) responses, may be most appropriate to managing those pressures.

### Issue 19: Development of a site-wide Biodiversity Conservation Plan

The combined information relating to Issues 17 and 18 will provide the basis for a site-wide Biodiversity Conservation Plan. The Plan will need to encompass the management of current condition, but also encompass opportunities to enhance the site's overall biodiversity value, into the future. It will also need to ensure that the site's attributes of Outstanding Universal Value are conserved. Requirements to control invasive species that could threaten the site's importance as a botanic garden, as well as its biodiversity interest, are likely to feature prominently in the plan.

#### Issue 20: The need to conserve the Rainforest

The six hectare area of primary lowland rainforest, deliberately preserved when the Gardens was first established, is located in the southern half of the Gardens. Due its relatively small size the Rainforest suffers from 'edge effects' and requires constant attention to reduce and, ideally, eliminate invasive weed species that enter around its margins, and to control the rampant growth of lianas that thrive in the undisturbed areas where ecological balance is lacking. Its composition is known to have changed over time and it appears to have become less humid. Its layers have slowly diminished with changes in the micro-environment of the soils and the surrounding environmental conditions - this change has caused the ground layer and shrub flora to be greatly reduced. Efforts to enhance the condition of the Rainforest are ongoing, with recent works including the provision of raised boardwalks to allow better species connectivity and minimise the impact of visitors walking through it.

Opportunities for enhancing the Rainforest are set out in the Action Plan for Lawns U, V, N and M. These include reinforcing the Rainforest with species that can be expected to have once occurred within it (or in similar forests of the region), removing invasive species and investigating ways to increase humidity levels (e.g. sprinkler system). Some of the most important trees in the rainforest are represented by only one or two individuals, which reinforces the need for a long-term plant replacement strategy to be in place at the Gardens.

### Issue 21: Connectivity and the long-term sustainability of the site's biodiversity

The site is relatively small and is, in large part, surrounded by urban development. Whilst it remains isolated from other areas of greenspace, the longevity and sustainability of the species assemblages that the site supports, are likely to remain fragile and subject to deterioration over time. A key long-term issue is the need for green corridors and stepping stones to connect the site with the Central Catchment, in order to facilitate the dispersal of species, reduce the effects of fragmentation and increase the site's long-term resilience to environmental change.

#### **Environmental Sustainability**

### Issue 22: Best practice in relation to sustainability

Whilst environmental sustainability and related best practice is at the forefront of the management of the Gardens, there would be benefit in this being better communicated and showcased as part of the visitor experience.

The Gardens has a corporate ethos of environmental sustainability and together with the National Parks Board as a whole is accredited with ISO 14001. Internally the Gardens already undertake numerous measures that contribute to its environmental ethos. These include:

- Leaf litter management, which involves the re-use of all leaf litter found in the Gardens as mulch. This minimises, amongst many things, desiccation, erosion and root damage and buffers local microclimates against imbalance, favouring biotic interactions (worms, micorrhizae etc). Educating people about why leaf litter is being retained is crucial.
- Recycling of all green horticulture waste.
- Integrated pest management in the living collections, with chemicals used as a last resort. Efforts to seek biological agents and controls are ongoing. In collaboration with NParks' Conservation Division, pests such as squirrels are captured and relocated to the nearby island of Pulau Ubin, to repopulate the reduced population there.
- Use of zero-emissions vehicles on-site, wherever possible.
- Ongoing investigation into the use of environmentally friendly lighting systems, to minimise light pollution.
- Storm water management future plans include expanding existing storm water recipient areas.

This sustainability ethos has also been realised through building development – the CDL Green Gallery is Singapore's first purpose-built zeroenergy gallery, which includes two eco-innovative technologies and sustainable features such as a green roof and walls. The Green pavilion also features a green roof. Proposals, trials and already implemented methods for more sustainable practices developed by the Botanic Gardens' staff are shortly due to be showcased to the rest of NParks and Singapore's horticultural industry.

There would be benefit in an overall Sustainability Strategy/Statement being formulated for the Botanic Gardens, outlining its commitment and strategy towards all areas of sustainability.

### **Climate Change**

### Issue 23: The effects of climate change on the Nominated Property

A Climate Change Study has been commissioned by the Singapore National Climate Change Secretariat to examine Singapore's vulnerabilities to climate change. Phase 1 of the Study was completed in 2009 and looked at the physical effects of climate change such as changes in sea-level and temperature rise. The findings of the Study are that 'by 2100, average temperatures could increase by 2.7 to 4.2 degrees Celsius; while sea levels could increase by 0.24 to 0.65m'. No discernible trend was identified in relation to change in rainfall, necessitating further studies. Phase 2 of the Study has been commissioned and will look at other projected effects of climate change, such as public health, biodiversity and energy consumption. Staff at the Botanic Gardens are also currently conducting research into climate change in Southeast Asia and are due to present their findings at a conference in January 2014.

The most likely direct impacts of climate change to the Nominated Property are increased incidences of severe weather events leading to storm damage or prolonged droughts (impacting on water resources) and changes to existing growing conditions (although there is much uncertainty about how individual species will respond).

In light of the existing frequency and severity of

storms in Singapore, lightning conductors have already been fitted to all heritage/tall trees and buildings. These are inspected on a regular basis. Ensuring that viable stock is available for replacing damaged plant material, as appropriate, will be important - this reinforces the aforementioned need for a site-wide plant replacement strategy. Considerable droughts were experienced in 2012, which resulted in the Botanic Gardens almost running out of irrigation water - staff are considering options for improved water storage (including expanding existing storm water recipient areas/recycling rain water) to ensure that a sustainable source of irrigation water is available to maintain the living collection. The Gardens' clay base exacerbates drought related issues for trees, which are at a greater risk of falling over if the clay shrinks. Water conservation measures via soil mulching (leaf litter management) are already in place and will become increasingly important.

Whilst the likelihood of a micro-burst storm affecting the Singapore Botanic Gardens is small, it cannot be ruled out or prevented – such a storm would have the potential to cause significant damage to both the living collection and buildings.

There is a need for the risks, opportunities and constraints to the Singapore Botanic Gardens of climate change to be further analysed and for appropriate adaptation strategies to minimise its effects to be developed.

### Risk Management and Counter-Disaster Preparedness

### Issue 24: The need for risk management and counter disaster preparedness

NParks has developed a Risk Management Plan (which encompasses the Botanic Gardens) which identifies key risk areas and measures to mitigate these (as far as practicable) as well as procedures to respond quickly and effectively to a range of potential incidents. Few disasters currently present a foreseeable threat to the Nominated Property. The biggest risks are associated with fire (affecting the site's buildings) and severe storms (affecting the site as a whole), for which preventive measures are in place. In light of Singapore's climate, the provision of irrigation during times of drought and the no fires/ smoking policy enforced across the entire site, fire is not anticipated to be a major threat in the landscape. Fire protection systems, checked by specialist contractors on a monthly basis, have been installed in all buildings. The Herbarium has been fitted with a sprinkler system and the Type Collection is kept in a separate room which can be filled with inert gases in the advent of fire (this is also the case for the Library's Rare Books Room). The Botanic Gardens is currently exploring options to improve the Herbarium's storage system to enhance protection against pest and water damage (if the sprinklers were to be turned on). In addition, staff receive fire safety training.

Whilst storms (including micro-bursts) cannot be prevented from happening, a number of protective measures are in place. All buildings and heritage trees have been fitted with lightning conductors and a plant replacement strategy is being developed for the living collection. Trees are inspected every 12-18 months and heritage trees on an annual basis to ensure public safety and tree health (an on–going pruning schedule is also in place). Supplementary inspections are carried out as and when necessary, e.g. following storms. The Rainforest can be closed off to the public during stormy weather.

In order to counteract potential issues such as power outage/failure of cooling and ventilation mechanisms, which would affect plants grown in protected environments (e.g. cool houses), the Botanic Gardens maintains a chiller and generators on standby.

As discussed previously a more in-depth risk assessment should be carried out in relation the potential impact that climate change may have on the living collection, landscape and overall significance of the site. A long-term strategy will need to be developed and regularly reviewed in light of possible changes to climate change indicators and climate predictions. It may be necessary to adjust the Acquisition and Retention Policy, to reflect this possibility.

There is a need to closely monitor the possible presence of wild boar in the Gardens, as wild boar were recently spotted close to the site. Wild boar have the potential to cause great damage to the living collections if they were to enter the site. A risk assessment should be carried out and preventative measures put in place were possible.

### Sustainable Use of the Site

#### **Scientific Research**

### Issue 25: Ensuring the site remains a leading centre for plant research and conservation

The Singapore Botanic Gardens is a leading centre for plant research and conservation. As described in Section 2.2 the Gardens has important science resources both institutionally and individually. These include the Herbarium (which houses the preserved collection), laboratory facilities (which house the genetic collection), the library (which houses the bibliographic and reference collections) and the gardens/living collection. Approximately 30 individuals work within the Gardens' Research and Conservation Branch, 25 being scientists. Conducting botanical research into and facilitating the conservation of plant diversity is fundamental to the Gardens' being/mission and the protection of its authenticity of function. To sustain this as well as its recreational and educational roles, the Gardens depends on having expert staff; well-documented, maintained and up-to-date living and preserved collections that are continually enriched and interpreted; and high quality facilities. A summary of the collections held at the Gardens and their relevance is provided in Section 2.2.

The needs of the Research and Conservation branch include, amongst many things, plant material, working space, laboratories, and library facilities as well as human and financial resources. Continual monitoring of these resources is essential and longterm plans needed to ensure critical shortfalls are prevented. A need has been identified for additional working space in the Herbarium, along with better storage (to enhance protection of the specimens against potential damage from water, if the sprinkler system was to be turned on, and pests) and a walk-in freezer room. The spirit room is at full capacity and needs to be enlarged. The Plant Resource Centre is due to undergo major refurbishment works and some of the equipment in the laboratories is being updated. Guest rooms for visiting researchers are

now available in Ridley Hall, which has enhanced the collections' accessibility. Some of the material forming part of the documentary and visual reference collections is not currently being stored according to best practice guidance (e.g. some archival material is staked vertically rather than horizontally) –there would be benefit in a detailed assessment being carried out and protocols being established relating to both storage and use of the collections (e.g. policy on the handling material). Consideration should be given to swapping the Library's carpets as part of the pest control. It is important that the collections are managed according to the highest standards of curation and housed, where appropriate, in suitable facilities.

An overarching Five to Ten Year Research Plan should be developed to guide the work of the Research and Conservation Branch. The aims and objectives of this Plan should support those of the Global Strategy for Plant Conservation (2011-2020). There would be benefit in exploring opportunities to increase the number of staff exchanges and plant collecting expeditions that take place as well as the number of papers published in high impact journals. The Gardens' ex situ collections are in need of enriching and strategic partnerships for specific plant groups held at the Gardens should be established. Future scientific focus should include the Singaporean flora and the Fabaceae/Leguminosae and Lauraceae families (the latter two being important regionally diverse groups). More researchers will be needed to front this research, maintain the collections and expand the Garden's scientific role.

Researchers have identified a need for trained technical staff to assist them with the maintenance of the specialist living collections, such as those held in the Plant Resource Centre and Potting Yard. This work is currently carried out by contractors who do not always have the appropriate skills/knowledge. Assistance is also required in the Herbarium and increased access to the Library's holdings needed (including access after-hours and to a catalogue of holdings). Closer collaboration between the Gardens' branches is essential, particularly between the Research/ Conservation, Horticulture/Exhibitions and Events and Educational branches. The research and living collections should not be seen as separate entities. The Gardens' would also benefit from recruiting individuals with editorial and plant illustration skills.

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Succession planning and ensuring that staff knowledge is passed on is crucial along with the digitisation of the collections. The Herbarium and Library's collections need digitising as a priority to enhance their accessibility, use and preservation. Unusual publications and documents, especially journals, are in the process of being digitised and made available through the Biodiversity Heritage Library based at Havard. Whilst digital plant records exist for the entire living collection, work is ongoing in relation to populating/improving accession data on BG BASE<sup>14.</sup> This involves ongoing work relating to 'cleaning' data (e.g. duplicate and standardisation) and incorporating images and associated descriptive information for different accessions. Current and future projects to enhance the information held about the Gardens' living collection and its accessibility (identified by the Plant Record Unit) include: tracing and capturing plant provenance data and heritage/monumental trees planting dates (ongoing since late 2010); mapping the living collections (upcoming); and test-bedding new cyber technology (e.g. Smartphone Applications, Augmented Reality, Kinect Technology, QR Code Technology) (upcoming).

#### **Visitor Management**

### Issue 26: Ensuring the site remains a leading visitor attraction

Alongside its continued role as a leading centre for plant research and conservation, the Singapore Botanic Gardens has long provided a key recreational greenspace and visitor attraction, cherished by locals and foreign visitors alike. It is the most visited botanic garden in the world, having welcomed over 4.4 million visitors in the financial year 2012–2013. A key strategy in Singapore's City in a Garden vision is to position the Singapore Botanic Gardens as an iconic world–class garden and to enhance it as a centre for heritage and botanical excellence.

Whilst the Singapore Botanic Gardens already provides a high quality visitor experience (as demonstrated by the results of the Customer Satisfaction Survey carried out in September 2013), this could be enhanced through the provision of improved interpretation, wayfinding and visitor facilities (e.g. retail and catering) as well as new/ enriched display gardens.

Essential to maintaining the Botanic Gardens' as a world-class visitor attraction is the need to understand its visitor profile, visitor perceptions/ needs/aspirations as well as potential visitor impacts on the Outstanding Universal Values of the site. Visitor surveys should be commissioned on a regular basis and the analysis of the information gathered fed into appropriate site strategies (e.g. visitor management strategy and volunteering, events and educational programmes).

### Issue 27: Opportunities for broadening the diversity of visitors

One of the Gardens' key objectives, as a visitor attraction, is to ensure equality of access for all visitors. Whilst the Botanic Gardens is widely visited, opportunities to broaden its current audience should be kept under review through ongoing monitoring of its visitor profile/site demographic context and the identification of any underrepresented user groups. Measures to encourage the latter to make greater use of the site and engage with it more should be identified and corresponding outreach programmes delivered. In order to broaden its appeal and relevance to all different sections of society, the Botanic Gardens may want to consider the need for an Audience Development Plan<sup>15</sup>.

With the exception of the National Orchid Garden<sup>16</sup>, the Botanic Gardens is free to visit and open every day of the year between 5am and midnight. This is likely to have contributed to its popularity and use by a wide range of user groups.

<sup>14</sup> BG BASE is a database application designed to manage information on biological [primarily botanical] collections

<sup>15</sup> The Audience Development Plan could form part of an overall Visitor Management Strategy.

<sup>16</sup> It should be noted that the National Orchid Garden offers periods of free entry for children and accompanying adults/ parents four times a year during the holidays (one week in March and September and five to six weeks in June and December)

### Issue 28: Improving the sense of arrival and orientation

There is currently a considerable number of access/ entry points into the Gardens which has implications for how the entry to the site is managed and how information and interpretation is provided at each point. Although the counter at the Nassim Gate is called a visitor centre on the visitor map, there is no obvious starting point for a visit, especially for first time visitors. There is also a lack of consistent orientation/interpretation material introducing visitors to the site and its offer at arrival points. The location of the Mass Rapid Transit (MRT) train station at the northwest corner of the Botanic Gardens (outside the boundary of the Nominated Property) also creates a new entry point away from the more central Tanglin Gate and Nassim Gate entrances, both of which are located within the Nominated Property and are linked to the older surviving parts of the Gardens. A new MRT station is due to open immediately opposite the Tanglin Gate by 2020.

Despite the presence of well-designed directional signage across the site and the provision of orientation maps (mounted on boards and in leaflet format), the site's size, undulating topography and extensive path network can make it challenging for some visitors to orientate themselves. There is a lack of available visitor information on how far features are from one another, disabled access/ facilities, and what the different parts of the site have to offer in relation to different themes (heritage, nature conservation, scientific work etc). This can impede the exploration of the site and lead to visitors becoming confused about both the purpose and nature of the site and its history. The Heritage Museum will play a central role in providing interpretative information about the site's Outstanding Universal Values and assisting with orientation/location of key features.

There would be benefit in devising an arrival point/ gateway strategy, which would outline the level of interpretation and entrance treatment/features appropriate for different entrances (e.g. MRT station, Tanglin and Nassim Gates treated as primary entrances). The number of entry points could be reduced to more effectively manage the visitor experience.

### Issue 29: Best practice in respect to disability equality

Two key objectives at the Gardens are to ensure equality of access for all visitors and to improve, wherever possible, access for all disabled visitors. All of the Botanic Gardens' features are accessible to disabled visitors, with the exception of the Plant House Garden and bandstand. There is however good visual access to these features. New features are designed with disabled access in mind and wherever possible, ramps have been provided as an alternative to existing steps. The National Orchid Garden was the first landscape to be awarded barrier free access accreditation in Singapore. Signage, interpretation and facilities should all be designed using inclusive designs.

There would be value in the Singapore Botanic Gardens developing a Disabled Access Policy and Strategy<sup>17</sup> and setting up disability focus groups, as and when appropriate, to review policies and services and development proposals.

#### **Issue 30: Providing appropriate events**

An ongoing year-round programme of high quality events/exhibitions should continue to be provided at the site. These should be educational, wherever possible emphasizing botanical issues, and should reinforce the Gardens' role as a premier botanical garden and visitor venue consistent with the cultural significance of the site. The tradition of playing music in the Gardens, which started shortly after 1860 should be maintained and consideration given to reintroducing concerts on the bandstand. The frequency, scale and location of events should be carefully considered so as not to negatively impact on the fabric and atmosphere of the Gardens. There would be value in regular art events taking place and an artist exchange programme being set up.

### Issue 31: Potential conflicts between user groups

Visitors come to the Gardens for many different reasons including to visit a renowned garden, see

<sup>17</sup> This could form part of an overall Visitor Management Strategy.

specific horticultural attractions/display gardens, exercise, have a stroll, picnic, learn about the plant world, observe nature, meet friends/family, listen to concerts and celebrate momentous occasions. Whilst on the whole the Botanic Gardens successfully accommodates all of these uses, there have been some tensions between a few user groups. For example, some individuals feel that their visitor experience is diminished due to the presence of dogs and others due to exercise groups and/or visitors monopolising shelters.

### Issue 32: The need for improved and new visitor facilities and attractions

Some of the Gardens' visitor facilities would benefit from being improved to ensure a high quality visitor experience. A number of projects/works are planned to address this, located either within, partly within or immediately adjacent to the Nominated Property (i.e. some falling within the Singapore Botanic Gardens but within the Nominated Property's proposed Buffer Zone). These are:

- Enhancements to the National Orchid Garden (due to be completed by the end of 2018), which was first laid out in 1995 and would benefit from landscape enhancements.
- An extension of the Jacob Ballas Children's Garden (due to be completed by the end of 2015), which has proved hugely popular for informal play and formal/informal learning.
- The creation of a new Ethnobotany Garden (due to be completed by the end of 2015), providing a new display garden for visitors to enjoy.
- The development of the Tyersall Learning Forest (not currently opened to the public) into a 'learning forest', providing a new feature for visitors to explore and an important learning resource (due to be completed by the end of 2015). The purpose of this forest is ex-situ conservation of rare species from the region.
- The provision of new food and beverage outlets in the Garage and also close to the Botanic Gardens MRT station (within the Buffer Zone). There currently are no refreshment facilities in these parts of the Gardens.

 The provision of a new garden shop in the Green Pavilion.

As discussed under issues 8 and 15, new facilities/ contemporary landscape design should not negatively impact on the Gardens Outstanding Universal Values, integrity and authenticity. New buildings should be of an appropriate scale, design and quality.

Better information to help guide visitors around the site and inform them of the site's heritage significance and values (see Issue 35 for issues around interpretation) is needed. The recent redevelopment of Holttum Hall as a heritage museum, the establishment of an exhibition gallery just south of it and the provision of new heritage interpretation panels at key locations across the site provide important new visitor facilities.

### Issue 33: Potential physical impacts from visitors

If not carefully managed, large numbers of visitors could have a negative impact on the fabric of the Gardens (e.g. through causing soil erosion/ compaction, trampling, and/or damage to the fabric of historic buildings), its atmosphere and/or its nature conservation value (see Issue 18). Whilst the site has long attracted large numbers of visitors, upto-now this has caused very few adverse impacts on the fabric of the site (e.g. a number of heritage trees are suffering from soil compaction and are due to be fenced off). Visitor numbers/activities are currently fairly well dispersed around the site and throughout the day/year. Damage to parts of the site may however become apparent if this were to change.

The Singapore Botanic Gardens is likely to remain a key visitor attraction in Singapore, with visitor numbers predicted to rise to c.6 million by 2020 - linked to WHS status, the provision of new/ enhanced visitor facilities/attractions as well as the opening of new MRT train stations. Visitor numbers and their distribution/circulation patterns (across the site and throughout the day/year) will need to be carefully monitored along with the condition of the site in order to identify and remediate any potential issues early on. There would be benefit in a Visitor Management Strategy being developed. Whilst some isolated incidences of vandalism and misuse of features (e.g. individuals climbing on trees or using shelters for exercise/picnicking) have occurred on site, the vast majority of visitors demonstrate considerable respect for the site and act in a responsible manner.

### Issue 34: Encouraging sustainable transport

The Singapore Botanic Gardens' ongoing commitment towards promoting sustainable transport should be maintained. Opened all year round between 5am and midnight, the Gardens can be accessed by car, taxi, coach, public transport (bus and MRT) and bicycle or on foot (information on how to reach the site using sustainable transport is provided on the Gardens' website and visitor map/ leaflet). Two additional MRT stations, one located by the existing MRT station to the north and the other opposite the Tanglin Gate to the south, are due to be opened by 2020, which will enhance sustainable access to the site via two new MRT lines.

Besides the redevelopment of the coach/car parking located near to the Ginger Garden/National Orchid Garden, as part of the Tyersall Learning Forest works, the Gardens do not intend to increase car parking capacity.

### **Issue 35: Potential for increased volunteering**

Whilst the Botanic Gardens already benefits from support from volunteers (who currently mainly lead walks around the site), a broader volunteering programme could be established. There are a number of opportunities to encourage different community groups/individuals to actively engage with the site and make valuable contributions to its ongoing management and conservation, including volunteering opportunities around wildlife and habitat management, historic research/ interpretation, and education and outreach activities. A 'Friends Group' could be established.

#### **Interpretation and Education**

### Issue 36: The need for improved interpretation

High quality and informative interpretation is an important part of providing a positive visitor experience as well as a vital education tool. It can be provided on and off site and through a range of methods including brochures, guided or self-guided tours, interactive displays, signage, media displays, audio information or interpretive information boards. Interpretation should help people to enjoy the site and learn from it (including gaining a better understanding of its significance and mission).

The Gardens would benefit from having an Interpretation Strategy/Plan<sup>18</sup> in place (making use of a wide range of interpretation/communication techniques), providing a framework for communicating the site's many stories, values/ significance and roles to as wide and varied an audience as possible through appropriate and consistent methods (both on and off site). Key themes for interpretation include: the Gardens' historical development, the Gardens' collections and scientific/conservation work, the Gardens involvement with economic crops, the Gardens' role in the greening of Singapore, the long tradition of orchid hybridization/breeding, the socio-cultural value of the Gardens, the Gardens' built heritage, the Gardens' nature conservation value and the development/maintenance of horticultural standards and techniques. The Heritage Museum is central to the site's interpretation.

Efforts to enhance the site's interpretation are already underway - Holttum Hall was recently redeveloped as a Heritage Museum (where the story of the development of the site and its significance is told), an exhibition gallery was erected south of Holttum Hall and new heritage interpretation panels are progressively being installed at key locations across the site.

### Issue 37: The need to conserve and enhance the site's educational remit

The Singapore Botanic Gardens fulfils an important role in formal and informal education, which is

<sup>18</sup> The Interpretation Strategy could form part of an overall Visitor Management Strategy.

crucial to the management of the site. This reflects upon the importance that UNESCO places on access, education and interpretation in its guidance.

Education at the site falls under a number of categories including: informal education of visitors (through interpretation mainly), formal schools education, informal adult education (provided through dedicated workshops/tours) and informal child education (through dedicated workshops/ tours). The Singapore Botanic Gardens is in a unique position to inform and educate the general public in respect of many topic areas including horticulture, biodiversity, sustainability and the site's Outstanding Universal Values.

Whilst the Gardens already deliver a strong educational programme/educational messages, there are opportunities to enhance this. There would be value, for example in embedding learning opportunities for different user groups into a new Interpretation Strategy<sup>19</sup> and in providing a wider range of workshops/tours for both adults and children/young people. Opportunities to build on the success of the 'behind the scenes' tours and see-through orchid laboratories, which proved to be popular means of engaging the wider public with the Gardens' research agenda, should be explored. As discussed under Issue 32 the programme of events/exhibitions should be educational.

The Singapore Botanic Gardens has been working closely with the Ministry of Education in relation to their aspirations to revise social studies for Primary Schools and to expand schools' engagement with the Gardens beyond the provision at the Jacob Ballas Children's Garden and the National Orchid Garden. There is great potential for different aspects of the curriculum (e.g. Science, Geography, History, Character and Citizenship Education) and different learning stages to be linked to other aspects of the site. This would necessitate expanding the educational team to engage with schools and teachers more (through an outreach programme/more teacher training workshops), deliver educational activities on site and develop teacher handbooks and other linked teaching and learning materials. There is also a need for increased educational/classroom space on site and for modest storage facilities to be provided at key locations where educational activities are carried out. More independent learning opportunities could potentially be delivered through extracurricular activities and clubs. The Jacob Ballas Children's Garden, located immediately adjacent to the Nominated Property's northern boundary, was designed to provide unique discovery and learning experiences to children in a garden setting. It has proved hugely popular and is due to be extended (into the Nominated property). There is scope for informal nature-based play and learning to be more widely promoted at the Gardens – e.g. through the provision of children/family orientated trails and activities.

As discussed under Issue 12, opportunities to re-introduce a horticultural training programme/ school of regional relevance at the Botanic Gardens should be explored. Access to information about the Nominated Property, its collections, significance and various roles should be made more accessible on and off site (particularly online).

#### Promotion

### Issue 38: The need for promotion/marketing of the WHS

There would be value in developing a marketing and branding strategy for the WHS to ensure it remains a sustainable cultural destination of international status, to seek to add value to the existing marketing programmes, to establish promotion priorities in chosen market segments and to create and sustain a clear image and identity for the Singapore Botanic Gardens WHS.

### Management of the Site

Support and participation from many organisations and individuals is critical to the successful implementation of the Management Plan. As stated in the Operational Guidelines for the Implementation of the World Heritage Convention (July 2013, paragraph 39) 'a partnership approach to nomination, management and monitoring provides a significant contribution to the protection of World Heritage properties and the implementation of the Convention'. A WHS Management Committee,

<sup>19</sup> The Interpretation Strategy could form part of an overall Visitor Management Strategy.

comprising key organisations and bodies with an interest in the administration and management of the WHS has been set up to oversee the successful implementation of the Management Plan. The Management Plan has been endorsed by the Committee, showing commitment from stakeholders, as far as is practicable, to implement those policies and actions for which they are responsible. There would be benefit in a member of the Singapore Botanic Gardens staff being designated as the WHS coordinator to help ensure that the Management Plan's aims and policies are appropriately implemented.

### Issue 39: The Need for regular review and monitoring

Management planning is a dynamic process and does not stop with the production of a Management Plan. New information, challenges and opportunities as well as changed perceptions of priorities are likely to emerge with time. Regular monitoring is essential to determine this information (particularly to assess how the values of the Nominated Property are being maintained over time and to identify key threats) as well as the effectiveness of the Management Plan/ its implementation. This information, in turn, is critical to informing periodic updates/reviews of the Management Plan and future management decisions/actions (measuring progress is essential to be able to adapt and improve management of the site). Monitoring indicators need to be firmly linked to the values and aims identified in the Management Plan.

The policies and suggested actions set out in the Management Plan should retain their relevance for five to ten years. A formal review of the issues and aims should be undertaken at least every five years and the Plan revised, if necessary, to reflect changed circumstances. Interim reviews should be undertaken as and when required to allow for some parts of the Plan to be updated at different intervals -the relevant section of the Plan should be updated accordingly and reissued to all key partners. The preparation and review of annual action plans should be an important part of the monitoring and review process. WHS Management Committee meetings should take place every six months.

### Issue 40: The need for adequate resources to implement the Management Plan

Adequate ongoing financial and human resources will need to be in place to ensure the implementation of the Management Plan and the long-term sustainability and protection of the site and its significance/values. No financial issues currently cause a threat to the ongoing management and maintenance of the Singapore Botanic Gardens. The existing annual operating and staff budget is S\$15 million, with substantial additional funding available to support a variety of infrastructural developments and maintenance works. In addition to existing funding the Singapore Botanic Gardens also works with community partners and corporate sponsors to develop programmes and displays linked to the Gardens fulfilling their mission of 'Connecting Plants and People'.

The Gardens would benefit from having a larger research and conservation team and from being less dependent on contractors. There is a need to ensure that the Gardens' personnel and contractors are adequately trained and that necessary specialist expertise is accessible.

#### Issue 41: The need for ongoing research

Effective management, conservation and enhancement of the Singapore Botanic Gardens' and its associated values depends on having a good understanding of the site, supported by a robust information base. Appropriate, ongoing research and survey work will help to support this.

There would be benefit in undertaking further research into how the Gardens' botanical collections and key historic buildings have evolved over time; the Gardens' contribution to the social history of Singapore and the development of the Singaporean identity; the wider social and economic impact of some of the economic crops researched and trialled by the Botanic Singapore Gardens other than rubber; and the Gardens' contribution to the greening of Singapore.

MANAGEMENT PLAN KEY MANAGEMENT ISSUES

# AIMS & POLICIES

Ginger Garden



Singapore Botanic Gardens Connecting Plants & People since1859

Tanglin Gate Entrance

### 5.0 AIMS AND POLICIES

### General

This chapter sets out an overall vision, long-term aims and policies for protecting and enhancing the Outstanding Universal Values, authenticity and integrity of the Singapore Botanic Gardens, and its other values, and encouraging sustainable uses including education, promotion and access.

The long-term aims look forward 30 years and the policies are intended to cover around five years.

### Singapore Botanic Gardens Mission Statement

The mission of the Singapore Botanic Gardens, which has been agreed by the NParks' Board, is:

'Connecting people and plants through publications, horticultural and botanical displays, educational outreach, and events, provision of a key civic and recreational space, and playing a role as an international Gardens and a regional centre for botanical and horticultural research and training.'

This mission statement represents Singapore Botanic Garden's corporate priorities for what it wants to achieve.

### Vision for the Singapore Botanic Gardens Candidate World Heritage Site

The significance of the Nominated Property is described in Section 3.0 of this Plan. The long-term vision for the Singapore Botanic Gardens candidate WHS is based on the fundamental need to protect, conserve, enhance and interpret the Outstanding Universal Values of the Property for present and future generations. The proposed vision for the Singapore Botanic Gardens candidate WHS is outlined below:

The Singapore Botanic Gardens will continue to be recognised as a tropical botanic garden of international renown. We will care for and safeguard this special place as an iconic world-class garden and flagship park for Singapore, and enhance it as a centre for heritage and botanical excellence. We will also ensure that its special qualities are presented, interpreted and enhanced where necessary so that visitors can better understand and appreciate the site's Outstanding Universal Value and other values.

Protecting the Site's Outstanding Universal Value

Long-Term Aim 1: Protect the site from activities which might harm the Outstanding Universal Values, authenticity and integrity of the Nominated Property, either within the site itself or through the effects of development in its setting, including the buffer zone.

**Policy 1a:** Development which would impact adversely on the WHS, its Outstanding Universal Values or its setting should not be permitted.

**Policy 1b:** Following inscription, the boundary of the Singapore Botanic Gardens WHS and its buffer zone will be reflected on URA's Special and Detailed Control Plan.

**Policy 1c**: Consider demarcating the Tyersall Learning Forest as a Nature Area.

### Conserving the Site

Long-Term Aim 2: Conserve and enhance the Outstanding Universal Values, authenticity and integrity of the site through implementation of positive conservation measures.

**Policy 2a**: Conserve and enhance the site's historic landscape.

### Actions:

- Conserve and enhance the site's historic layout and landscape planting framework through high quality cyclical maintenance, succession planting and regular inspections of its condition.
- Establish a Plant Acquisition and Replacement Policy.
- Implement and regularly review the 10 Year
  Living Collection Management Plan and
  associated Lawn Action Plans.
- Maintain internal key views and openness of certain Lawns.
- Maintain the sense of enclosure provided by the vegetation around the site's periphery.
- Enhance the interpretation of the site's historic development including lost and extant features.
- Enhance the condition of heritage trees in accordance with arboricultural assessments and the arboricultural strategy (contained in the 10 Year Living Collection Management Plan).
- Consider which additional tree specimens could be proposed as Heritage Trees for endorsement by the Heritage Tree Panel.
- Monitor the need for lightning conductors to be fitted to additional trees.
- Sustain efforts to label and better interpret the living collections.
- Improve the nursery facilities (linked to action listed under Policy 3a).
- Consider developing a Historic Landscape
  Improvement Plan, which would set out a
  detailed WHS/historic landscape vision and
  heritage improvement strategy, design guidelines

for public realm interventions and conservation plans for individual Conserved Buildings (see also Policy 2b).

- Continue to provide horticultural/botanical training to staff.
- Support staff in obtaining a Workforce Skill Qualification.
- Explore opportunities to re-open a School of Horticulture at the site.

### Policy 2b: Conserve and enhance the site's built heritage

Actions:

- Continue to carry out regular inspections and maintenance.
- Ensure that all building restoration works are carried out in accordance with best practice guidance by suitably qualified professionals, using appropriate methods and materials.
  Conservation permission should be obtained from the Competent Authority prior to refurbishment/restoration works being carried out on a Conserved Building/Structure.
- Carry out repairs works to the Garage and House 6.
- Develop a Conservation Plan for each of the site's Conserved Buildings/ Structures (as part of an overall Historic Landscape Improvement Plan).
   Use these to guide their future management.
- Undertake a survey of the interior and surviving historic features/fabric of all Conserved Buildings/ Structures and ensure their preservation is upheld in future conservation and adaptation proposals. Use the survey information to inform the Conservation Plans.
- Define buffer zones for all Conserved Buildings/ Structures.
- Where appropriate, enhance the setting of historic buildings.
- Explore opportunities to replace the planting around E.J.H. Corner House with plants which will alleviate existing moisture related issues.



- Ensure that buildings meet 21st century standards/regulations and that innovative solutions are sought for historic buildings (preserving their fabric/character).
- Ensure all buildings have a sustainable and suitable use.

**Policy 2c:** Conserve and enhance the site's nature conservation value in ways that are complementary with its Outstanding Universal Values.

#### Actions:

- Undertake a habitat survey and subsequently more detailed ecological surveys, as appropriate.
- Manage existing habitats to increase overall biodiversity and where appropriate introduce new habitats.
- Promote management practices that conserve and enhance biodiversity.
- Develop and implement a site-wide Biodiversity Conservation Plan (outlining the Gardens' commitment to conserving and enhancing biodiversity as well as specific biodiversity enhancement measures). The Plan should be regularly reviewed and updated in light of new information and survey results.
- Undertake a regular site-wide ecological survey(s) to maintain an up to date understanding of the locations of all species and habitats. Use this information to measure and record biodiversity/ potential changes in the nature conservation value of the site using indicator species.
- Monitor the potential impact of visitors on biodiversity. This should inform management of the site.
- Ensure that biodiversity enhancement measures do not undermine the site's historic landscape/ features or its recreational and scientific functions.
- Continue to remove invasive alien species.
- Provide high quality interpretation relating to the site's nature conservation value/biodiversity.
- Conserve and enhance the rainforest through appropriate maintenance and management.

 Seek opportunities to connect the site with greenspaces/wildlife areas beyond its boundaries.

Policy 2d: Maintain accreditation to ISO 14001.

**Policy 2e:** Carry out a study of the possible impacts of climate change and identify appropriate adaptation strategies.

**Policy 2f:** Risk management and counter-disaster preparedness strategies should be kept under review and updated as necessary.

### Sustainable Use of the Site

Long-Term Aim 3: Encourage sustainable uses of the site that help conserve the Site's Outstanding Universal Values, authenticity and integrity, including scientific research functions and appropriate provision of education, outreach, promotion and access for visitors.

#### **Scientific Research**

**Policy 3a:** Ensure that the site's role as a leading scientific research and conservation centre is sustained and where possible enhanced.

Actions:

- Develop a 10 Year Research and Conservation Strategy with mechanism to implement and review it.
- Explore opportunities to increase the working space in the Herbarium, enhance its storage facilities and provide a walk-in freezer.
- Install compactor units in the spirit room to increase its holding capacity.
- Enhance the nursery facilities, as appropriate (linked to action listed under Policy 2a).
- Enhance the living collection, in line with the Plant Acquisition and Retention Policy, to meet research and conservation needs.

- Assess, and where appropriate enhance, the curation of the documentary and visual reference collections. Establish a list of protocols and improve access.
- Explore opportunities to expand teams within the Research and Conservation branch, as appropriate.
- Continue efforts to digitise the collections and keep information up-to-date.
- Develop a digital (GIS) map of the living collections and test new cyber technology.
- Install appropriate shelving/drawer system to accommodate collection of botanical paintings and large-size volumes in Rare Books Room.

#### **Visitor Management**

**Policy 3b:** Management of visitors to the site should be exemplary and follow relevant national and international guidance on sustainable tourism, supporting the Gardens' role as a leading visitor attraction.

#### Actions:

- Develop and implement a Visitor Management Strategy (which would include an audience development plan, interpretation plan/strategy and disabled access policy/strategy).
- Groups which are currently under-represented at the site or form a small share of existing visitors should be identified as part of the audience development plan and opportunities to encourage them to use the site more, engage with them more and increase their awareness of the site's significance and offer should be identified.
- Undertake regular visitor/user surveys.
- Set up disability focus groups as and when appropriate.

**Policy 3c:** Improve the sense of arrival and orientation.

### Actions:

- Consider closing some entry points/gates and developing a 'gateway' strategy.
- Provide clear and consistent orientation and visitor information at all entrances (including a map with the location of all key features, information about the nature of the site and what it has to offer).
- Explore opportunities to enhance interpretation and orientation information provided at existing 'visitor centres/visitor receptions'.
- Provide high quality, up-to-date and informative pre-visit information.
- Provide directional information in a range of media.
- Promote the Heritage Museum as the Singapore Botanic Gardens' World Heritage Centre (see also Policy 3e).

**Policy 3d:** Balance the needs of different user groups.

Actions:

- Explore opportunities to provide more dog-free zones.
- Continue to enforce a no picnics and exercise policy in the shelters and where this causes obstructions on paths.

**Policy 3e:** Enhance the visitor experience through the provision of new/improved visitor facilities and services without compromising the site's Outstanding Universal Values.

Actions:

- Enhance the National Orchid Garden.
- Extend the Jacob Ballas Children's Garden.
- Introduce a new Ethnobotany Garden.
- Continue to develop the Tyersall Learning Forest.
- Relocate/enhance existing visitor counters.


- Promote the Heritage Museum as the Singapore Botanic Gardens' World Heritage Centre, a key facility where visitors can find in-depth interpretative information about the site/ its values as well as information to help them discover how they can make the most out of the site. It could act as the starting point for several walks/trails (see also policy 3c).
- Provide a food and beverage outlet in the Garage.
- Provide a new garden shop at the Green Pavilion.

**Policy 3f:** Monitor the physical impact of visitors on the site.

Actions:

- Carry out regular condition surveys.
- Monitor the use of different parts of the site by visitors.
- Ensure the Visitor Management Strategy includes appropriate methods to manage visitor circulation and access to different elements of the site.
- Where appropriate erect fences around Heritage Trees.

**Policy 3g:** Encourage visitors to make sustainable choices and informed decisions about how they will get to the site.

### Action:

 Information for the general public about transport services will focus on alternatives to car use and will be high quality, up-to-date, accessible and widely promoted.

Policy 3h: Promote community involvement.

- Broaden the volunteer programme and associated volunteering opportunities.
- Consider establishing a Friends group.
- Deliver outreach projects to promote the Gardens.

Interpretation and Education

**Policy 3i:** Interpretation of the WHS on and off site will be of a high standard, accurate, accessible and consistent and will enhance enjoyment and appreciation of the site's values/significance and roles by as wide and varied audience as possible.

### Actions:

- Develop an interpretation strategy (including on and off site interpretation), as part of an overall Visitor Management Strategy.
- Explore opportunities to develop web, handheld device or mobile phone-based interpretation resources for engaging new audiences through digital and interactive media.

Policy 3j: Enhance learning opportunities.

Actions:

- Broaden the formal school education programme, in line with the Government's aspirations.
- Broaden the informal adult and children/young people's education programme, in collaboration with the Ministry of Education.
- Promote and enhance learning through natural play (including through the extension of the Jacob Ballas Children Garden and provision of family trails and associated activities).
- Deliver high quality and accessible interpretation and events/exhibition that have direct relevance to and strengthen understanding of the Outstanding Universal Values of the site and other associated values.
- Explore opportunities to expand the educational team, as appropriate.
- Increase educational outreach activities.
- Develop and disseminate resources for teachers and educational practitioners to use as teaching and learning tools about the WHS.
- Identify appropriate venues within the Gardens which could be used as classrooms and seek opportunities to provide storage facilities where needed.



**Policy 3k**: Widely promote the site's Outstanding Universal Values and other associated values.

### Actions:

- Develop and implement a WHS Marketing and Branding Strategy.
- Liaise with the Singapore Tourism Board to ensure linkage with the national strategy/ initiatives.
- Promote existing offer and new aspects of it, targeting resources effectively.

### Management of the Site

Long-Term Aim 4: Ensure that effective governance arrangements are in place that involve stakeholders in the long-term management and monitoring of the site, and in balancing research, conservation, access, sustainable use, including tourism, and the interests of the local community.

**Policy 4a:** Ensure a partnership approach to the implementation of the Management Plan.

### Action:

- Appoint a WHS co-ordinator.

**Policy 4b:** Ensure sufficient resources are in place to enable effective management, conservation and monitoring of the WHS.

### Actions:

- Explore opportunities to expand the Education team and teams within the Research and Conservation branch.
- Ensure adequate funding is available to cover operational and capital costs.

### Policy 4c: Ensure regular monitoring of the WHS.

### Actions:

- Review priorities and progress on the implementation of the Management Plan at six monthly WHS Management Committee meetings.
- Review and update the Management Plan at least every five years. Interim reviews should be undertaken as and when appropriate.
- Establish monitoring indicators relevant to the site's Outstanding Universal Values to measure progress with the protection, interpretation and management of the site.

**Policy 4d:** Undertake research to further supplement understanding of the site's values.

### Actions:

- Undertake additional research to better understand how the Gardens' botanical collections and key historic buildings have evolved over time.
- Undertake additional research to better understand the Gardens' contribution to the social history of Singapore and the development of the Singaporean identity.
- Undertake additional research to better understand the wider social and economic impact of some of the economic crops (other than rubber) researched and trialled by the Singapore Botanic Gardens.
- Undertake additional research to better understand the Botanic Gardens' contribution to the greening of Singapore.

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### 6.0 IMPLEMENTATION

### General

This chapter presents an action plan setting out priorities and responsibilities for the implementation of the aims and policies listed in **Section 5.0**.

### Action Plan

The Management Plan's aims and policies will be achieved through a range of actions/projects, led by various organisations involved in the WHS. The following Action Plan outlines new and ongoing projects/works for the short (5 years), medium (10 years) and long-term (30 years). It identifies the lead organisation and key partners that need to be involved, the time scale for implementation and resources needed.

The implementation of the Action Plan will require the support and participation of the WHS partners in terms of staff time and funding. The Management Plan, particularly the Action Plan, has been formally endorsed by key stakeholders. The Action Plan provides a valuable tool to monitor progress towards achieving the Management Plan's aims. Based on the Action Plan, annual work programmes, agreed by the WHS Management Committee, should be developed. The action plan table uses the following abbreviations for lead accountabilities and key delivery partners:

NParks	National Parks Board
SBG	Singapore Botanic Gardens
URA	Urban Redevelopment Authority
WHSMC	World Heritage Site Management Committee

Aims, Policies and Actions		Stakeholder(s) responsible for delivery	Resources needed	Time scale
Aim 1	Protect the site from activities which might harm the Outstanding Universal Values, authenticity and integrity of the Nominated Property, either within the site itself or through the effects of development in its setting, including the buffer zone.			
Policy 1a	Development which would impact adversely on the WHS, its Outstanding Universal Values or its setting should not be permitted.	URA, SBG	Staff	Ongoing
Policy 1b	Following inscription, the boundary of the Singapore Botanic Gardens WHS and its buffer zone will be reflected on URA's Special and Detailed Control Plan.	URA	Staff	Short
Policy 1c	Consider demarcating the Tyersall Learning Forest as a Nature Area.	URA	Staff	Short

Aims, Policies and Actions		Stakeholder(s)	Resources	Time
		responsible	needed	scale
		for delivery		
Aim 2	Conserve and enhance the Outstanding University	al Values, authe	enticity and inte	egrity of
Doligy 20	Conserve and enhance the site's historic landscane	servation meas	ures.	
Policy Za	Conserve and enhance the site's historic landscape.	CDC	Ctoff	Ongoing
	- Conserve and enhance the site's historic layout	369	Stall	Ongoing
	high quality cyclical maintenance succession			
	nlanting and regular inspections of its condition			
	<ul> <li>Establish a Plant Acquisition and Replacement Policy</li> </ul>	SBG	Staff	Short
	<ul> <li>Implement and regularly review the 10 Year</li> </ul>	SBG	Staff	Medium
	Living Collection Management Plan and	364	Stan	and
	associated Lawn Action Plans.			ongoing
	<ul> <li>Maintain internal key views and openness of</li> </ul>	SBG	Staff	Ongoing
	certain Lawns.			- 0- 0
	<ul> <li>Maintain the sense of enclosure provided by</li> </ul>	SBG	Staff	Ongoing
	the vegetation around the site's periphery.			
	- Enhance the interpretation of the site's historic	SBG	Specialist advice	Short
	development including lost and extant features.		and capital	
	<ul> <li>Enhance the condition of heritage trees in</li> </ul>	SBG	Staff	Medium
	accordance with arboricultural assessments and			and
	the arboricultural strategy (contained in the 10			ongoing
	Year Living Collection Management Plan).			
	<ul> <li>Consider which additional tree specimens</li> </ul>	SBG	Staff	Short
	could be proposed as Heritage Trees for			and
	endorsement by the Heritage Tree Panel.			ongoing
	<ul> <li>Monitor the need for lightning conductors to be</li> </ul>	SBG	Staff	Ongoing
	fitted to additional trees.	CD C	<u>c</u> , ((	
	<ul> <li>Sustain efforts to label and better interpret the living collections.</li> </ul>	SBG	Staff	Ongoing
	Inving collections.	SPC	Capital	Chart
	<ul> <li>Improve the nursery facilities (inked to action</li> <li>listed under Policy 3a)</li> </ul>	SBG	(socured)	Short
	Develop a Historic Landscape Improvement Plan	SBG	(secured)	Medium
	which would set out a detailed WHS/historic	300	advice and	Medium
	landscape vision and heritage improvement		capital	
	strategy, design guidelines for public realm		capital	
	interventions and conservation plans for individual			
	Conserved Buildings (see also Policy 2b).			
	<ul> <li>Continue to provide horticultural/botanical</li> </ul>	SBG	Staff	Ongoing
	training to staff.			
	<ul> <li>Support staff in obtaining a Workforce Skill</li> </ul>	SBG	Staff training	Ongoing
	Qualification.		cost covered in	
			existing budget	
	<ul> <li>Explore opportunities to re-open a School of</li> </ul>	SBG	Staff, capital	Long
	Horticulture at the site.		and increased	
			operational	
			budget	

Aims, Policies and Actions		Stakeholder(s) responsible for delivery	Resources needed	Time scale
Policy 2b	Conserve and enhance the site's built heritage			
	<ul> <li>Continue to carry out regular inspections and maintenance.</li> </ul>	SBG, NParks	Staff/ maintenance	Ongoing
	<ul> <li>Ensure that all building restoration works are carried out in accordance with best practice guidance by suitably qualified professionals, using appropriate methods and materials.</li> <li>Conservation permission should be obtained from the Competent Authority prior to refurbishment/restoration works being carried out on a Conserved Building/Structure.</li> </ul>	SBG, NParks	Staff/ maintenance	Ongoing
	<ul> <li>Carry out repairs works to the Garage and House 6.</li> </ul>	SBG, NParks	Staff, covered in existing budget	Short
	<ul> <li>Develop a Conservation Plan for each of the site's Conserved Buildings/ Structures (as part of an overall Historic Landscape Improvement Plan).</li> <li>Use these to guide their future management.</li> </ul>	SBG, NParks	Staff/ maintenance	Medium
	<ul> <li>Undertake a survey of the interior and surviving historic features/fabric of all Conserved</li> <li>Buildings/ Structures and ensure their preservation is upheld in future conservation and adaptation proposals. Use the survey information to inform the Conservation Plans.</li> </ul>	SBG, NParks	Specialist advice and capital	Medium
	<ul> <li>Define buffer zones for all Conserved Buildings/ Structures.</li> </ul>	SBG	Staff	Medium
	<ul> <li>Where appropriate, enhance the setting of historic buildings.</li> </ul>	SBG	Staff (part of delivering the 10 Year Living Collection Management Plan)	Medium
	<ul> <li>Explore opportunities to replace the planting around E.J.H. Corner House with plants which will alleviate existing moisture related issues.</li> </ul>	SBG	Staff (part of delivering the 10 Year Living Collection Management Plan)	Medium
	<ul> <li>Ensure that buildings meet 21st century standards/regulations and that innovative solutions are sought for historic buildings (preserving their fabric/character).</li> </ul>	SBG, NParks	Staff and specialist advice	Ongoing
	<ul> <li>Ensure all buildings have a sustainable and suitable use.</li> </ul>	SBG, NParks	Staff	Ongoing

Aims, Policies and Actions		Stakeholder(s)	Resources	Time
		for delivery	neeaea	scale
Policy 2c	Conserve and enhance the site's nature conservation	n value in ways th	nat are complen	nentary
	with its Outstanding Universal Values.			
	<ul> <li>Undertake a habitat survey and subsequently</li> </ul>	SBG, NParks	Staff and	Short
	more detailed ecological surveys, as appropriate.		capital cost	
	<ul> <li>Manage existing habitats to increase overall biodiversity and where appropriate introduce new habitats.</li> </ul>	SBG	Staff/ maintenance	Ongoing
	<ul> <li>Promote management practices that conserve and enhance biodiversity.</li> </ul>	SBG	Staff	Ongoing
	<ul> <li>Develop and implement a site-wide Biodiversity Conservation Plan (outlining the Gardens' commitment to conserving and enhancing biodiversity as well as specific biodiversity enhancement measures). The Plan should be regularly reviewed and updated in light of new information and survey results.</li> </ul>	SBG, NParks	Staff and capital	Medium and ongoing
	<ul> <li>Undertake a regular site-wide ecological survey(s) to maintain an up to date understanding of the locations of all species and habitats. Use this information to measure and record biodiversity/potential changes in the nature conservation value of the site using indicator species.</li> </ul>	SBG, NParks	Staff and capital	Ongoing
	<ul> <li>Monitor the potential impact of visitors on biodiversity. This should inform management of the site.</li> </ul>	SBG	Staff	Ongoing
	<ul> <li>Ensure that biodiversity enhancement measures do not undermine the site's historic landscape/features or its recreational and scientific functions.</li> </ul>	SBG	Staff	Ongoing
	- Continue to remove invasive alien species.	SBG	Staff	Ongoing
	<ul> <li>Provide high quality interpretation relating to the site's nature conservation value/biodiversity.</li> </ul>	SBG	Staff and capital	Medium
	<ul> <li>Conserve and enhance the rainforest through appropriate maintenance and management.</li> </ul>	SBG	Staff/ maintenance	Ongoing
	<ul> <li>Seek opportunities to connect the site with greenspaces/wildlife areas beyond its boundaries.</li> </ul>	SBG, NParks	Staff and capital	Long
Policy 2d	Maintain accreditation to ISO 14001.	SBG	Staff	Ongoing
Policy 2e	Carry out a study of the possible impacts of climate change and identify appropriate adaptation strategies.	SBG	Specialist advice and capital	Medium
Policy 2f	Risk management and counter-disaster preparedness strategies should be kept under review and updated as necessary.	NParks	Staff	Ongoing

Aims, Policies and Actions		Stakeholder(s) responsible for delivery	Resources needed	Time scale	
Aim 3	Encourage sustainable uses of the site that help conserve the Site's Outstanding Universal Values, authenticity and integrity, including scientific research functions and appropriate provision of education, outreach, promotion and access for visitors.				
Policy 3a	Er an	nsure that the site's role as a leading scientific reseand where possible enhanced.	arch and conserv	ation centre is s	ustained
	-	Develop a 10 Year Research and Conservation Strategy with mechanism to implement and review it.	SBG	Staff	Medium and ongoing
	_	Explore opportunities to increase the working space in the Herbarium, enhance its storage facilities and provide a walk-in freezer.	SBG	Capital	Medium
	_	Install compactor units in the spirit room to increase its holding capacity.	SBG	Capital	Short
	_	Enhance the nursery facilities, as appropriate (linked to action listed under Policy 2a).	SBG	Capital (secured)	Short
	_	Enhance the living collection, in line with the Plant Acquisition and Retention Policy, to meet research and conservation needs.	SBG	Staff (part of delivering the 10 Year Living Collection Management Plan)	Medium and ongoing
	-	Assess, and where appropriate enhance, the curation of the documentary and visual reference collections. Establish a list of protocols and improve access.	SBG	Staff and capital	Short
	_	Explore opportunities to expand teams within the Research and Conservation branch, as appropriate.	SBG	Increased operational budget	Short
	—	Continue efforts to digitise the collections and keep information up-to-date.	SBG	Staff	Ongoing
	_	Develop a digital (GIS) map of the living collections and test new cyber technology.	SBG	Staff, specialist advice and capital	Medium
	_	Install appropriate shelving/drawer system to accommodate collection of botanical paintings and large-size volumes in Rare Books Room.	SBG	Capital (secured)	Short

Aims, Policies and Actions		Stakeholder(s)	Resources	Time
		for delivery	needed	Scule
Policy 3b	Management of visitors to the site should be exemp international guidance on sustainable tourism, supp attraction.	lary and follow re orting the Garde	elevant national ns' role as a leac	and ling visitor
	<ul> <li>Develop and implement a Visitor Management</li> <li>Strategy (which would include an audience</li> <li>development plan, interpretation plan/strategy</li> <li>and disabled access policy/strategy).</li> </ul>	SBG	Staff, specialist advice and capital	Short and ongoing
	<ul> <li>Groups which are currently under-represented at the site or form a small share of existing visitors should be identified as part of the audience development plan and opportunities to encourage them to use the site more, engage with them more and increase their awareness of the site's significance and offer should be identified.</li> </ul>			
	<ul> <li>Undertake regular visitor/user surveys.</li> </ul>	SBG	Staff	Ongoing
	<ul> <li>Set up disability focus groups as and when appropriate.</li> </ul>	SBG	Staff	Short
Policy 3c	Improve the sense of arrival and orientation.			
	<ul> <li>Consider closing some entry points/gates and developing a 'gateway' strategy.</li> </ul>	SBG	Staff	Short
	<ul> <li>Provide clear and consistent orientation and visitor information at all entrances (including a map with the location of all key features, information about the nature of the site and what it has to offer).</li> </ul>	SBG	Staff	Short
	<ul> <li>Explore opportunities to enhance interpretation and orientation information provided at existing 'visitor centres/visitor receptions'.</li> </ul>	SBG	Staff	Short
	<ul> <li>Provide high quality, up-to-date and informative pre-visit information.</li> </ul>	SBG	Staff and capital	Short and ongoing
	<ul> <li>Provide directional information in a range of media.</li> </ul>	SBG	Staff and capital	Short
	<ul> <li>Promote the Heritage Museum as the Singapore Botanic Gardens' World Heritage Centre (see also Policy 3e).</li> </ul>	SBG	Staff	Ongoing
Policy 3d	Balance the needs of different user groups.			
	<ul> <li>Explore opportunities to provide more dog-free zones.</li> </ul>	SBG	Staff and capital	Short
	<ul> <li>Continue to enforce a no picnics and exercise policy in the shelters and where this causes obstructions on paths.</li> </ul>	SBG	Staff	Ongoing

Aims, Polic	ies and Actions	Stakeholder(s) responsible for delivery	Resources needed	Time scale
Policy 3e	Enhance the visitor experience through the provisio services without compromising the site's Outstanding	n of new/improv ng Universal Valu	ed visitor faciliti es.	es and
	<ul> <li>Enhance the National Orchid Garden.</li> </ul>	SBG	Capital (secured)	Short
	<ul> <li>Extend the Jacob Ballas Children's Garden.</li> </ul>	SBG	Capital (secured)	Short
	<ul> <li>Introduce a new Ethnobotany Garden.</li> </ul>	SBG	Capital (secured)	Short
	<ul> <li>Continue to develop the Tyersall Learning Forest.</li> </ul>	SBG	Capital (secured)	Short and ongoing
	<ul> <li>Relocate/enhance existing visitor counters.</li> </ul>	SBG	Covered under existing budget	Short
	<ul> <li>Promote the Heritage Museum as the Singapore Botanic Gardens' World Heritage Centre, a key facility where visitors can find in-depth interpretative information about the site/its values as well as information to help them discover how they can make the most out of the site. It could act as the starting point for several walks/trails (see also policy 3c).</li> </ul>	SBG	Staff	Ongoing
	<ul> <li>Provide a food and beverage outlet in the Garage.</li> </ul>	SBG	Capital (secured)	Short
	<ul> <li>Provide a new garden shop at the Green</li> <li>Pavilion.</li> </ul>	SBG	Covered under existing budget	Short
Policy 3f	Monitor the physical impact of visitors on the site.	T		1
	<ul> <li>Carry out regular condition surveys.</li> <li>Monitor the use of different parts of the site by visitors.</li> </ul>	SBG SBG	Staff Staff	Ongoing Ongoing
	<ul> <li>Ensure the Visitor Management Strategy includes appropriate methods to manage visitor circulation and access to different elements of the site.</li> </ul>	SBG	Staff, specialist advice	Short
	<ul> <li>Where appropriate erect fences around Heritage Trees.</li> </ul>	SBG	Staff/ maintenance	Ongoing

Aims, Policies and Actions       Stakeholder(s)       Resources       Tir         responsible       needed       sca         for delivery       For delivery       For delivery	ime cale
Policy 3g Encourage visitors to make sustainable choices and informed decisions about how they	/ will
get to the site.	
<ul> <li>Information for the general public about</li> <li>SBG</li> <li>Staff</li> <li>Or</li> </ul>	ngoing
transport services will focus on alternatives	
to car use and will be high quality, up-to-date,	
accessible and widely promoted.	
Policy 3hPromote community involvement.SBGStaffOr	ngoing
<ul> <li>Broaden the volunteer programme and</li> <li>SBG</li> <li>Staff</li> <li>Sh</li> </ul>	hort
associated volunteering opportunities. an	nd
Or	ngoing
<ul> <li>Consider establishing a Friends group.</li> <li>SBG</li> <li>Staff</li> <li>Sh</li> </ul>	hort
<ul> <li>Deliver outreach projects to promote the SBG Staff Sh</li> </ul>	hort
Gardens. an	nd
	ingoing
<b>Policy 31</b> Interpretation of the WHS on and off site will be of a high standard, accurate, accessible a	and
consistent and will enhance enjoyment and appreciation of the site's values/significance	e and
Develop an interpretation strategy (including on SPC Staff Sh	hort
and off site interpretation), as part of an overall	non
Visitor Management Strategy. advice. capital	
- Explore opportunities to develop web.     SBG Staff. Me	ledium
handheld device or mobile phone-based specialist	
interpretation resources for engaging new advice, capital	
audiences through digital and interactive	
media.	
Policy 3j Enhance learning opportunities.	
<ul> <li>Broaden the formal school education</li> <li>SBG</li> <li>Staff and</li> <li>Sh</li> </ul>	hort
programme, in line with the Government's capital	
aspirations.	
<ul> <li>Broaden the informal adult and children/</li> <li>SBG</li> <li>Staff and</li> <li>Sh</li> </ul>	hort
young people's education programme, in capital an	nd
collaboration with the Ministry of Education.	ngoing
<ul> <li>Promote and enhance learning through natural SBG</li> <li>Staff, capital Sh</li> </ul>	hort
play (including through the extension of the (secured) an	nd
Jacob Ballas Children Garden and provision of on	ngoing
family trails and associated activities).	
<ul> <li>Deliver high quality and accessible</li> <li>SBG</li> <li>Staff,</li> <li>Sh</li> </ul>	hort
<ul> <li>Deliver high quality and accessible interpretation and events/exhibition that</li> <li>SBG</li> <li>Staff, Sh specialist an</li> </ul>	hort nd
<ul> <li>Deliver high quality and accessible interpretation and events/exhibition that have direct relevance to and strengthen</li> <li>SBG</li> <li>Staff, Sh specialist advice and on</li> </ul>	hort nd ngoing
<ul> <li>Deliver high quality and accessible</li> <li>interpretation and events/exhibition that</li> <li>have direct relevance to and strengthen</li> <li>understanding of the Outstanding Universal</li> <li>SBG</li> <li>Staff,</li> <li>Sh</li> <li>specialist</li> <li>an</li> <li>advice and</li> <li>capital (linked</li> </ul>	hort nd ngoing
<ul> <li>Deliver high quality and accessible</li> <li>interpretation and events/exhibition that</li> <li>have direct relevance to and strengthen</li> <li>understanding of the Outstanding Universal</li> <li>Values of the site and other associated values.</li> </ul>	hort nd ngoing
<ul> <li>Deliver high quality and accessible interpretation and events/exhibition that have direct relevance to and strengthen understanding of the Outstanding Universal Values of the site and other associated values.</li> <li>Explore opportunities to expand the oducational team as appropriate</li> </ul>	hort nd ngoing hort



Aims, Polici	es and Actions	Stakeholder(s) responsible for delivery	Resources needed	Time scale
Policy 3j (cont.)	<ul> <li>Increase educational outreach activities.</li> </ul>	SBG	Staff and capital	Short and ongoing
	<ul> <li>Develop and disseminate resources for teachers and educational practitioners to use as teaching and learning tools about the WHS.</li> </ul>	SBG	Staff and capital	Short and ongoing
	<ul> <li>Identify appropriate venues within the Gardens which could be used as classrooms and seek opportunities to provide storage facilities where needed.</li> </ul>	SBG	Capital	Short
Policy 3k	Widely promote the site's Outstanding Universal Val	ues and other as	sociated values.	
	<ul> <li>Develop and implement a WHS Marketing and Branding Strategy.</li> </ul>	SBG	Staff, specialist advice and capital	Short and ongoing
	<ul> <li>Liaise with the Singapore Tourism Board to ensure linkage with the national strategy/ initiatives.</li> </ul>	SBG	Staff	Short and ongoing
	<ul> <li>Promote existing offer and new aspects of it, targeting resources effectively.</li> </ul>	SBG, NParks	Staff	Ongoing
Aim 4	Ensure that effective governance arrangements in the long-term management and monitoring o conservation, access, sustainable use, including community.	are in place tha f the site, and ir tourism, and th	t involve stake 1 balancing res e interests of t	holders earch, ne local
Policy 4a	Ensure a partnership approach to the implementation of the Management Plan.	SBG	Staff	Ongoing
	<ul> <li>Appoint a WHS co-ordinator</li> </ul>	SBG	Staff	Short
Policy 4b	Ensure sufficient resources are in place to enable effective management, conservation and monitoring of the WHS.	SBG	Staff	Ongoing
	<ul> <li>Explore opportunities to expand the Education team and teams within the Research and Conservation branch.</li> </ul>	SBG	Increased operational budget	Short
	<ul> <li>Ensure adequate funding is available to cover operational and capital costs.</li> </ul>	SBG	Staff	Ongoing
Policy 4c	Ensure regular monitoring of the WHS.	SBG	Staff/ specialist advice	Ongoing
	<ul> <li>Review priorities and progress on the implementation of the Management Plan at six monthly WHS Management Committee meetings.</li> </ul>	SBG	Staff	Short and ongoing

Aims, Polici	es and Actions	Stakeholder(s) responsible for delivery	Resources needed	Time scale
Policy 4c (cont.)	<ul> <li>Review and update the Management Plan at least every five years. Interim reviews should be undertaken as and when appropriate.</li> </ul>	SBG	Staff	Short and ongoing
	<ul> <li>Establish monitoring indicators relevant to the site's Outstanding Universal Values to measure progress with the protection, interpretation and management of the site.</li> </ul>	SBG	Staff	Short
Policy 4d	Undertake research to further supplement understa	anding of the site	's values.	
	<ul> <li>Undertake additional research to better understand how the Gardens' botanical collections and key historic buildings have evolved over time.</li> </ul>	WHSMC	Staff and capital	Medium
	<ul> <li>Undertake additional research to better understand the Gardens' contribution to the social history of Singapore and the development of the Singaporean identity.</li> </ul>	WHSMC	Capital	Medium
	<ul> <li>Undertake additional research to better understand the wider social and economic impact of some of the economic crops (other than rubber) researched and trialled by the Singapore Botanic Gardens.</li> </ul>	WHSMC	Staff	Medium
	<ul> <li>Undertake additional research to better understand the Botanic Gardens' contribution to the greening of Singapore.</li> </ul>	WHSMC	Staff	Medium



# APPENDIX i CHARACTER AREAS

# APPENDIX i CHARACTER AREAS

### Landscape Character Areas

Character Area 1: Eco Lake/Former Economic Gardens

This area of the site, once part of the Economic Gardens (present between the late 1870s and early 1920s) has an undulating topography, with small grass man-made mounds topped with wooden shelters overlooking the Eco Lake (the 1983 Bukit Timah Core pond was expanded into the Eco Lake in 1993). It is generally open with views possible across it and to high rise buildings located beyond the site boundary. The Eco Lake, a naturalistic lake with a shingle shore and swamp plants along its margins, dominates this character area. A number of plant collections/display gardens (fruit trees, spices, bamboo/reflexology, trellis garden and foliage garden) are dotted around the lake providing variety and ornamental interest. Planting here is generally not yet fully mature. Character Area 1 is located outside the Nominated Property in the proposed Buffer Zone.

### **Character Area 2: Plant Resource Centre**

This character area, once part of the Economic Gardens and later the former Raffles College grounds, is made up of the plant resource centre (established in 1995). This facility is closed to the public and used by the Botanic Gardens' staff for the following purposes: propagation of plants of interest (e.g. ornamentals, native species, rare plants, iconic species) for in-house use and exchange; seed management and germination, housing of plants received (including for thematic projects and research collections) and acclimatisation prior to planting in the Botanic Gardens; plant record keeping (in-coming and out-going of plants); hands-on training centre for students, interns, volunteers in conservation, horticulture and education; plant rescue and recuperation centre (for rare plants that need special attention); provision of plants for events, decorations etc. Character Area 2 is located outside the Nominated Property in the proposed Buffer Zone. Character Area 3: Jacob Ballas Children's Garden

This character area, once part of the Economic Gardens and later the former Raffles College grounds, was designed and planted from 2004 to 2007 to provide a unique discovery and learning experience in a garden setting for children of up to 12 years of age. It is well-enclosed and has a sense of facilities in a woodland or forest. Interactive, fun and sometimes brightly coloured play areas/ equipment are carefully nestled among the vegetation. Key features include 'living' classrooms, a suspension bridge, a cave, a pond containing a floating platform and timber deck, a tree house, a potting garden, a sensory garden, a maze, a playground and a water play area. A carpark and a brightly coloured visitor and reception centre are located to the east of this zone. Character Area 3 is located outside the Nominated Property in the proposed Buffer Zone.

# Character Area 4: Former Raffles College Houses and Setting

This part of the Botanic Gardens (which once formed part of the Economic Gardens and later the former Raffles College grounds) slopes down steeply to the west with five former university buildings (built in the early 1920s) located along the edge of the hilltop, set back against the site's outer perimeter. This part of the Botanic Gardens contains numerous mature trees (including old tembusu trees and palms dating back to the 1920s) which provide dappled shade along footpaths. It is generally well-contained with some internal views down towards the garage (built in the 1920s) located at the foot of the hill, with old nutmeg and durian trees in between. The Fragrant Garden completed in 2013 (replacing derelict university out-buildings) wraps around House 5 and contains new planting including diverse shrubs and herbs with sweetsmelling flowers. Chinese tombs (1842-81) set

within an open grass lawn with scattered shrubs and trees are located to the north–east of the zone.

**Character Area 5: Evolution Garden** 

This character area once formed part of the Economic Gardens and contained the former garden workers' accommodations, who were rehoused off site and their former houses removed during the 1970s. The Evolution Garden, planted from an empty space, opened in 2005. It is laid out on a small hill and is visually enclosed by dense tree planting. A winding path takes the visitor on a journey through time and exhibits the evolution of plant life. Tall tree specimens, outcrops of rocks, large boulders and fossils (some real and some artificial) border both sides of the main path spiralling to the base of the hill. There are no views out and a series of surprise views unfold along the main path revealing different epochs beginning with the lifeless earth and ending with the flowering of plants. Its south-western and eastern edges contain older plantings of timber trees, a couple of late 19th century economic plantings and impressive African baobab specimens clinging to the west-facing slope beneath. The texture of the planting is varied, ranging from that of low delicate ferns to that of mature tall cycads.

### **Character Area 6: Healing Garden**

This character area once formed part of the Economic Gardens and later the former Raffles College grounds. It was landscaped as the Healing Garden in 2011, replacing college land bearing derelict university out-buildings, a few large trees (retained) and many smaller trees, shrubs and lawn. The Healing Garden is located adjacent to the old university houses and is laid out over sloping and terraced ground facing south-east. A complex of winding paths leads the visitors through generally new plantings (which includes highly floriferous herbaceous species) interspersed with tall tree specimens (including veteran trees such as Palaquium obovatum, planted by Ridley in the then Economic Gardens). 500 species of plants used for traditional medicine in Southeast Asia are laid out in the shape of the human body, the plantings corresponding to those body areas the

plants are used to treat. This garden surrounds the former Economic Gardens' historic Field Assistant's House (House 6, completed in 1919) and includes mature oil palms dating from c.1920, likely to have been planted as sources of seed for the nascent plantation industry at the time.

### **Character Area 7: Raffles Building and Setting**

The Raffles Building (previously known as Raffles Hall, completed in 1958) and adjacent carpark/food and beverage facility dominate this character area, which once formed part of the Economic Gardens and later the former Raffles College grounds. The front of the Raffles Building holds a young collection of mostly wild provenance *Myrtaceae* (Myrtle or Eucalypt Family), while the area immediately southwest of the Healing Garden has the remains of a *Myristicaceae* (Nutmeg Family) collection.

### **Character Area 8: Central Zone**

This character area once formed part of the Economic Gardens. The eastern half of it is dominated by visitor car parking and associated infrastructure; it is open with views across it and out towards Cluny Road. A small naturalistic water feature located beside the traffic roundabout connects the roads between the Raffles Building, Cluny Road exit and Nassim Gate entrance and carparks. A large attractive veteran rain tree dominates the entrance into the Botanic Gardens and visitor centre, completed in 1998. The ground gently rises in the western half of this character area, with the NParks Headquarters and E.J.H. Corner House sited on higher ground above the visitor centre.

Once past the covered visitor centre/counter, visitors enter into Palm Court, located between a restaurant and the Garden Shop. This area is dominated by striking tall oil palms, individually planted in raised granite planters, whose trunks are clothed in epiphytic plants. Views are possible towards the Cascade Garden and up towards the NParks Headquarters.

E.J.H. Corner House, a traditional Black and White style bungalow completed in 1910, dominates a small grass hill to the west. It is set among lush tropical planting and includes a small domestic scale garden immediately adjacent to the house. A diverse collection of palms contiguous with those in Palm Valley is located on the south side of the house, which add to the lush character of the zone.

Character Area 9: Palm Valley and Symphony Lake

Palm Valley, planted from 1879 (where an Economic Garden planted under Murton's superintendence once stood), stretches northwards from Orchid Plaza, gently sloping down to Symphony Lake. This large expanse of grass, with multiple scattered mature palms of varying sizes (c.220 species represented) and other tree species, is nestled in a shallow valley between the Rainforest and the National Orchid Garden, whose eastern side once included part of the original extent of Palm Valley. While being more open in character than other parts of the Botanic Gardens, the many palms and topography still limit full panoramic views. Symphony Lake dominates the northern end of this character area, with its iconic stage (the Shaw Symphony Stage, built in 2005 to replace a stage erected in 1995) providing a focal point in views along the valley. An arrow (date unknown) emerges from the lake, pointing towards Greenwich, London. This marks the location of a temporary station for the observation of terrestrial magnetism set up in the Gardens in 1914. Broad views to the south are afforded from the Viewing Terrace. A series of beds located along Heliconia Walk (to the east, dated 1998) showcase the larger growing and more spectacular species of this genus. This strengthens the lush tropical character of Palm Valley.

### **Character Area 10: Rainforest**

A raised boardwalk leads visitors through a tract of primary rainforest which, due to its dense and tall vegetation, is very enclosed with jungle. Only limited glimpses of the sky can be achieved through small openings in the canopy of the mature forest trees. A total of 300 tree species have been recorded in the Rainforest by the Botanic Gardens' scientists, but many of these are represented by few or solitary individuals, as is to be expected in such a small area of species–rich vegetation. This element of the Botanic Gardens was carefully preserved and integrated into the landscape from the outset.

### Character Area 11: National Orchid Garden and Nursery

The National Orchid Garden, designed to showcase the products of the Botanic Gardens' orchid breeding programme, lies on a relatively steep east/north-east facing slope. It was completed in 1995 and is sited on the side of the hill upon which Burkill Hall, a black and white plantation style bungalow is located. The sophisticated landscaping ensures that at each twist and turn a new vista is presented. The winding paths lead visitors through this secluded lush tropical garden punctuated by tall palms and other tree species and dominated by a tapestry of orchid blooms of all shapes, shades and sizes. The misthouse (1995), bromeliad enclosure (1995) and cool house (2004) provide further specialist tropical display gardens within the National Orchid Garden. The latter houses an artificially controlled montane tropical cloud forest display with trees and rocks draped with orchids and carnivorous plants. The Orchid Plaza provides a key meeting place, overlooking Palm Valley and providing access into the National Orchid Garden to the west and Ginger Garden to the south.

A small semi-wild remnant of freshwater swamp (where water runs through throughout the year), the Orchid Nursery and mature trees are located to the north. The latter are mostly assumed to have been transplanted from the former Economic Gardens. Indeed, from 1917 until the early 1920s a number of valuable fruit and timber species were transplanted from the Economic Gardens, which were expected to be lost (when the Botanic Gardens' 1879 northern extension was initially designated for use as a public housing area and later re-designated for the former Raffles College, built 1925–28). Transplanted trees included durian, tamarind, Diospyros blancoi, mahoganies (African and American), Erythrophleum guineense and Sterculia foetida. These are now the largest examples of these species in the Botanic Gardens and will be made accessible to the public after the National Orchid Garden undergoes refurbishment during 2014-2018.

A small portion of Palm Valley (to the south–west) was incorporated into the National Orchid Garden in

the 1990s, within which can still be seen some large palm specimens of considerable age.

Character Area 12: Potting Yard and Plant House Zone

The Potting Yard area (dating back to the 1880s), Fernery Garden (1980), Aroid Garden (1999) and Plant House Garden (first established in 1882 and redesigned in the 1950s) are located at the foot of an east facing slope, close to Cluny Road. All of these features are nestled among mature vegetation which mainly comprise tall tree specimens. This character area is generally inward looking and imparts a sense of seclusion. Some views west towards Bandstand Hill are afforded from the Aroid and Plant House Gardens. Pergolas draped in climbers constructed on all four sides of the Plant House Garden provide shade. This Garden is more symmetrical and formal in appearance/design than most of the rest of the Botanic Gardens (with the exception of the Sundial Garden). The Plant House Garden originally contained a large rectangular 'plant house' (completed in 1882 and roofed in 1885) erected to accommodate public flower shows and displays of potted plants and annuals (some of which were for sale). It now comprises a grass quadrangle surrounded by pergolas, with a central water lily pond (completed 1958).

Character Area 13: Ginger Garden and The Dell

This character area is filled with lush tropical planting showcasing over 550 different types of gingers and species in the related families of the heliconias, bird–of–paradise, bananas and arrowroot. Colourful blooms punctuate this inward looking display garden and meandering paths lead visitors past ponds (including a water lily pond with *Victoria* and the giant aroid, *Typhonodorum lindleyanum*), a waterfall and seven major exhibits organised according to geographical origin or plant uses. The Halia restaurant complex, opened in April 2001, occupies the northern end of this Ginger Garden.

The area known as the The Dell, where the water supply for Swan Lake from the Tyersall Learning Forest enters at its north end, covers the southern end of this character area. First developed as a fernery in the early 1880s, it has retained its distinctive character. The sheltered, humid environment favours certain unusual plants, such as *Monophyllaea horsfieldii*, though it does not have a taxonomic collections focus. There is an abundance of tall Dracaena along the various paths and a number of large and climbing Araceae. Attractive ferns and fern allies can be found in the shadiest spots. An unusually tall rain tree marks the limit of The Dell with the Ginger Garden's coach drop–off area, the east side of which is planted with various palms and *Mimusops elengi*. The east side of The Dell is accessed in three places by steps, which descend steeply through a wall of vegetation into its dark interior.

### **Character Area 14: Bandstand Hill**

Display gardens (*Vanda* 'Miss Joaquim' display –1980s, Sun Garden – 2004, Bonsai Garden – 2005 and Sundial Garden – 1929) and a frangipani collection (to the east, dated 1920s) have been laid out on the gently sloping sides of Bandstand Hill, on the top of which sits the decorative white painted Bandstand (1930). Bandstand Hill, which formed part of the 1860s design of the then pleasure gardens, commands the highest point in the original area of the Botanic Gardens (1859).

The Bandstand is bordered by a ring of new low shrubs which gives way to a large flat area of mown grass encircled by yellow rain trees, the foliage of which is a focal point among the green tree canopies and lawns. The different parts of this character area impart a feeling of seclusion and are inward looking. The bonsai collection and Sundial Garden to the south and desert plants to the west are in stark contrast to the more lush tropical planting found elsewhere in the Botanic Gardens. The very formal layout of the Sundial Garden is strikingly different to the rest of the Botanic Gardens.

### **Character Area 15: Botany Centre and Setting**

The Botany Centre and Green Pavilion, built in 2006, feature Singapore's first pitched green roof. These buildings, located at the foot of an east facing slope, dominate the eastern half of this character area. An imposing veteran tree, *Callophyllum inophyllum*, which influenced the layout of the Botany Centre, stands tall at its centre. A large lawn slopes southwards to the west of the Centre, with the Green Gallery (2013) and Holttum Hall (1921) on the crest of the slope. Ridley Hall (1882) is located immediately to the north of the Botany Centre. This character area is relatively open with views out towards the City to the south and east being possible from the lawn in front of Holttum Hall. The administrative/research centre of the Botanic Gardens has been located in this part of the Botanic Gardens since the late 19th century.

Character Area 16: Saraca Stream Zone

A twisting walkway which follows a fast-flowing man-made stream, which weaves its way through this character area in a southerly direction, leads visitors through lush vegetation and tall tree planting dominated by the flowering tree Saraca cauliflora. The inspiration behind the landscaping work (completed in 2006) is the Saraca Stream vegetation, a typical habitat found along the rocky headwaters of streams and rivers of the Malay Peninsula. Tree species also include Tristania and *Podocarpus* while the understorey planting includes species such as dwarf palms, ferns and gingers. This character area is generally inward looking and incorporates the Tanglin Gate (existing gates dated 2006), the main historic entrance into the Botanic Gardens.

Visitor facilities in the form of toilets and shelters (1970s–2005) are located to the north, from which views down across the surrounding lawns sloping towards Swan Lake (1866) can be afforded. Vegetation beyond is fairly dense and generally comprises mature tree planting.

**Character Area 17: Swan Lake and Lawns** 

This character area is dominated by Swan Lake (1866), which is nestled at the foot of very gently westerly sloping lawns peppered with a wide variety of trees. Views across this part of the Botanic Gardens, which is fairly open in character, are afforded from the surrounding lawns. Thick tall vegetation is present along the southern and western edges of this character area, which abut Holland Road and the Tyersall extension respectively. This part of the Botanic Gardens, while being tropical in appearance, reflects its historic character, which was intended to emulate British pleasure gardens/public parks, with a wide promenade following a large water body and scattered trees set within mown grass. The Marsh Garden, laid out in 1969, is located to the south and incorporates the remnants of a rhinoceros wallow and alligator ponds present in the Botanic Gardens during the late 19th century, when the Botanic Gardens contained such zoological collections.

**Character Area 18: Tyersall Learning Forest** 

This character area comprises dense secondary forest overgrown with laurel, *Albizia* and towering tembusu trees, some planted in 1862. This character area is very inward looking, the vegetation blocking views in and out. Character Area 18 is located outside the Nominated Property in the proposed Buffer Zone.

## APPENDIX ii

### 10 YEAR LIVING COLLECTION MANAGEMENT PLAN

# 10 Year Living Collection Management Plan

Lawns A,B,C,D

Date: August 2013

Manager: Rebecca Tan Hui Xian

Section Head: Dr. Nura Abdul Karim

# Lawn A [Tanglin Core: between Holland Road boundary, Main Gate Road & Lawn F (Swan Lake)]

### Landscape Content and Heritage Value

Essentially flat land, densely planted with some palm collections and old frangipanis (The frangipanis were transplanted from Marina Park and brought in from Indonesia during redevelopment of the area in mid 2000) near the gate, giving way to larger trees (Dipterocarps, various Ficus, Khaya, Cola gigantea) in the direction of Swan Lake, with the Marsh Garden at its west end and the Holland Road boundary formed by a hedge of Baphia nitida. The clump of Metroxylon sagu bursting through the boundary hedge near Tanglin (Main) Gate and the huge, picturesque Ficus kurzii Heritage Tree overhanging the southern margin of Swan Lake may pre-date SBG's foundation, whilst the other Heritage Tree, Khaya senegalensis planted by former PM Lee Kuan Yew in November 1980, is a more recent specimen of note. The Marsh Garden (1969) derives from a former Victoria water lily pond, which utilised a wallow dug for a rhinoceros when SBG had zoological collections during the 1870s. It is a mixed collection of freshwater aquatic, swamp and saline-tolerant mangrove species, including large Old & New World Araceae, Barringtonia asiatica, giant Pandanus, very large Cerbera odollam, tall Cyrtostachys renda, tree ferns etc., but lacks interpretation, which would draw attention to the interesting plant adaptations displayed. It is supplied by the overflow of Swan Lake.

### **Present Condition**

The collections near the gateway (*Saraca, Brownea*, palms, frangipanis etc) are too dense to be properly appreciated and some of the palms are in poor condition. The ground flora appears random and poorly maintained, giving an impression of neglect as the visitor enters the site. The lacklustre sparse small beds of butterfly attracting flowering plants along the Main Gate Road need to be revamped. One large specimen of cannonball tree (*Couroupita guianensis*) and a *Terminalia* beside the Holland Road boundary are more or less hidden and could be removed to give space for other plantings of greater value. The Marsh Garden needs something to draw the visitor's attention to it. Generally speaking, the lawn does not give the impression of being maintained as intensively as other parts of SBG and the high proportion of unlabelled specimens is something that SBG can do without.

### Constraints

The current plantings act as a sound/pollution barrier to traffic noise/fumes along the busy Holland Road. Thinning out the plantings, whilst desirable, might increase the intrusiveness of the road.

### Strengths

Historic specimens thought to antedate the Gardens' foundation and history of the Marsh Garden.

### Weaknesses

There is a general lack of interpretation, apart from the Lee Kuan Yew Heritage *Khaya*. Density of plantings near the Tanglin gateway and lack of paths discourages visitors from entering to observe, e.g., the original sago palm which lack of labelling. There is no particular focus in Lawn A with the mix variety of plants and random planting beds along the

walkway. As water in Marsh Garden is supplied by the overflow of Swan Lake, water supply may stop during periods of drought when water level drops. Also note the deteriorating fence along Holland Road, which will be amended in coming months.

The newly established butterfly trail flowering beds started in March 2012 along Main Gate Road is not establishing well due to the shade cover from the old established large trees, which has also limited the selection of butterfly attracting plants to be introduced in these beds.

### **Potential for Improvement** [to mention collections focus if relevant]

Lawn A does not appear to have any particular collection's focus apart from the palms planted during the redevelopment of Tanglin Core in 2005/6 near the gate, which are the most abundant group, though very crowded and of poor condition and hence probably less appreciated. Some judicious thinning or removal of these and other nearby plantings could enable the heritage sago to be revealed and interpreted as well as create space for new plantings. De-accession of the diseased palms will allow the existing dipterocarps to grow larger. The aesthetic of the lawn could be improved by removing the patchy turf and replacing with generous leaf litter mulch and/or groundcover. Replace the fence along Holland Road and the leaning Baphia hedges to improve the boundary and security of SBG property. The other area with potential to be upgraded and interpreted is the Marsh Garden, which could be expanded and the Lake water better utilised. Here consideration could be given for reintroducing Victoria species or other water lilies to the pond, to reflect the former heritage feature seen in early photographs of SBG. The overgrown Montrichardia arborescens can be thinned down to allow other existing plants to establish. Reducing the shade at the back of Marsh Garden will allow more potential plants to be incorporated. The current tiled and stoned footpaths have deteriorated and retiling will need to be carried out to stabilize the path especially after rains.

**10-year plan** [to be drafted by Lawn manager for feedback by senior SBG management]

• Years 1–3: actions proposed [to include de-accessioning, acquisitions,

### interpretation]

- a) Inventory checked, analyzing and de-accession of collection where necessary
  - i) Update inventory
  - ii) Analyse collection overtime
  - iii) De-accession if necessary
  - iv) Addition of relevant new plant taxa to collection, if required

### b) Interpretation

- To provide interpretation signage for significant and interesting old mature trees and plants of conservation importance where suitable, especially, the Marsh Garden, Heritage Sago Palm and other heritage trees which will be installed by end of 1<sup>st</sup> year.
- ii) Labels and interpretation where required for general collections.

### c) Conservation of Heritage Collection Gene Pool

i) Review the present collection strength in terms of conservation and botanical values in 2<sup>nd</sup> year and subsequent years.

 Formulate and implement a conservation strategy such as propagation and seed collection of valuable old and rare plants of known provenance to maintain the gene pool.

### d) Replace existing fence along Holland Road and Marsh Garden's footpath

 To ensure the boundary and security of SBG property is maintained with good fencing and to replace the deteriorating footpath along Marsh Garden for public safety.

### e) Turf Management Programme

- i) Continue with turf management programme in improving the turf and soil such as hollow thinning and top dressing as required.
- ii) Re-turfing for areas that are poor and balding or consider using ground covers and leaf litters.

### f) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

### g) Pest, Disease and Fertilising/Soil Management

- i) Collect data on pest and disease problems and trial simple control measures and documentation of trials.
- ii) To study the need of fertilizers for the different plant taxa and apply suitable fertilizer regime.

### h) Redevelop the butterfly attracting plant collection along the Main Gate Road, linking the Marsh Garden to Swan Lake

i) To re-landscape with more butterfly attracting plants alternating and interspersed with *Canna* collection along the Main Gate Road to add colour to the entrance as this would in part recreate the heritage of this area, which had flowerbeds from Niven's time. Thinning of the mature trees may be required to ensure more sunlight into certain portions of planting beds.

### i) Improvements to Marsh Garden Collection

 Redevelopment of the Marsh Garden and introduce more native marsh plants and interpretation of these flora for educational outreach.

### • Years 4–6: actions proposed [as above]

- a) Inventory, analyzing and de-accession of collection
  - i) Revisit and update inventory
  - ii) Review the collection.
  - iii) De-accession if necessary.
  - iv) Addition of relevant new plant taxa to collection, if required.

### b) Interpretation

i) Labels and interpretation where required for general collection.

### c) Conservation of Heritage Collection Gene Pool

i) Review the present collection strength and the collection preservation needs for the period.

### d) Turf Management Program

- i) Continue with turf management programme in improving the turf and soil such as hollow thinning and top dressing as required.
- ii) Re-turfing for areas that are poor and balding or consider using ground covers and leaf litters.

### e) Tree Management Program

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating

### f) Pest, Disease and Fertilising Program

- i) Recommend possible non-chemical treatment for controlling pests & diseases.
- ii) Propose and apply fertilising/soil amendment programme to meet the needs of the collection.

### g) Improvements to Marsh Garden Collection

i) Review Marsh Garden collection and introduce more native marsh plants and interpretation if necessary.

### • Years 7–10: actions proposed [as above]

- a) Inventory, analyzing and de-accession of collection
  - i) Revisit and update inventory
  - ii) Review of collection.
  - iii) De-accession if necessary.
  - iv) Addition of relevant new plant taxa to collection, if required.

### b) Interpretation

i) Labels and interpretations where required for general collection.

### c) Conservation of Heritage Collection Gene Pool

i) Review the present collection strength and the collection preservation needs for the period.

### d) Turf Management Programme

- i) Continue with turf management programme in improving the turf and soil such as hollow thinning and top dressing as required.
- ii) Re-turfing for areas that are poor and balding or consider using ground covers and leaf litters.

### e) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

### f) Pest, Disease and Fertilising Programme

- i) Recommend possible non-chemical treatment for controlling pests & diseases.
- ii) Propose and apply fertilising programme to meet the needs of the collection.

# Lawn B [Tanglin Core: north side of Main Gate Road, bounded by Lawns C, D, E & F (Swan Lake)]

### Landscape Content and Heritage Value

South-sloping land, densely planted with trees at its east end, with under storey palms enjoying the shade. The west end is noted for its conifers, conifer-like *Gymnostoma* spp. (Casuarinaceae), Dipterocarps and a large heritage tree, Stereospermum fimbriatum (snake tree, Bignoniaceae) but the lawn is otherwise quite miscellaneous in its botanical collections that were planted up during the 2005/6 development of the Saraca Stream. At its east end it forms part of the Saraca stream feature, which is intended to represent a local habitat formation. The Saraca are accompanied by numerous plantings of a more herbaceous character, some deriving from salvaged Singapore Garden Festival (SGF) material. Here there is also a small collection of *Barringtonia* spp. The Heritage Tree, *Podocarpus* neriifolius, is a conifer of note and the east end of this and adjacent lawns formerly held tall Araucaria specimens that can be seen in historic photographs of the Main Gate area. As part of the 1990 Master Plan for SBG, tall-growing trees, especially Dipterocarps, were planted to screen off views of the city's taller buildings from within the Gardens, which appears to have been successful. The west end includes attractive clumps of giant bamboo (Schizostachyum brachycladum, habitat for a specialised bat, the bamboo being maintained here for its benefit), a large, healthy Mesua ferrea and a number of rather indifferent tembusu (Cyrtophyllum fragrans), which are not so valuable in view of the numerous other fine specimens seen elsewhere in SBG. This lawn also holds a large Enterolobium cyclocarpum native to tropical Americas of ethnobotanical value planted in 1975. Along the path descending to Swan Lake is a row of Hopea odorata specimens planted circa 1990s. The huge Shorea roxburgii by Main Gate Road is worthy of being proposed as a Heritage Tree.

### **Present Condition**

The collections are mostly in good condition and the west end is sufficiently open to allow visitor access. A large old specimen of *Terminalia catappa* should have its crown reduced to allow the unusual *Shorea assamica* beneath to develop properly. As with Lawn A, collections labelling needs to be improved. Various *Hopea* specimens by the path descending to Swan Lake at the north-west end of the lawn have co-dominant leaders and need arboricultural attention. The eastern side of the lawn are densely planted and part of the area suffers from compaction due to visitors cutting through to the start of Saraca Stream Walk towards the Botany Centre drop-off point.

### Constraints

None identified.

### Strengths

*Podocarpus neriifolius* Heritage Tree, designated September 2012 and developing Dipterocarp specimens representative of the regional tree flora. Other fine tree specimens are present.

### Weaknesses

Lack of interpretation.

### **Potential for Improvement** [to mention collections focus if relevant]

Lawn B does not appear to have any particular collection's focus apart from the conifers and valuable Dipterocarps (these display a good diversity of genera), which are the most abundant groups, though somewhat crowded and hence probably less appreciated. Some judicious thinning of the collections (e.g. the tembusus), prioritising removal of those with limited provenance data, could enable the remaining collections to be revealed and interpreted. Consideration should be given to replanting a part of the lawn with tall-growing conifers to recreate the historic view of the Tanglin (Main) gateway, which was formerly dominated by tall *Araucaria* specimens. If this is attempted, protection of these plants from termite attack should be taken into account, or more resistant species chosen. Appropriate interpretation of this historic lawn may also be considered. The Saraca Stream collection needs improvement as the current planting does not truly reflect the vegetation type of this habitat. Many ornamentals had been planted during the re-development as suitable species were not able to be sourced. With improved planting of suitable forest species, interpretation may be installed. Irrigation will be another infrastructure improvement for the Saraca Stream to reduce the need of manual watering.

**10-year plan** [to be drafted by Lawn manager for feedback by senior SBG management]

- <u>Years 1–3: actions proposed [to include de-accessioning, acquisitions,</u> <u>interpretation]</u>
  - a) Inventory checked, analyzing and de-accession collection where necessary
    - i) Update inventory
    - ii) Analyse collection over time
    - iii) De-accession if necessary
    - iv) Addition of relevant new taxa if required

### b) Interpretation

- To provide interpretation signage for significant and interesting old mature trees and plant collection or lawn historic significance where suitable
- ii) Labels and interpretation where required for general collection.

### c) Conservation of Heritage Collection Gene Pool

- Review the present collection strength in terms of conservation and botanical values in 2<sup>nd</sup> year and subsequent years.
- Formulate and implement a conservation strategy such as propagation and seed collection of valuable old and rare plants of known provenance to maintain the gene pool.

### d) Turf management program

- i) Remedial action for improving the turf and soil such as hollow tining and top dressing as required.
- ii) Re-turfing for areas that are poor and balding.

 May also need to look at possible planting of groundcovers or addition of more leaf litters in areas that are not suitable for turf.

### e) Tree management program

- i) Regular scheduled tree inspection and maintenance.
- ii) Follow-up treatment for trees that are deteriorating in health.

### f) Pest, Disease and Fertilising Programme

- i) Recommend possible non-chemical treatment for controlling pests & diseases if required
- ii) Propose and apply fertilising programme to meet the needs of the collection.
- iii) Amend soil condition (eg. addition of leaf litters) if required, in order to reduce use of chemicals and fertilisers.

### g) Saraca Stream Collection

 Maintain the current collection and source for more suitable species representative of this habitat. This area, Lawn B, can be considered as the start of the Saraca Stream and mainly holds the tropical rainforest understory timber collection, leading to the main or core Saraca Stream collection in Lawn C and D.

### Years 4–6: actions proposed [as above]

- a) Inventory check, analysing and de-accession collection
  - i) Revisit and update inventory
  - ii) Review collection
  - iii) De-accession where necessary
  - iv) Addition of relevant new taxa to collection if required.

### b) Interpretation

i) Labels and interpretation where required for general collection.

### c) Conservation of Heritage Collection Gene Pool

i) Review the present collection strength and the collection preservation needs for the period.

### d) Turf Management Programme

- i) Continue with turf management programme in improving the turf and soil such as hollow thinning and top dressing as required.
- ii) Re-turfing for areas that are poor and balding or replace with groundcovers and leaf litters.

### e) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

### f) Pest, Disease and Fertilising Programme

- i) Recommend possible non-chemical treatment for controlling pests & diseases.
- ii) Propose and apply fertilising programme to meet the needs of the collection.

### g) Saraca Stream Collection

i) Maintain the collection overtime, addition of relevant plant taxa if required.

### • Years 7–10: actions proposed [as above]

### a) Inventory, analyzing and de-accession of collection

- i) Revisit and update inventory.
- ii) Review of collection.
- iii) De-accession if necessary.
- iv) Addition of relevant new plant taxa to collection, if required.

### b) Interpretation

i) Labels and interpretations where required for general collection.

### c) Conservation of Heritage Collection Gene Pool

i) Review the present collection strength and the collection preservation needs for the period.

### d) Turf Management Programme

- Continue with turf management programme in improving the turf and soil such as hollow thinning and top dressing as required.
- ii) Re-turfing for areas that are poor and balding or replace with groundcovers and leaf litters.

### e) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

### f) Pest, Disease and Fertilising Programme

- i) Recommend possible non-chemical treatment for controlling pests & diseases.
- ii) Proposed and apply fertilising/ soil amendment programme to meet the needs of the collection.
- g) Saraca Stream Collection
i) Maintain the collection overtime, addition of relevant plant taxa if required.

# <u>Lawn C</u> [Tanglin Core: Tanglin Gate and Botany Centre area, bounded by Herbarium Ring Road, Office Gate Road and Cluny Road]

#### Landscape Content and Heritage Value

This mainly flat area, which slopes down to the Tanglin (Main) Gate at its southern limit, is largely occupied by Botany Centre complex (opened 2006) and includes 0.6 hectares of new land acquired by moving Cluny Road to the east in the interests of preserving the Heritage Penaga Laut (*Calophyllum inophyllum*), which dominates the west side of the building complex. The Green Pavilion is said to have Singapore's first 'green' roof and beneath it is a water feature with plants and fish. The collections located to the west of the Pavilion include the only remaining second generation Pará Rubber tree (Hevea brasiliensis – no longer in good condition and had uprooted on 26 June 2013. As the majority of roots are still intact to the ground, the tree has been cut to a stump and propped up in the hope of regeneration of shoots) and an old teak tree (*Tectona grandis*), both spared during the development of the new gateway complex prior to 2006. By the Main gate, a low, widespreading rain tree (Samanea saman) has also been spared and incorporated into the complex development. At its south-west extent the lawn forms part of the Saraca stream area with associated water features and beyond there are large frangipani spreading over the board walk that descends to the Main Gate and tall oil palms. Climbers and ground cover include Bauhinia kockiana (complementing the design of the gates) and large Bougainvillea cultivars trained over the covered corridor between the drop off point and Green Pavilion. The Saraca stream area holds most of this lawn's significant accessions, including Saraca spp., conifers (Podocarpus, Dacrycarpus), Horsfieldia, Strophanthus (freeflowering), Dryobalanops, Pandanus, Intsia bijuga, Mangifera caesia (binjai), Syzygium gratum (nice bark), Garcinia nervosa (huge leaves), Sterculia foetida and Pterygota alata. To the north of Botany Centre and the historic Ridley Hall, the lawn extends towards the junction of Office Ring Road and Office Gate Road and includes *Diospyros* spp., whilst to the east of the buildings the varied plantings beside the car park access and Cluny Road are also to be considered here. Ridley Hall built in 1822 is the oldest building in the Gardens, which was given conservation status on 23 May 2008.

## **Present Condition**

The collections are mostly in good condition, except the *Ixora* planted around the *Saraca* stream, which are not thriving in the deep shade and suffering from insect damage. The water quality of the stream and associated features is poor and needs better filtering and lowering of pH. The water in the Koi ponds at the taxi drop-off area and boardwalk are not suitable for Koi display as the fishes are showing signs of disease and are in bad health. The fishes also suffer from the variation of weather and algae growth in ponds. Over feeding of fishes further deteriorates the water quality and need better filtration. Alien aquatic fauna that were not original residence of the ponds but released by public also caused space constraints. The source of water for these ponds is from Swan Lake hence the water quality may not be suitable for rearing Koi without good filtration in place. The Green Pavilion water feature needs careful review since this feature was not designed as an aquatic planting area, since parts are too shaded to allow healthy plant growth and the (over-) feeding of the fish by the public is polluting the water, which requires better filtration. It has been highlighted by Operations branch that the Green Pavilion water feature leaks to the basement and an enhanced reinforcement of this pond base needs to be addressed. The

hardy plants on the green roof are self-sustainable and irrigation system is in working condition, however, there is currently no inspection or proper maintenance schedule for this system by Operations branch. The carpet grass lawns fronting the Green Pavilion may need to be managed better to ensure reduced patchiness and bald spots as this is a high visibility area for users of the Function Hall & Function Room rentable venues of the Botany Centre.

## Constraints

Hard landscape associated with water features.

## Strengths

Native species representation around the Saraca stream.

#### Weaknesses

Lack of interpretation. The margins of the *Saraca* stream are rather unnatural.

## **Potential for Improvement** [to mention collections focus if relevant]

See comments under Present Condition. Need for interpretation of *Saraca* stream area and the addition of more native species of relevance to the stream habitat should be considered (e.g. the *Pometia* are not the local native form) and sourced. A reduction in the number of individuals of some species could provide space for other new examples. Boardwalk descent to Tanglin Gate is in need of repair.

**10-year plan** [to be drafted by Lawn manager for feedback by senior SBG management]

• Years 1–3: actions proposed [to include de-accessioning, acquisitions,

interpretation]

- a) Inventory checked, analyzing and de-accession of collection where necessary
  - i) Update inventory
  - ii) Analyse collection over time
  - iii) De-accession if necessary
  - iv) Addition of relevant new taxa if required

## b) Interpretation

- To provide interpretation signage for significant and interesting old mature trees and plant collection and/or lawn's historic significance where suitable
- ii) Labels and interpretation where required for general collection.

## c) Conservation of Heritage Collection Gene Pool

- Review the present collection strength in terms of conservation and botanical values in 2<sup>nd</sup> year and subsequent years.
- Formulate and implement a conservation strategy such as propagation and seed collection of valuable old and rare plants of known provenance to maintain the gene pool.

# d) Turf Management Programme

- i) Remedial action for improving the turf and soil such as hollow thinning and top dressing as required.
- ii) Re-turfing for areas that are poor and balding.
- iii) May also need to look at possible planting of ground cover and more leaf litter in areas which are not suitable for turf.
- iv) Improve the management of the carpet grass lawns fronting the Green Pavilion.

# e) Tree Management Programme

- i) Fencing of selected Heritage trees.
- ii) Regular scheduled tree inspection and maintenance.

# f) Pest, Disease and Fertilising/ soil Management

- i) Collect data on pest and disease problems and trial simple control measures and documentation of trials.
- ii) Proposed and apply fertilising/ soil amendment programme to meet the needs of the collection.

# g) Facilities improvement and maintenance

- To work with Operations to improve and review the maintenance and repairs required for the Green Pavilion water feature, taxi drop-off and boardwalk ponds as well as the boardwalks and the Green Roof's irrigation and roof.
- h) Improve on the diversity of species planted to be more representative of a tropical Malayan riverine flora along the Saraca Stream
  - i) Research and start sourcing of relevant riverine flora overtime to improve the diversity of Saraca Stream area.
  - ii) Soften the edge of Saraca stream to give it a more natural look.

# • Years 4–6: actions proposed [as above]

- a) Inventory check, analyzing and de-accession of collection where necessary
  - i) Revisit and update inventory.
  - ii) Review collection over time.
  - iii) De-accession if necessary.
  - iv) Addition of relevant new plant taxa to collection, if required.

# b) Interpretation

i) Labels and interpretation where required for general collection.

# c) Conservation of Heritage Collection Gene Pool

i) Review the present collection strength and the collection preservation needs for the period.

# d) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

## e) Pest & Disease Management and Fertilising Programme

- i) Recommend possible non-chemical treatment methods for controlling pests & diseases,
- ii) Propose and apply fertilising programme that meets the needs of the collection.

# f) Saraca Stream Collection

- i) Stronger representation of relevant riverine flora.
- ii) Introduce 10 or more relevant species to the collection overtime.

# • Years 7–10: actions proposed [as above]

## a) Inventory check, analyzing and de-accession of collection

- i) Revisit and update inventory.
- ii) Review of collection.
- iii) De-accession if necessary.
- v) Addition of new plants to collection, if required

## b) Interpretation

i) Labels and interpretation where required for general collection.

## c) Conservation of Heritage Collection Gene Pool

i) Review the present collection strength and the collection preservation needs for the period.

## d) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

## e) Pest & Disease Management and Fertilising Programme

- i) Recommend possible non-chemical treatment methods for controlling pests & diseases.
- ii) Proposed and apply fertilising programme that meet the needs of the collection.

# f) Saraca Stream Collection

i) Stronger representation of relevant riverine flora and addition of relevant taxa overtime.

#### Lawn D [Tanglin Core: north of Herbarium Ring Road, bounded by Lawns B, C, E & K]

#### Landscape Content and Heritage Value

This mainly flat area, which slopes down to the Office Ring Road at its southern limit, is partly occupied by the Saraca stream feature, of which it forms the 'head waters' lined with large Dracaena. The Saraca stream is discussed in more detail under Lawn C (q.v.). There are various paths, board walks, shelters, toilets and other small buildings that break up this lawn. The sloping south end is densely planted with a miscellany of trees whose roots run across the surface and discourage visitor access. The east side is occupied by the heritage building, Holttum Hall and its associated expanse of grass, upon which a new gallery building will be constructed during 2013 (a gallery for temporary heritage and art exhibitions). The Holttum Hall was built in 1920 and was given conservation status on 23 May 2008. Besides Holttum Hall, the lawn includes one of two Heritage Kapok trees (the other is on Lawn O) planted in 1933 and the fruiting Double Coconut (Lodoicea maldivica) and its offsprings, a source of wonder as bearer of the world's largest seed. There are many other old or impressive specimens, especially palms at the northern end of the lawn, including a nibung (Oncosperma tigillarium), believed to have been planted in 1878, and tall Borassus, Corypha (flowering in 2012/13), oil palm and rattan, which probably relate to the former Arecaceae/Palmae collection started along Office Gate Road in the 19<sup>th</sup> century. Other fine trees include Sandoricum koetjape and a very floriferous Cannonball Tree and large Tabebuia facing Lawn E. Another interesting planting is the group of Oroxylum indicum (Midnight Horror, Broken Bones Plant, Sword of Damocles) around the margins of the Holttum lawn, at the south end of which are two third generation rubber trees planted during a video link-up with RBG Kew upon the celebration of the gardens' respective 150<sup>th</sup> and 250<sup>th</sup> anniversaries in 2009. The collections have no particular focus, though the presence of a selection of conifers at the south end compliments those on adjacent Lawn B (Agathis, Araucaria, Calocedrus, Pinus, Podocarpus). At its NW corner the lawn includes various economic species, but none is interpreted. North of Holttum Hall is an old Magnolia (Michelia) x alba, a large Cola gigantea and a nice young collection of Sterculia spp., with Diospyros continuing across from those planted on Lawn C, and Dipterocarpaceae include Dipterocarpus, Hopea and Vatica.

#### **Present Condition**

The collections are mostly in good condition, though the plantings at the south end are very dense. A significant number of specimens lack proper labels, including the numerous conspicuous, orange-leaved *Citharexylum spinosum* that mark the edge of Holttum Hall lawn and other plantings around the Hall itself. The *Inga edulis* (ice cream bean) has a diseased trunk, looks in poor condition and may need propagation. Nearby, there is also a rather poor specimen of *Alstonia angustiloba* that may not be worth retaining and a large *Syzygium grande* that needs to be inspected regularly for safety.

#### Constraints

The lawn is very much dissected by paths and associated buildings. Lawns are very compacted and evidence of soil erosion is obvious. There is also high human traffic on these lawns during the weekends.

## Strengths

Heritage Kapok, Double Coconut, old palms and many other fine or unusual specimens.

#### Weaknesses

Lack of interpretation. As noted under Lawn C, the margins of the *Saraca* stream are rather unnatural and the plantings at the sloping south end are too dense.

## **Potential for Improvement** [to mention collections focus if relevant]

Interpretation of the many interesting botanical collections could make a big difference to the visitor experience when passing through this lawn. Using leaf litter as mulching for Lawn D where the Double Coconuts are would be a sustainable maintenance plan for the area. The Diospyros collection, Double Coconuts and some of the old economic plants could be better interpreted.

**10-year plan** [to be drafted by Lawn manager for feedback by senior SBG management]

- Years 1–3: actions proposed [to include de-accessioning, acquisitions,
  - interpretation]
    - a) Inventory checked, analyzing and de-accession of collection where necessary
      - i) Update inventory
      - ii) Analyse collection
      - iii) De-accession if necessary
      - iv) Addition of relevant taxa if required.

## b) Interpretation

- To provide interpretation signage for significant and interesting old mature trees and plants of conservation importance where suitable.
- ii) Labels and interpretation where required for general collections.

## c) Conservation of Heritage Collection Gene Pool

- Review the present collection strength in terms of conservation and botanical values in 2<sup>nd</sup> year and subsequent years.
- Formulate and implement a conservation strategy such as propagation and seed collection of valuable old and rare plants of known provenance to maintain the gene pool.

## d) Pest, Disease and Fertilising/ Soil Management

- i) Collect data on pest and disease problems and trial simple control measures and documentation of trials.
- ii) To study the need of fertilizers for the different plant taxa and apply suitable fertilizer regime.
- iii) Soil levelling and gradient amendments may need to be looked into.

## e) Turf Management Programme

- i) Remedial action for improving the turf and soil such as hollow thinning and top dressing as required.
- ii) Re-turfing for areas that are poor and balding.
- iii) May also need to look at possible planting of ground cover in areas which are not suitable for turf.
- iv) Utilising leaf litter as mulch for compacted areas to improve the soil condition and conserve surface roots of old specimens.

# f) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.
- iii) Replace poor turf with leaf litter in area behind Holttum Hall to reduce soil erosion and protect surface tree roots.

# g) Saraca Stream Collection

- i) Research and start sourcing of relevant riverine flora overtime to improve the diversity of Saraca Stream area
- ii) Stronger representation of relevant riverine flora
- iii) Soften the edge of Saraca stream to give it a more natural look.

# • Years 4–6: actions proposed [as above]

- a) Inventory check, analyzing and de-accession of collection where necessary
  - i) Revisit and update inventory.
  - ii) Review collection over time.
  - iii) De-accession if necessary.
  - iv) Addition of relevant new plant taxa to collection, if required.

# b) Interpretation

i) Labels and interpretation where required for general collection.

# c) Conservation of Heritage Collection Gene Pool

i) Review the present collection strength and the collection preservation needs for the period.

# d) Nomination of Heritage trees

i) To work with Plant Records and Arboriculture to decide the possibility of old trees to be nominated as Heritage trees.

# e) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

#### f) Pest & Disease Management and Fertilising Programme

- i) Recommend possible non-chemical treatment methods for controlling pests & diseases,
- ii) Propose and apply fertilising programme that meets the needs of the collection.

#### g) Saraca Stream Collection

i) Stronger representation for relevant riverine collection.

#### • Years 7–10: actions proposed [as above]

#### a) Inventory check, analyzing and de-accession of collection

- i) Revisit and update inventory.
- ii) Review of collection.
- iii) De-accession if necessary.
- iv) Addition of new plants to collection, if required

#### b) Interpretation

i) Labels and interpretation where required for general collection.

#### c) Conservation of Heritage Collection Gene Pool

i) Review the present collection strength and the collection preservation needs for the period.

#### e) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

#### f) Pest & Disease Management and Fertilising Programme

- i) Recommend possible non-chemical treatment methods for controlling pests& diseases.
- ii) Proposed and apply fertilising programme that meet the needs of the collection.

#### g) Saraca stream Collection

i) Maintain the riverine collection overtime.

# 10 Year Living Collection Management Plan

Lawns J, K, L, M and O

Date: Aug 2013

Manager: Loh Chin Fong

Section Head: Dr. Nura Abdul Karim

#### Lawn J [Tanglin Core: between Lawns E, H, O & K]

#### Landscape Content and Heritage Value

This area is immediately south of the Bandstand terrace and includes the formal Sundial Garden begun by SBG Director, Eric Holttum, in 1929 (including the concrete sundial designed by the Director's wife, Ursula Holttum). Later, in 1971, four rectangular tanks for Nymphea cultivars were added, then later still, c. 2006, 4 gifted classical statues were installed at each corner. This feature, though quaint, is out-of-character with the rest of SBG's landscape, which is of the informal English Landscape Movement style popularised by 'Capability' Brown (UK, 18<sup>th</sup>C). Prior to Holttum's innovation, the area is thought to have once included a Rose Garden planted by Cantley in the 1880s. Sloping down from the Sundial Garden is the Moraceae collection, including plantings of Ficus, with prominent aerial roots, and a row of Tempinis trees (Streblus elongatus) planted circa early 1990s bordering the Main Gate Path as it rises to the junction at the Swiss Granite Ball Fountain. The Lower Ring Road crosses the Lawn and is lined with SBG's hallmark Sealing Wax Palm (Cyrtostachys renda), originally planted up by Ridley in 1905 and renewed subsequently. Between this and the Bandstand Terrace is the Frangipani collection (*Plumeria* spp., hybrids & cvs) and old specimens of Lagerstroemia tomentosa, Dacrycarpus imbricatus and Adenanthera pavonina (Saga), the latter a Heritage Tree. Holttum is credited with popularising Frangipani in Singapore and Malaysia. Right beside the Adenanthera pavonina is the sculpture by British artist Sydney Harpley, gifted in 1987 by the first Chief Minister of Singapore, Mr. David Marshall (1908 – 1995), named 'Lady on a Hammock'.

#### **Other Significant Structures**:

Beside the old *Lagerstroemia tomentosa* by the edge of the Frangipani collection is a 2012 installed gifted sculpture named 'Nurturing'. This and the 'Lady on a Hammock' sculptures are well maintained and are popular with visitors. There is also an old staircase of heritage value right beside 'Lady on the Hammock', leading to the Frangipani collection which is rather dilapidated and need restoring.

#### **Present Condition**

The Heritage Tree (Adenanthera pavonina) suffers from soil compaction in its surrounding due to trampling by visitors collecting the seeds which are of particular interest as a keep-sake. The recent plantings of Ficus spp. (Moraceae collection) seem to be shaded out by the row of mature *Streblus elongatus*. The Frangipani collection is quite heavily infected with yellow rust fungal disease. The four rectangular tanks in Sundial Garden have a re-occurring algae issue.

#### Constraints

The Sundial Garden is arguably out-of-kilter with the rest of SBG, but has been in place for too long to be simply removed and is regarded as popular with visitors.

#### Strengths

Sundial Garden, Frangipani collection and 'Lady on the Hammock' are the highlights of the lawn. The Heritage Saga Tree (*Adenanthera pavonina*) signage will be in place before the end of 2013. The avenue of Sealing Wax Palms (*Cyrtostachys renda*) is also of interest since

this endangered native palm is depicted as the logo of the Botanic Gardens and this avenue has been in place since 1905.

## Weaknesses

The inappropriate design of the Sundial Garden (in a garden otherwise conforming to the English Landscape Movement). Lack of interpretation, for example: Sundial Garden and Moraceae collection. Review of present collection strength has not been carried out for the last 20 years. We also note that the Heritage trees are slowly deteriorating in health and may be reaching their natural life span. Conserving of the heritage collection's gene pool is currently not in place. It is important to evaluate the conservation value of these trees and decide whether these need to be conserved (eg. via seed collection, cuttings, marcottings, etc.) and set up saving plans.

# **Potential for Improvement** [to mention collections focus if relevant]

De-compaction of the soil, improving turfing and possible fencing off of the vulnerable Heritage Tree to be looked into. Shrubs in Sundial Garden are looking straggly and may need to be planted up every 3-4 years. Lawn survey to be done before the end of 2013 to rectify the lack of labels, especially in the Frangipani collection. In late 2013, SBG will experiment with night-lighting the Frangipani (*Plumeria*) collection for the upcoming celebrations of the 50 years of the Greening of Singapore. If this is successful, consideration can be given to making it a permanent feature to attract visitation at night. Increase taxa diversity of Moraceae collection will be of botanical merit. Due to shading, there is a need to engage the arboriculture team to advice on thinning of the *Streblus elongatus*.

# **10-year plan** [to be drafted by Lawn manager for feedback by senior SBG management]

- <u>Years 1–3: actions proposed [to include de-accessioning, acquisitions,</u> <u>interpretation]</u>
  - a) Inventory check, analyzing and de-accession of collection where necessary
    - i) Update inventory.
    - ii) Analyse collection over time.
    - iii) Deaccession if necessary.
    - iv) Addition of relevant new plant taxa to collection, if required.
  - b) Interpretation
    - To provide interpretation signage for significant and interesting old mature trees and plants of conservation importance where suitable.
    - ii) Labels and interpretation where required for general collection.
  - c) Conservation of Heritage Collection Gene Pool
    - i) Review the present collection strength in terms of conservation and botanical values in 2<sup>nd</sup> year and subsequent years.
    - Formulate and implement a conservation strategy such as propagation and seed collection of valuable old and rare plants of known provenance to maintain the gene pool.

# d) Turf Management Programme

- i) Remedial action for improving the turf and soil such as hollow thinning and top dressing as required.
- ii) Returfing of bald areas and weeding for areas with high weed growth.

- vi) May need to look at possible planting of ground covers and/or shrubs on slopes to reduce the danger of grass cutting in such areas.
- v) Improvement of compacted and bare areas by adding leaf litter mulch where suitable.

# e) Tree Management Programme

- i) Fencing of selected Heritage trees if suitable.
- ii) Regular scheduled tree inspection and maintenance.
- iii) Follow-up treatment for trees that are deteriorating in health.

# f) Pest, Disease and Fertilising Management

- i) Collect data on pest and disease problems and trial simple control measures and documentation of trials.
- ii) To study the need of fertilizers for the different plant taxa and apply suitable fertilizer regime.

# g) Improvement to Frangipani Collection

- i) Identify the collection with assistance from Herbarium and overseas experts.
- ii) Report to Plant Records for fabrication of labels.
- iii) Improvement of soil of the plot and start sourcing for more variety to enhance this collection to be of horticultural merit.

# h) Improvement to Moraceae Collection

- i) Identify the collection with assistance from Herbarium and overseas experts.
- ii) Report to Plant Records for fabrication of labels.
- iii) Sourcing for more species diversity to enhance this collection to be of reasonably good scientific collection.

# • Years 4–6: actions proposed [as above]

# a) Inventory, analyzing and de-accession of collection

- i) Revisit and update inventory
- ii) Review of collection.
- iii) Deaccession if necessary.
- iv) Addition of relevant new plant taxa to collection, if required.

# b) Interpretation

i) Labels and interpretation where required for general collection.

# c) Conservation of Heritage Collection Gene Pool

i) Review the present collection strength and the collection preservation needs for the period.

# d) Nomination of Heritage trees

i) To work with Plant Records and Arboriculture to decide the possibility of nomination of more Heritage trees.

# e) Turf Management Programme

- i) Continue with turf management programme in improving the turf and soil such as hollow thinning and top dressing as required.
- ii) Returfing for areas that poor and balding.
- iii) Improvement of compacted and bare areas by adding leaf litter mulch where suitable.

# f) Tree Management Programme

i) Regular tree inspection and maintenance.

ii) Follow up treatment for trees that are deteriorating in health.

# g) Pest, Disease and Fertilising Programme

- i) Recommend possible non-chemical treatment for controlling pests & diseases.
- ii) Propose and apply fertilising programme to meet the needs of the collection.
- h) Expansion of the Frangipani collection
  - i) Introduce approximately 10 new varieties of frangipani to the collection to enhance display.
- i) Expansion of the Moraceae collection
  - i) Introduce approximately 10 new species of Ficus to the collection to enhance collection diversity.
  - ii) Thinning of certain trees to ensure possibility of more Ficus species to be introduced in deep shaded areas.

# • Years 7–10: actions proposed [as above]

# a) Inventory, analyzing and de-accession of collection

- i) Revisit and update inventory.
- ii) Review of collection.
- iii) Deaccession if necessary.
- iv) Addition of relevant new plant taxa to collection, if required.

# b) Interpretation

i) Labels and interpretations where required for general collection.

## c) Conservation of Heritage Collection Gene Pool

i) Review the present collection strength and the collection preservation needs for the period.

## d) Turf Management Programme

- i) Continue with turf management programme in improving the turf and soil such as hollow thinning and top dressing as required.
- ii) Returfing of areas that are poor and balding.
- iii) Continue improvement of compacted and bare areas by adding leaf litter mulch where suitable.

## e) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

## f) Pest, Disease and Fertilising Programme

- i) Recommend possible non-chemical treatment for controlling pests & diseases.
- ii) Propose and apply fertilising programme to meet the needs of the collection.

#### Lawn K [Tanglin Core: between Lawns C, D, E, J & L]

#### Landscape Content and Heritage Value

This small Lawn is dominated by the remains of a once longer avenue of Caribbean royal palms (*Roystonea oleracea*), planted in 1950, and the walk-through pergola of *Cissus sicyoides* with its curious hair-like aerial roots that was erected in 2010. Other plantings include various *Sterculia* spp. (a collection continuing from Lawn D) and, beside the northern entrance of the pergola, a huge and old Tiger Orchid (*Grammatophyllum speciosum*) growing on the ground, with interpretation showing its infrequently produced flowers. A good specimen of a rain-tree (*Samanea saman*) is located at the side of the southern entrance of the pergola. An avenue of Jelutong trees (*Dyera costulata*) starting from Lawn L, cutting through Lawn K and continuing to Lawn O are growing well. A historical structure present in this lawn are the brick steps from Lower Ring Road leading to Plant House that were made by prisoners of war (PoWs) during the Japanese occupation of Singapore (1942 – 1945) and above them is a modern frame , up which is trained *Petraeovitex wolfei*. The six shallow water-lily troughs facing the Plant House were built in the 1930s. By the fork leading to Potting Yard at the northern end, is a magnificently tall Koompassia malaccensis which is worth nominating for heritage tree status in the future.

#### **Present Condition**

Over the years the avenue of 1950s Caribbean royal palms (*Roystonea oleracea*) has decreased in numbers, due to crown-rot and insect attacks as well as removal during the development of the Botany Centre Complex. The southern entrance of the pergola of *Cissus sicyoides* seems to be shaded out by the *Samanea saman* on its left and the *Diospyros malabarica* on its right.

#### Constraints

Spraying with fertiliser twice a week and root trimming once every 2-3 weeks causes the pergola to be closed to public access for a day every week. The limited land area of this Lawn ensures not many new species can be introduced and planted out.

#### Strengths

Majestic avenue of the royal palms (*Roystonea oleracea*), the *Cissus sicyoides* pergola and the giant tiger orchid (*Grammatophyllum speciosum*) are highlights of the lawn. The historical brick steps are of significant heritage value.

#### Weaknesses

The relatively small size of this lawn as compared to the rest is a consequence of the rearrangement of paths done a decade or so ago.

#### **Potential for Improvement** [to mention collections focus if relevant]

What is left of the Caribbean royal palm avenue could be interpreted, drawing attention to the use of this genus in other gardens. The *Samanea saman* and *Diospyros malabarica* are both very good specimens but should be considered to be transplanted elsewhere to ensure more access to sunlight for the pergola of *Cissus sicyoides* in order for more vigorous and better growth. Look into alternative fertilising other than spraying to minimise inconvenience to visitors due to temporary closure weekly of the pergola. Work with

Operations branch to restore and maintain the historical brick steps to minimise deterioration over time.

**10-year plan** [to be drafted by Lawn manager for feedback by senior SBG management]

# • Years 1–3: actions proposed [to include de-accessioning, acquisitions,

# interpretation]

- a) Inventory check, analyzing and de-accession of collection where necessary
  - i) Update inventory.
  - ii) Analyse collection over time.
  - iii) Deaccession if necessary.
  - iv) Addition of relevant new plant taxa to collection, if required.

# b) Interpretation

- i) To provide interpretation signages for significant and interesting old mature trees and plants of conservation importance where suitable.
- ii) Labels and interpretation where required for interesting collection.

# c) Conservation of Heritage Collection Gene Pool

- i) Review the present collection strength in terms of conservation and botanical values in 2<sup>nd</sup> year and subsequent years.
- ii) Formulate and implement a conservation strategy such as propagation and seed collection of valuable old and rare plants of known provenance to maintain the gene pool.

# d) Nomination of Heritage trees

i) To work with Plant Records and Arboriculture to decide the possibility of nomination of more Heritage trees.

# e) Turf Management Programme

- i) Remedial action for improving the turf and soil such as fertilising and top dressing as required.
- ii) Returfing of areas that are poor and balding.
- iii) May need to look at possible planting of ground covers and/or shrubs on slopes to reduce the danger of grass cutting in such areas.
- iv) Improvement of compacted and bare areas by adding leaf litter mulch where suitable.

# f) Tree Management Programme

- i) Regular scheduled tree inspection and maintenance.
- ii) Follow-up treatment for trees that are deteriorating in health.

# g) Pest, Disease and Fertilising Management

- i) Collect data on pest and disease problems and trial simple control measures and documentation of trials.
- ii) Propose and apply fertilising programme to meet the needs of the collection.

# h) Improvement to Sterculia Collection

- i) Identify the collection with assistance from Herbarium.
- ii) Report to Plant Records for fabrication of labels.
- iii) Review the feasibility of introducing more taxa diversity to enhance this collection.

# • Years 4–6: actions proposed [as above]

# a) Inventory, analyzing and de-accession of collection

- i) Revisit and update inventory
- ii) Review of collection.
- iii) Deaccession if necessary.
- iv) Addition of relevant new plant taxa to collection, if required.
- b) Interpretation
  - i) Labels and interpretation where required for general collection.

# c) Conservation of Heritage Collection Gene Pool

i) Review the present collection strength and the collection preservation needs for the period.

# d) Turf Management Programme

- i) Continue with turf management programme in improving the turf and soil such as hollow thinning and top dressing as required.
- ii) Returfing of areas that are poor and balding.
- iii) Improvement of compacted and bare areas by adding leaf litter mulch where suitable.

# e) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

# f) Pest, Disease and Fertilising Programme

- i) Recommend possible non-chemical treatment for controlling pests & diseases.
- ii) Propose and apply fertilising programme to meet the needs of the collection.

# g) Expansion of the Sterculia collection

i) Introduce approximately 5-10 new species of Sterculia to the collection to enhance display to be of good scientific collection.

# Years 7–10: actions proposed [as above]

# a) Inventory, analyzing and de-accession of collection

- i) Revisit and update inventory.
- ii) Review of collection.
- iii) Deaccession if necessary.
- iv) Addition of relevant new plant taxa to collection, if required.
- b) Interpretation
  - i) Labels and interpretations where required for general collection.

# c) Conservation of Heritage Collection Gene Pool

i) Review the present collection strength and the collection preservation needs for the period.

# d) Nomination of Heritage trees

i) To work with Plant Records and Arboriculture to decide the possibility of nomination of more Heritage trees.

# e) Turf Management Programme

- i) Continue with turf management programme in improving the turf and soil such as hollow thinning and top dressing as required.
- ii) Returfing of areas that are poor and balding.

iii) Improvement of compacted and bare areas by adding leaf litter mulch where suitable.

# f) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

# g) Pest, Disease and Fertilising Programme

- i) Recommend possible non-chemical treatment for controlling pests & diseases.
- ii) Propose and apply fertilising programme to meet the needs of the collection.

## Lawn L [Tanglin Core: between the Plant House, Lawns C & K and Cluny Road]

#### Landscape Content and Heritage Value

This small lawn is a dense botanical planting screening off this part of the Gardens from Cluny Road. At its northern end is the Plant House (built in 1882–85), at its southern, the Office Gate, once the first public access point to SBG (prior to 1864) and replaced nowadays with the principal opening an electric gate giving access to service vehicles. There are no heritage plantings to consider, save for some huge old *Syzygium grande* (Sea Apple) close to the periphery of the fence. An avenue of Jelutong trees (*Dyera costulata*) starting from Lawn L, cutting through Lawn K and continuing to Lawn O.

#### **Present Condition**

Deaccession and removal of undesirable collection has been carried out in May 2013 following an extensive lawn survey. Clearing of self-sown, weedy plants in portions of neglected areas of the lawn have allowed new tropical timber saplings to be planted in the cleared areas and inventory has been duly updated. There is an avenue of regional timber trees, *Tectonia grandis (Teak), Dyera costulata (Jelutong)* parallel to the footpath. A small plot of *Amorphophallus spp. collection is located* below the teak trees (*Tectonia grandis*) which lack diversity and interpretation.

#### Constraints

Need to maintain screening of Cluny Road.

## Strengths

None of note.

#### Weaknesses

Noise pollution generated by nearby Cluny Road. Poor diversity of the Amorphophallus collection. The site has very limited species variety and does not meet its intention to showcase this interesting aroid genus plus the lack of interpretation adds to the neglected state of this small collection area. Review of present collection strength has not been carried out for the last decade. The fencing around the periphery of this lawn and its hedging needs to be looked into.

## **Potential for Improvement** [to mention collections focus if relevant]

Expand and increase of tropical timber collection in the area. Expand and increase the species numbers of the *Amorphophallus* to enable better interpretation of the collection. Replacing of rusty fence along Lawn L and replacement planting of *Baphia nitida* hedging are in place and expected to be completed by end of 2013.

**10-year plan** [to be drafted by Lawn manager for feedback by senior SBG management]

- <u>Years 1–3: actions proposed [to include de-accessioning, acquisitions,</u> <u>interpretation]</u>
  - a) Inventory check, analyzing and de-accession of collection where necessary
    - i) Update inventory.
    - ii) Analyse collection over time.
    - iii) Deaccession if necessary.

iv) Addition of relevant new plant taxa to collection, if required.

# b) Interpretation

- i) To provide interpretation signages for significant and interesting old mature trees and plants of conservation importance where suitable.
- ii) Labels and interpretation where required for interesting collection.

# c) Conservation of Heritage Collection Gene Pool

- i) Review the present collection strength in terms of conservation and botanical values in 2<sup>nd</sup> year and subsequent years.
- ii) Formulate and implement a conservation strategy such as propagation and seed collection of valuable old and rare plants of known provenance to maintain the gene pool.

# d) Turf Management Programme

- i) Remedial action for improving the turf and soil such as fertilising and top dressing as required.
- ii) Returfing of areas that are poor and balding.
- iii) May need to look at possible planting of ground covers or ferns in areas which are not suitable for turf.
- iv) Improvement of compacted and bare areas by adding leaf litter mulch where suitable.

# e) Tree Management Programme

- i) Regular scheduled tree inspection and maintenance.
- ii) Follow-up treatment for trees that are deteriorating in health.

# f) Pest, Disease and Fertilising Management

- i) Collect data on pest and disease problems and trial simple control measures and documentation of trials.
- ii) To study the need of fertilizers for the different plant taxa and apply suitable fertilizer regime.

# g) Improvement to Amorphophallus Collection

- i) Identify current collection with assistance from Herbarium and overseas experts.
- ii) Report to Plant Records for fabrication of labels.
- iii) Sourcing for more taxa diversity to enhance this collection to be of good botanical merit.

# h) Improvement to Timber Collection

- i) Identify the collection with assistance from Herbarium.
- ii) Report to Plant Records for fabrication of labels.
- iii) Sourcing for more taxa diversity to enhance this collection.

# • Years 4–6: actions proposed [as above]

- a) Inventory, analyzing and de-accession of collection
  - i) Revisit and update inventory
  - ii) Review of collection.
  - iii) Deaccession if necessary.
  - iv) Addition of relevant new plant taxa to collection, if required.
- b) Interpretation
  - i) Labels and interpretation where required for general collection.
- c) Conservation of Heritage Collection Gene Pool

i) Review the present collection strength and the collection preservation needs for the period.

# d) Nomination of Heritage trees

i) To work with Plant Records and Arboriculture to decide the possibility of nomination of Heritage trees.

# e) Turf Management Programme

- i) Continue with turf management programme in improving the turf and soil such as hollow thinning and top dressing as required.
- ii) Returfing of areas that are poor and balding.
- iii) Improvement of compacted and bare areas by adding leaf litter mulch where suitable.

# f) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

# g) Pest, Disease and Fertilising Programme

- i) Recommend possible non-chemical treatment for controlling pests & diseases.
- ii) Propose and apply fertilising programme to meet the needs of the collection.

# h) Expansion of the Amorphophallus collection

- i) Introduce approximately 5 or more new species of Amorphophallus to the collection to enhance its botanical merit. To work with Research and Conservation of possibility of collection of these species in their overseas field trips.
- ii) Expansion of the plot under the established trees as these species can take shade.

# i) Expansion of the Timber collection

i) Introduce approximately 5-10 new species of timber trees to the collection to enhance display.

## • Years 7–10: actions proposed [as above]

## a) Inventory, analyzing and de-accession of collection

- i) Revisit and update inventory.
- ii) Review of collection.
- iii) Deaccession if necessary.
- iv) Addition of relevant new plant taxa to collection, if required.
- b) Interpretation
  - i) Labels and interpretations where required for general collection.
- c) Conservation of Heritage Collection Gene Pool
  - i) Review the present collection strength and the collection preservation needs for the period.

## d) Turf Management Programme

- i) Continue with turf management programme in improving the turf and soil such as hollow thinning and top dressing as required.
- ii) Returfing of areas that are poor and balding.
- iii) Improvement of compacted and bare areas by adding leaf litter mulch where suitable.

#### e) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

#### f) Pest, Disease and Fertilising Programme

- i) Recommend possible non-chemical treatment for controlling pests & diseases.
- ii) Propose and apply fertilising programme to meet the needs of the collection.

#### h) Amorphophallus collection

- i) Review collection and increase diversity if needed.
- i) Timber collection
  - i) Review collection and monitor diversity of collection overtime.

# The Plant House & Fernery in Lawn L [Tanglin Core: between Lawns C, M & O and Cluny Road]

#### Landscape Content and Heritage Value

The 1882 Plant House, with its exotic tropical climbers' collection and central and marginal water tank features, is the oldest structure built for plants in SBG, though its claim to authenticity may be restricted to the original footprint it occupies, since most if not all of the building has been replaced over time. The contiguous lawn to the north is small, being the modern Fernery at SBG, in part occupying a former extension of the Plant House made in 1889, originally for orchids and ferns. Beyond this partly preserved, historic extension is a modern, slightly raised galvanised steel walkway built in 2011, keeping the visitor's feet clear of the very damp ground in which the ferns, fern allies and rock work are arranged. This is a secluded area in some ways comparable with The Dell (Lawn G), but less visited, perhaps because most visitors do not know it is there or bypass it for more obvious attractions. The Plant House's external water features have water lilies, while internally are large specimens of *Typhonodorum lindleyanum*. This lawn is the known habitat of the endangered native tree snails (*Amphidromus inversus*) which is also found in the adjacent rainforest and also recently at the Dell and Ginger Garden areas.

#### Fernery

Discussion on extension of fernery started mid-2011, a decision is taken to construct a raised walkway as the existing ground can be quite wet during rainy seasons. Apart from this hardscape, installation of irrigation system was done mid-2012 as ferns generally needed a cool and moist environment to thrive. Consultations with some fern experts were done in early 2013 to further strengthen the 'Fernery' identity. After discussions and on site observations, it was decided that the extension be broadly divided into 4 major groups of pteridophytes (namely Lycophytes & Fern allies, Eusporangiate ferns or Ancient ferns, Primitive Leptosporangiate ferns and Advanced Leptosporangiate ferns) with the 1<sup>st</sup> major group (lycophytes & fern allies) being nearest to Plant House as most require more sunlight and the 4<sup>th</sup> major group (advanced leptosporangiate ferns) nearer to Potting Yard. One key for this fernery collection is to focus on native and regional ferns as an inventory check

shows SBG lacking it this area. A fern-list was decided after consulting the experts with the aim of increasing our fern taxa. Soil was an issue on site as it was mostly clayey; media more suited (light with good drainage) for ferns were incorporated on site and planting beds were slightly raised to allow ferns to be nearer to visitors. Apart from procuring ferns from traditional nurseries, there are plans to go for collection trips or approach private collectors and botanical institutions to start exchanges in the future.

#### **Aroid collection**

Under the canopy of shade provided by the climbers in Plant House are a collection of aroids in the elevated planting beds. Talks on improvement of aroid collection in Plant House (Lawn L) together with the aroid collection found at Lawn M are beginning and would be implemented early 2014. Plan includes improvement on landscape, increase of taxa diversity and better interpretation. Note that work should be done carefully due to the presence of the endangered native tree snails (*Amphidromus inversus*) so not to disturb their habitat there.

#### **Present Condition**

The intertwined climbers are dense and hard to separate and identify as they were grown closely together and flower infrequently. The internal aquatic plantings in the water tanks are flourishing well. The Plant House also houses some aroids but of poor botanical merit and may need to be reviewed and replaced in the future. Endangered native tree snails (*Amphidromus inversus*) can be found in the Fernery and Plant House area. Review of present collection strength has not been carried out for the last decade or two.

#### Constraints

As the modern Fernery is off the normal route, visitors often miss out these parts of the Gardens.

#### Strengths

Suitable environment for a good fern collection which are moist- and shade-loving plants. Secluded location affected by noise pollution from Cluny Road. Good old exotic climber collection, eg. *Mucuna bennettii* (dated 1939), *Camoensia splendens, Beaumontia jerdoniana, Perona volubilis, Diploclisia kunstleri*, etc. still grace the Plant House. Endangered native tree snails (*Amphidromus inversus*) found in this area.

#### Weaknesses

Ferns etc are rather prone to attack by invasive molluscs, which abound. Collection of aroids lacks diversity and of poor botanical merit. The wooden rafters of the Plant House get worn down after 5-10 years and are currently in poor condition and may pose safety issue overtime if not replaced in time.

#### **Potential for Improvement** [to mention collections focus if relevant]

Interpretation of the Plant House and its history, its extension etc., ferns and their life cycle is desirable. Specific control of non-native molluscs is needed. Targeted systematic pruning and thinning to sort the climber collection is required. Increase of aroid collection in the planters.

# **10-year plan** [to be drafted by Lawn manager for feedback by senior SBG management]

• Years 1–3: actions proposed [to include de-accessioning, acquisitions,

# interpretation]

- a) Inventory check, analyzing and de-accession of collection where necessary
  - i) Update inventory.
  - ii) Analyse collection over time.
  - iii) Deaccession if necessary.
  - iv) Addition of relevant new plant taxa to collection, if required.

# b) Interpretation

- i) To provide interpretation signage for significant and interesting old mature trees and plants of conservation importance where suitable.
- ii) Labels and interpretation where required for interesting collection.

# c) Conservation of Heritage Collection Gene Pool

- i) Review the present collection strength in terms of conservation and botanical values in 2<sup>nd</sup> year and subsequent years.
- ii) Formulate and implement a conservation strategy such as propagation and seed collection of valuable old and rare plants of known provenance to maintain the gene pool.

# d) Turf Management Programme

- i) Remedial action for improving the turf and soil such as fertilising and top dressing as required.
- ii) Returfing of areas that are poor and balding.
- iii) May need to look at possible planting of ground cover or ferns in areas which are not suitable for turf.
- iv) Improvement of compacted and bare areas by adding leaf litter mulch where suitable.

# e) Tree Management Programme

- i) Regular scheduled tree inspection and maintenance.
- ii) Follow-up treatment for trees that are deteriorating in health.

# f) Pest, Disease and Fertilising Management

- i) Collect data on pest and disease problems and trial simple control measures and documentation of trials.
- ii) To study the need of fertilizers for the different plant taxa and apply suitable fertilizer regime.

# g) Improvement to Fernery Collection

- i) Identify the collection with assistance from Herbarium and fern experts.
- ii) Report to Plant Records for fabrication of labels.
- iii) Consult ferns experts on drawing up a list of native and regional ferns to collect and source.
- iv) Sourcing for more diversity to enhance this collection.

# h) Improvement to Climber Collection

- i) Identify the collection once flowering with assistance from Herbarium.
- ii) Report to Plant Records for fabrication of labels.
- iii) Sourcing for a few more species to enhance this collection further.

# i) Improvement to Aroid Collection

- i) Identify the collection with assistance from Herbarium and aroid experts.
- ii) Report to Plant Records for fabrication of labels.

iii) Sourcing for more diversity to enhance this collection simultaneously with aroid collection in Lawn M.

# j) Facility Improvement

i) To work with Operations branch to improve and replace existing old wooden rafters of the Plant House to ensure safety to visitors.

# • Years 4–6: actions proposed [as above]

- a) Inventory, analyzing and de-accession of collection
  - i) Revisit and update inventory
  - ii) Review of collection.
  - iii) Deaccession if necessary.
  - iv) Addition of relevant new plant taxa to collection, if required.
- b) Interpretation
  - i) Labels and interpretation where required for general collection.
- c) Conservation of Heritage Collection Gene Pool
  - i) Review the present collection strength and the collection preservation needs for the period.

# d) Nomination of Heritage trees

i) To work with Plant Records and Arboriculture to decide the possibility of nomination of more Heritage trees.

# e) Turf Management Programme

- i) Continue with turf management programme in improving the turf and soil such as hollow thinning and top dressing as required.
- ii) Returfing of areas that are poor and balding.
- iii) Improvement of compacted and bare areas by adding leaf litter mulch where suitable.

# f) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

# g) Pest, Disease and Fertilising Programme

- i) Recommend possible non-chemical treatment for controlling pests & diseases.
- ii) Propose and apply fertilising programme to meet the needs of the collection.

# h) Improvement of the Fernery collection

- i) Introduce approximately 40 new species of ferns to the collection to enhance display.
- ii) Consult fern experts on areas for collection of native and regional ferns.

# i) Improvement of the Climber collection

i) Explore possibility of increasing and introducing new species of climber to the collection overtime

# j) Improvement of the Aroid collection

i) Introduce approximately 10-20 new species of aroid to the collection at this lawn and in Lawn M.

# • Years 7–10: actions proposed [as above]

- b) Inventory, analyzing and de-accession of collection
  - i) Revisit and update inventory.

- ii) Review of collection.
- iii)Deaccession if necessary.
- iv)Addition of relevant new plant taxa to collection, if required.

#### b) Interpretation

i) Labels and interpretations where required for general collection.

#### c) Conservation of Heritage Collection Gene Pool

i) Review the present collection strength and the collection preservation needs for the period.

#### d) Turf Management Programme

- i) Continue with turf management programme in improving the turf and soil such as hollow thinning and top dressing as required.
- ii) Returfing of areas that are poor and balding.
- iii) Improvement of compacted and bare areas by adding leaf litter mulch where suitable.

## e) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

## f) Pest, Disease and Fertilising Programme

- i) Recommend possible non-chemical treatment for controlling pests & diseases.
- ii) Propose and apply fertilising programme to meet the needs of the collection.

# Lawn M in part – Potting Yard and Aroid Garden [Tanglin Core: Potting Yard, between Lawns L & M (Rainforest) and Cluny Road]

#### Landscape Content and Heritage Value

The Potting Yard is a behind-the-scenes operational area, part of which dates from Nathaniel Cantley's time (1880s), when SBG had a nursery producing planting stock for Singapore's parks and forests. It was later used as the Botanic Gardens main nursery and store prior to the development of the Plant Resource Centre at Bukit Timah Core which opened in 1996. Today it is used as a training area by CUGE etc. and has 2 glasshouses accommodating living research collections and orchids under study by Herbarium staff. The area also houses the offices of the landscape technicians of the Horticulture, Events and Exhibitions (HEE). There are some old rainforest specimen trees in the Potting Yard area. The critically endangered *Memecylon cantleyi* located next to the Potting Yard gate needs to be conserved as it is the one of the very few living specimens left in Singapore.

#### Aroid Garden

Sitting at the edge of Lawn M along Lower Ring Road is a small plot of aroid collection with a white concrete wall about 1.5m tall backdrop. Previously this site used to be a Japanese garden. Talks on improvement of the aroid garden together with its collection also found at the Plant House (Lawn L) are beginning and would be implemented early 2014. Plan includes

improvement on landscape, increase of taxa diversity and better interpretation. Note that work should be done carefully due to the presence of the endangered native tree snails (*Amphidromus inversus*) at this locale.

#### **Present Condition**

Mixed.

## Constraints

Potting Yard area not accessible to the public.

## Strengths

Historic area. Area where the last stand of *Memecylon cantleyi* is located in SBG property. A decent aroid collection of botanical interest. Endangered native tree snail found at aroid garden.

#### Weaknesses

Not accessible to the public especially Potting Yard.

## **Potential for Improvement** [to mention collections focus if relevant]

Interpretation at gate area to explain historic significance, but may not be read by many visitors as the site is off the normal circulation routes. Increase the aroid collection diversity in the Plant House and Aroid garden.

## **10-year plan** [to be drafted by Lawn manager for feedback by senior SBG management]

- <u>Years 1–3: actions proposed [to include de-accessioning, acquisitions, interpretation]</u>
  - a) Inventory check, analyzing and de-accession of collection where necessary
    - i) Update inventory.
    - ii) Analyse collection over time.
    - iii) Deaccession if necessary.

## b) Interpretation

- i) To provide interpretation signage for significant and interesting old mature trees and plants of conservation importance where suitable.
- ii) Labels and interpretation where required for general collection.

## c) Conservation of Heritage Collection Gene Pool

- i) Review the present collection strength in terms of conservation and botanical values in 2<sup>nd</sup> year and subsequent years.
- ii) Formulate and implement a conservation strategy such as propagation and seed collection of valuable old and rare plants of known provenance to maintain the gene pool.

## e) Tree Management Programme

- i) Regular scheduled tree inspection and maintenance.
- ii) Follow-up treatment for trees that are deteriorating in health.

## f) Pest, Disease and Fertilising Management

- i) Collect data on pest and disease problems and trial simple control measures and documentation of trials.
- ii) To study the need of fertilizers for the different plant taxa and apply suitable fertilizer regime.

## g) Improvement to Aroid Collection

- i) Identify the collection with assistance from Herbarium and aroid experts.
- ii) Report to Plant Records for fabrication of labels.
- iii) Sourcing for more diversity to enhance this collection simultaneously with aroid collection in Plant House (Lawn L)

# • Years 4–6: actions proposed [as above]

- a) Inventory, analyzing and de-accession of collection
  - i) Revisit and update inventory
  - ii) Review of collection.
  - iii) Deaccession if necessary.
  - iv) Addition of relevant new plant taxa to collection, if required.
- b) Interpretation
  - i) Labels and interpretation where required for general collection.
- c) Conservation of Heritage Collection Gene Pool
  - i) Review the present collection strength and the collection preservation needs for the period.

# d) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

# e) Pest, Disease and Fertilising Programme

- i) Recommend possible non-chemical treatment for controlling pests & diseases.
- ii) Propose and apply fertilising programme to meet the needs of the collection.

## f) Improvement of the Aroid collection

i) Introduce approximately 10-20 new species of aroid to the collection and also the aroid collection in Plant House (Lawn L)

## • Years 7–10: actions proposed [as above]

## a) Inventory, analyzing and de-accession of collection

- i) Revisit and update inventory.
- ii) Review of collection.
- iii) Deaccession if necessary.
- iv) Addition of relevant new plant taxa to collection, if required.
- b) Interpretation
  - i) Labels and interpretations where required for general collection.

## c) Conservation of Heritage Collection Gene Pool

i) Review the present collection strength and the collection preservation needs for the period.

## e) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.
- f) Pest, Disease and Fertilising Programme
  - i)Recommend possible non-chemical treatment for controlling pests & diseases.

ii) Propose and apply fertilising programme to meet the needs of the collection.

#### Lawn O [Tanglin Core: Bandstand area]

#### Landscape Content and Heritage Value

The Bandstand area is the oldest designed feature in SBG's landscape, dating from 1860/61, the building itself from 1930 (restored 1994). The hilltop was first levelled by Lawrence Niven as a band parade ground, which a photograph taken in 1877 clearly shows. In the 1990s, the previous plantings adjacent to the Upper Ring Road were replaced with golden rain trees (Samanae saman) and the building surrounded by beds of shrubs, these contrasting with its appearance in an earlier photograph taken in April 1956, which shows a band playing to an audience seated on the surrounding turf. The slope below the encircling Upper Ring Road includes two Heritage Trees – a second giant kapok (planted 1933, cf. Lawn D), with huge buttresses, and the recently nominated Mengkulang (Heritiera elata), with its curiously folded/winged trunk. Adjacent to these are large Elephant ferns (Angiopteris) and, further east, two sculptures by British artist Sydney Harpley, gifted 1984–87 by the first Chief Minister, Mr. David Marshall (1908–1995), named 'Girl on a Swing' and 'Girl on a Bicycle'. In between and outside the Lower Ring Road is the Aroid garden. On the west side of the Upper Ring Road is the planting of c. 20,000 stems of Singapore's National Flower, Vanda 'Miss Joaquim', adjacent to which is a Jacaranda that is most attractive when flowering. To the south of the Upper Ring Road is a brick-walled terrace (1937) and a covered walkway (pergola, 1935) that passes the desert plants of the Sun Garden on its north side. At its southernmost limit the Lawn includes the Bonsai collection enclosure which replaced the formal floral beds and a sheltered rose garden, while to the SE there are *Ficus* with hair-like aerial roots and a fine specimen of *Saraca thaipingensis*.

#### **Other Significant Structures:**

The sculpture cum water feature in Sun Rockery 'Passing of Knowledge' by Victor Tan Wee Tar, donated by The Rotary Club of Singapore.

#### **Present Condition**

Most of the collections are in reasonable condition and adequately labelled, except for the Bonsai collection due to the lack of specialised care and the Sun Garden due to unsuitable climate, media and plant type. The Heritage Trees (*Ceiba pendantra & Heritiera elata*) suffer from soil compaction, lack of organic forest ground layer. The turf is in a fairly poor condition due to the heavy visitor traffic especially near the edges of the Upper and Lower Ring Roads. Shrubs surrounding the iconic Bandstand are getting straggly and damaged by over-enthusiastic photographers and bridal couples. The *Vanda* 'Miss Joaqium' plot are in a fairly poor condition as the wooden support are getting worn-out and need to be replaced. The Vandas' are also unhealthy as they are infected with virus.

# Constraints

The large co-dominant branch on the kapok is reason to fence off the slope beneath in the interests of public safety.

## Strengths

The rich heritage history of the landscape and the two Heritage Trees give this lawn its unique character. The botanical collection of succulents and cacti are interesting display areas worth further developing by means of interpretations. The aesthetic plots throughout Lawn O, example 'Girl on Swing', 'Girl on Bicycle', Vanda Plot and Bonsai Garden are popular with visitors for photography.

## Weaknesses

At 33 metres a.s.l. there are city buildings visible from certain points on Lawn O, but these are not too intrusive. Bonsai collection needs to be reviewed and probably staff needs to be trained in the art of bonsai to keep the collection. Currently this area does not really draw the visitors due to the lack of interesting bonsai collection on display. The Sun Garden planting needs to be improved and interpreted. Hardier species that can withstand the climate and tropical environment should be grown instead of C4 plant species to fill the area that are bare due to death of plants.

# **Potential for Improvement** [to mention collections focus if relevant]

In the interests of promoting heritage, consideration should be given to returning the area immediately surrounding the Bandstand building to the simple manicured lawn that existed until post 1950s. Better interpretation covering the Lawn's history has been developed and installed in June 2013. The Bonsai collection needs expert care if it is not already beyond rescue. The Sun Garden needs interpretation including details of the horticultural challenges presented by Singapore's climate. Shrubs in Bandstand are looking slightly unkempt, and may need to be replanted after every 3-4 years. Vanda Plot are looking straggly, and may need to be replanted every 4-6 years to ensure vigorous growth and flowering.

**10-year plan** [to be drafted by Lawn manager for feedback by senior SBG management]

- Years 1–3: actions proposed [to include de-accessioning, acquisitions, interpretation]
  - a) Inventory check, analyzing and de-accession of collection where necessary
    - i) Update inventory.
    - ii) Analyse collection over time.
    - iii) Deaccession if necessary.
    - iv) Addition of relevant new plant taxa to collection, if required.
  - b) Interpretation
    - i) To provide interpretation signages for significant and interesting old mature trees and plants of conservation importance where suitable.
    - ii) Labels and interpretation where required for interesting collection.
  - c) Conservation of Heritage Collection Gene Pool
    - i) Review the present collection strength in terms of conservation and botanical values in 2<sup>nd</sup> year and subsequent years.

ii) Formulate and implement a conservation strategy such as propagation and seed collection of valuable old and rare plants of known provenance to maintain the gene pool.

# d) Turf Management Programme

- i) Remedial action for improving the turf and soil such as fertilising and top dressing as required.
- ii) Returfing of areas that are poor and balding.
- iii) May need to look at possible planting of ground cover in areas which are not suitable for turf.
- iv) Improvement of compacted and bare areas by adding leaf litter mulch where suitable.

# e) Tree Management Programme

- i) Regular scheduled tree inspection and maintenance.
- ii) Follow-up treatment for trees that are deteriorating in health.

# f) Pest, Disease and Fertilising Management

- i) Collect data on pest and disease problems and trial simple control measures and documentation of trials.
- ii) To study the need of fertilizers for the different plant taxa and apply suitable fertilizer regime.

# g) Improvement to Succulent/Cacti Collection

- i) Identify the collection with assistance from Herbarium and cacti/succulent experts
- ii) Report to Plant Records for fabrication of labels.
- iii) Consult from Cacti experts on list of native and regional succulent/cacti to collect and/or procure.
- iv) Sourcing for more taxa diversity to enhance this collection.

# h) Improvement to Bonsai Collection

- i) Consult and obtain assistance from local bonsai society expert to train and improve collection
- ii) Sourcing for more interesting specimens to enhance this collection and this may require procuring from nurseries.

# • Years 4–6: actions proposed [as above]

# a) Inventory, analyzing and de-accession of collection

- i) Revisit and update inventory
- ii) Review of collection.
- iii) Deaccession if necessary.
- iv) Addition of relevant new plant taxa to collection, if required.

# b) Interpretation

i) Labels and interpretation where required for general collection.

# c) Conservation of Heritage Collection Gene Pool

i) Review the present collection strength and the collection preservation needs for the period.

# d) Nomination of Heritage trees

- i) To work with Plant Records and Arboriculture to decide the possibility of nomination of more Heritage trees.
- e) Turf Management Programme

- i) Continue with turf management programme in improving the turf and soil such as hollow thinning and top dressing as required.
- ii) Returfing of areas that are poor and balding.
- iii)

# f) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

# g) Pest, Disease and Fertilising Programme

- i) Recommend possible non-chemical treatment for controlling pests & diseases.
- ii) Propose and apply fertilising programme to meet the needs of the collection.

# • Years 7–10: actions proposed [as above]

# a) Inventory, analyzing and de-accession of collection

- i) Revisit and update inventory.
- ii) Review of collection.
- iii)Deaccession if necessary.
- iv)Addition of relevant new plant taxa to collection, if required.

## b) Interpretation

i) Labels and interpretations where required for general collection.

## c) Conservation of Heritage Collection Gene Pool

i) Review the present collection strength and the collection preservation needs for the period.

## d) Turf Management Programme

- i) Continue with turf management programme in improving the turf and soil such as hollow thinning and top dressing as required.
- ii) Returfing of areas that are poor and balding.
- iii) Improvement of compacted and bare areas by adding leaf litter mulch where suitable.

## e) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

## f) Pest, Disease and Fertilising Programme

- i) Recommend possible non-chemical treatment for controlling pests & diseases.
- ii) Propose and apply fertilising programme to meet the needs of the collection.

# **10 Year Living Collection Management Plan**

Lawns P, R (Ginger Garden) & S

Date: August 2013

Manager: Tan Miao Yuan Ada

Section Head: Dr. Nura Abdul Karim

# LAWN P, R (GINGER GARDEN) and S [Tanglin & Central Cores]

#### Landscape Content and Heritage Value

The Ginger Garden, which comprises of Lawn P and R was launched on 18 October 2003, showcasing more than 500 species, varieties and cultivars of the Ginger order (Zingiberales). The design and planting details of the Ginger Garden was much contributed by Mr Alan Carle, a field botanist and plant collector based in Queensland. He is a published author, and an expert on the growth of gingers and tropical fruits.

The main Ginger collection is located at Lawn P and R and these were formerly part of the 1955 Orchid Enclosure that was closed down around 1995 after the National Orchid Garden opened in October 1995. Lawn S is an eastern extension of the Ginger Garden into the southernmost part of the SBG Rainforest (formerly known as the Gardens Jungle) that buffers the Ginger Garden from the main Rainforest and Maranta Avenue. The main entrances to the Ginger Garden include entering via Orchid Plaza, the Tyersall Avenue Coach drop off point or via the lawn to the north of Swan Lake or from the Bandstand hill. The current layout of the Ginger Garden is indicated in Fig. 1.

#### Lawn P

The collections are mostly Zingiberales, plus an assortment of trees such as the Pride of Burma (*Amherstia nobilis*) greeting the visitors entering the Ginger Garden via the Coach drop off point and the Sandbox trees (*Hura crepitans*), in an avenue leading to the third upcoming entrance to Ginger Garden from Bandstand hill. The main ginger collection in Lawn R has subsumed plot 19 (Fig. 1) to include the Lowiaceae (Orchidantha family) in 2012, which is under represented in the Gingers collection.

The Orchidantha family has only one genus with only 20 species. The herbaceous shrubs are usually small in size with heights ranging below 1m. It has short lasting flowers that emit an unpleasant smell. The flowers are unique in its shape and colour and resemble an orchid flower. It has potentials as an ornamental herbaceous plant.

#### Lawn R

The front thoroughfare of Ginger Garden walk via Orchid Plaza is well shaded by the native Saraca trees which produce bunches of bright orange flowers (usually in February and July). Also dotting the landscape are some interesting rare palms that date back to the late 1980s/early 1990s. The most striking landscape intervention here is the Waterfall Hill with its walk-behind cascade and associated plantings, including *Nepenthes* etc. This waterfall with a walk-through cave made of artificial rocks is one of the many popular photo spots of SBG. There is a shelter opposite this waterfall with interpretation for the Ginger Garden and there are also murals on the walls of adjacent buildings featuring aspects of Zingiberales.

Another prominent water feature of this lawn is the Water Lily pond with Victoria and the giant aroid *Typhonodorum lindleyanum*. The edge of this lawn runs along Tyersall Avenue and formerly included Tyersall Gate, an entrance less grand than the Tanglin/Main Gate, but nevertheless provided with a pair of stone gate pillars and an avenue of the Sugar Palms as seen in the 1950 aerial photograph of the Gardens. The stone gate pillars still stands.

Amongst the ginger landscape are mature rare palms (as mentioned earlier) and some magnificent huge Pandanus with lovely prop roots. All are remains from the Orchid Enclosure landscape.

The eastern core of this lawn is also another popular exploring spot where visitors are greeted by the large cannonball (*Couroupita guianensis*) trees. These trees came in the form of seeds that were collected and brought to the Gardens by E.J.H. Corner from Peradeniya, Sri Lanka, while en route to Singapore from United Kingdom in March 1934 and were planted on site in December 1934. The western region is divided into seven major plots where gingers and allies are grouped according to their geographical origin or plant uses (Fig.1):

- i. Africa
- ii. Tropical America
- iii. Asia (Indo-China plot was created as a subset of this plot)
- iv. Pacific
- v. Banana Gallery
- vi. Ethnobotanical
- vii. Mixed

In 2003, the watering of the gingers in this lawn was supported with an extensive sprinkler system (approx. 95% coverage). The irrigation system is currently not in use due to constant faults and poor maintenance.

Our rare SBG native snail (*Amphidromus inversus*), although small in numbers, were recently spotted at this lawn. The main sighting of these native snails had always been near the walls of the remnant Japanese Garden which had been converted to the Aroid Garden along the Lower Ring Road and in the Rainforest area.

Fringing the Ginger Garden entrance facing the National Orchid Garden is the Costaceae (Costas family) plot. The Costus family has a total of seven genera with about 150 species. Costus are a popular tropical plant that is highly utilised in landscapes here. This plot serves to consolidate the diversity of Costaceae and showcase this highly desirable ornamental ginger. The attraction to the Ginger Garden is further enhanced at the northern end with the popular Halia Restaurant that offers dining at its sheltered outdoor deck that fronts the lush greenery.

#### Lawn S

This roughly triangular area is the eastern extension of the Ginger Garden into the southernmost part of the SBG Rainforest. It is adjacent to the well-known and shady Maranta Avenue, named after the genus Maranta from the Marantaceae (arrowroot family). This lawn is characterized by under storey palm collection complementing the other main area for this family in Palm Valley. Not surprising, it also holds several species from the Marantaceae, such as Maranta spp., *Marantochloa cuspidata* and *Marantochloa mannii* 

The most important understorey palm here is the Johannesteijsmannia collection with the larger specimens dating back to the late 1960s/early 1970s and a few Australia-Oceania understorey palms which pre-date the formation of the Ginger Garden. At the north-west end beside Maranta Avenue is a commemorative rubber tree (*Hevea brasiliensis*) dedicated to the City of London and protected by a barrier against vandalism. It was planted by the Right Honourable the Lord Mayor, Alderman Sir David Howard Bt. on 29<sup>th</sup> October 2001.

#### Other significant structures

The regional plots at Lawn R are represented by four specially commissioned wooden totem pole sculptures that were installed in 2010. The 2.5m tall sculptures are made from recycled timber from fallen trees in the Garden. Another remarkable artwork in the Ginger Garden is the wall murals. One wall mural features the eight ginger families under the order of Zingiberales, i.e. Marantaceae, Costaceae, Musaceae, Heliconiaceae, Lowiaceae, Cannaceae, and Strelitziaceae. It can be seen from the entrance via Orchid Plaza. The second wall mural, which is behind the Banana Gallery, traces back the history of modern banana and its many uses. Both the sculptures and the wall murals were designed and done by outdoor artist, Ms. Michele Piccoli.

#### **Present Condition**

#### Lawn P and R

There is concern for the vitality of the mature palm species at Lawn R as 2 palms (*Wodyetia bifurcata* and *Roystonea regia* were removed in the last 3 months as a result of fungal disease as evidenced by the presence of bracket fungi at the base of the trunks. Shade conditions in Lawn P and R is another major concern, as it limits the success of several major sun-loving Ginger collections planted in the areas. Pests, especially squirrels tend to be a threat to the conservation and successful development of the gingers as they consume the young shoots and flowers.

#### Lawn S

The entire Maranta Avenue is generally well-shaded except for the north east end where it is slightly brighter as the tall *Alstonia angustiloba* (~30m) fell across Maranta Avenue last May as a result of microburst.


# LEGEND

Light green	MIXED ZONE (Plot No. 1,2,3,4,7,8,9,10,19,20,21,22,23,38,41,42,43)
Dark green	AMERICA (Plot No. 27, 28, 29, 30, 31, 32, 33)
Yellow	ASIA (Plot No. 11,12,13,14,15,16,17,18,24,25,26,39,40)
Light brown	PACIFIC (Plot No. 37)
Dark brown	AFRICE (Plot No. 35)
Dark Maroon	ETHNOBOTANY (Plot No. 34, 36)
Light Maroon	BANANA GALLERY (Plot No. 5, 6)

## Fig 1. Demarcation of gingers display and rainforest in Ginger Garden.

#### Constraints

No tall gingers should be blocking the view from the Halia Restaurant open air timber decking dining area. For the outdoor dining experience, it is essential to keep the planting low.

#### Strengths

Ginger collections and understorey palm collection are significant conservation collection strengths of the lawns.

#### Weakness and Potential for Improvement

#### 1. Shade

Shade is a limiting factor to the sun-loving Gingers, particularly at the Ethnobotanical and Pacific plots where it is densely shaded by the old *Syzygium companulatum* at plot 36 and 37. Minor part of the Musaceae collection is also shaded by 2 neighbouring *Maniltoa browneoides* at plot 5 and 6. The tree covers is also shading the water feature and limiting the growth of the Victoria and other aquatic plants in the Water Lily pond. Removal or thinning of the mentioned trees should be considered to increase the amount of light penetration in the area.

#### 2. Species

Insufficient ginger species are represented at the Ethnobotanical and Pacific plots. To work with researchers to source for more collection as well as purchase relevant species. The addition of the ginger species should be done after the necessary tree thinning works are carried out.

#### 3. Pest Management

- Multiple gingers were damaged/culled as a result of squirrel attacks. To date, there is no effective system in place to manage the squirrels. May need to work with relevant experts to explore ways to control the squirrel population.

#### 4. Lack of interpretation and signage

- To install interpretation on Costaceae, Lowiaceae and Banana Gallery display plots. The current totem pole sculptures with specific icons that had been commissioned are not effective in distinguishing the regional plots. There is a need to add proper signs to distinguish the regional demarcations.
- Visitors who wish to enter the Ginger Garden via the southern side of the Lower Ring Road might have difficulties locating it as there is no entrance sign. To put up another Ginger Garden entrance sign to mark the accessibility of the garden from the Lower Ring Road, close to the Sandbox trees (*Hura crepitans*) for visitors.

#### 5. Technical issues with the Waterfall and sprinkler system

- The waterfall has an overflow feature, which channels excess water to the pond by a drain. It has been noted that the drain can be choked by accumulating soil particles and/or leaf debris and this occurs once in every two/three months. In times of blockage, the overflowing water from the drain to the passageway posed a safety issue especially during peak visitorship periods.
- It has also been noted that the flow rate of the waterfall is inconsistent. One side of the waterfall tends to fail more easily than the other. To work together with Operation branch to improve on the performance and filtration of the Waterfall.
- It would be greatly beneficial to the growth of the gingers if the extensive sprinkler system in Ginger Garden can be reinstated. This would reduce the need of workers to carry out daily manual watering and free them to carry out other horticulture work.

## 7. Orchidantha display plot

- The current display can be improved by increasing the number of species to be of scientific merit. It would worthwhile for SBG to showcase the most comprehensive Orchidantha collection in this region by working closely with our Ginger researcher in Research and Conservation Branch. Interpretation on this collection will also add to visitors' understanding of this unique monogeneric family.

#### 8. Regional Plot Signages

Currently all regional plots are represented by a unique totem pole sculpture which are highly stylised and actual names of the regions represented may need to be carved or painted to the totem poles. Also the smaller Indo-China plot that is a subset of the Asia plot is not represented by totem pole and there is a potential to commission another of the pole for this subplot. This will be looked into with assistance from Procurement to commission the same artist to work further on the totem poles.

**10-year plan** [to be drafted by Lawn manager for feedback by senior SBG management]

- <u>Years 1–3: actions proposed [to include de-accessioning, acquisitions,</u> <u>interpretation]</u>
  - a) Inventory check, analyzing and de-accession of collection where necessary
    - i) Update inventory.
    - ii) Analyse collection over time.
    - iii) De-accession if necessary.
    - iv) Addition of relevant new plant taxa to collection, if required

## b) Interpretation

- i) To provide general interpretation signage for various plots' collection.
- ii) Labels and interpretation where required for general collection.
- iii) Engraving or painting of regions' name to be incorporated into the existing wooden sculptures to highlight the different regional plots. To work with Procurement to commission the same artist to carry out the works.
- iv) To collaborate with Operation branch to work on the fabrication of the Ginger Garden Entrance signage for Lower Ring Road

## c) Tree Management Programme

- i) Regular scheduled tree inspection and maintenance.
- ii) Follow-up treatment for trees that are deteriorating in health.
- iii) To review and schedule the progressive removal of non-significant trees.

#### d) Pest, Disease and Fertilising Management

- i) Explore the control and management of squirrels with relevant experts.
- ii) To study the need of fertilizers for the different plant taxa and apply suitable fertilizer regime.
- iii) Work with National Biodiversity Centre to monitor the population of the native snail at this site.

## e) Increase collection to Ethnobotany, Pacific and Lowiaceae plots

 To work with relevant taxonomists as well as procuring through various nurseries to increase the ginger diversity in these plots.

## f) Tackling of technical issues at Ginger Garden

- To work with Operation branch to resolve the blockage and design issue of the Waterfall and to carry out joint inspection to monitor the progress regularly.
- ii) To work with Operation branch to explore the possibility of reinstating the sprinkler system.

## g) Ginger Collection

i) Maintain and monitor the ginger collection and make addition or removal of species when necessary.

## • Years 4–6: actions proposed [as above]

a) Inventory, analyzing and de-accession of collection

- i) Revisit and update inventory
- ii) Review of collection.
- iii) De-accession if necessary.
- iv) Addition of relevant new plant taxa to collection, if required.

#### b) Interpretation

i) Labels and interpretation where required for general collection.

## c) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

## d) Pest, Disease and Fertilising Programme

- i) To monitor and control the squirrels.
- ii) Propose and apply fertilising programme to meet the needs of the collection.

## e) Ginger Collection

i) Maintain and monitor the ginger collection and make addition or removal of species when necessary.

## • Years 7–10: actions proposed [as above]

## a) Inventory, analyzing and de-accession of collection

- i) Revisit and update inventory.
- ii) Review of collection.
- iii) Deaccession if necessary.
- iv) Addition of relevant new plant taxa to collection, if required.

#### b) Interpretation

i) Labels and interpretations where required for general collection.

#### c) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

#### d) Pest, Disease and Fertilising Programme

- i) Recommend possible non-chemical treatment for controlling pests & diseases.
- ii) Propose and apply fertilising programme to meet the needs of the collection.

#### e) Ginger Collection

i) Maintain and monitor the legume collection and make addition or removal of species when necessary

# 10 Year Living Collection Management Plan

Lawns M, N, U, V (Rainforest formerly Gardens Jungle)

Date: August 2013

Manager: Lahiru Wijedasa

Section Head: Dr. Nura Abdul Karim

#### Lawns U, V, N and M in part [Tanglin Core: Rainforest (former Lawn Q merged with N)]

#### Landscape Content and Heritage Value

SBG's Rainforest or Gardens Jungle is an important landscape element, though not designed by man. It is nowadays managed with a focus of maintaining and enhancing its biodiversity and is a feature accessible to the public on raised boardwalks that permit biological connectivity in the organic layer beneath. It also forms an important landscape backdrop to other designed Lawns, especially Palm Valley and spectacular views from the National Orchid Garden.

The heritage value as a natural area is considerable, as it is the only relatively undisturbed rainforest remnant in Singapore outside of the Nature Reserves (i.e. Bukit Timah and MacRitchie Nature Reserves). However, with an area of only between 4–6 hectares it suffers from "edge effects" and needs constant attention to reduce and, ideally, eliminate invasive weedy species that enter around its margins, and to control the rampant growth of lianas that thrive in the disturbed areas, where ecological balance is lacking.

It includes a number of massive canopy emergents, some recognized as Heritage Trees and protected with lightning conductors, but its composition is known to have changed over time (since 1859) and it appears to be less humid than formerly. For example, *Nepenthes* was recorded amongst its flora by botanical artist Marianne North in 1876, but is no longer found, though it can be reintroduced as part of a programme to reinforce the Rainforest with species that can be expected to have occurred in it or in similar forests of the region.

A total of 490 species of trees have been recorded in SBG's Rainforest by the Gardens' scientists, but many of these are represented by few or solitary individuals, as is to be expected in such a small area of species-rich vegetation. Nevertheless, various species that are nationally rare, Endangered or Critically Endangered survive in the Rainforest and include species first described to science from the Gardens Jungle such as *Heritiera elata*, *Antiaris toxicarius, Planchonia grandis* and *Memecylon cantleyi* to name a few. Among the rare trees, it is interesting to note that the original trees that Ridley used to first describe *Memecylon cantleyi* as new to science still exist today – these two trees are the only two trees ever recorded from Singapore. Other Critically Endangered species of note are *Planchonia grandis, Gymnacranthera farquhariana, Shorea gratissima* and *Ficus kerkhovenii*, the last two of which Heritage Trees.

*Terminalia subspathulata* (beside Lawn O and recognizable in photographs taken in 1877) is a Heritage Tree dedicated to late Lady Yuen Peng McNeice, a long time supporter of the Gardens. At the south-west access point of the Rainforest stands a fine specimen of *Cola gigantea* (Africa), notable for having been dedicated to Nelson Mandela.

The rainforest also used to have at least 4 entrances to its core till 2000 -1 at Liane Road, 1 at Maranta Avenue and 2 along Palm Valley Road. All except one of the path along Palm Valley still exist. The path in the heart of the rainforest used be a cement path and the main

road leading from the Liane Road was a tarmac road but had since been replaced in 2000 and 2011 by a slight raised GFRC boardwalk to ensure better root and plant growth .



Figure 1: Map of the subplots in the Gardens Jungle

#### **Present Condition**

The rainforest suffers from a number of effects due to its location and distance from other nature areas in Singapore. The altered conditions of the forest have affected its ecology. While structurally similar to a natural rainforest in certain places, it is altered in other places. The rainforest layers has slowly diminished with the changes in the microenvironment of the soils and the surrounding environmental conditions. This changes has caused the ground layer and shrub flora to be greatly reduced in this remnant primary rainforest.

#### Constraints

Public access can only be permitted along the raised boardwalks, this being in the interest of conserving the natural environment. Most tree species don't fruit and the recruitment of those that do fruit is limited. The proximity of footpaths within or adjacent to the rainforest means that all trees have potential safety issues to visitors, thus old dead trees which might be suitable habitats for birds and other animals must be cut down for safety reasons. Removal of dangerous or dead trunks and branches posed a major problem due to poor access or inaccessibility for arborists to reach the upper limits of canopy trees to safely cut down affected branches or trunks.

#### Strengths

Heritage Trees and rare native species, including non-plant wildlife, e.g. the mollusc, *Amphidromus inversus*, first recorded for Singapore and Peninsula Malaysia in 1961 from SBG's Rainforest near the Potting Yard. Public get to experience what a rainforest is like in such close proximity to the city without having to visit the nature reserves located further away.

Over the period 2009-2012 an inventory of the trees in the rainforest has been carried out. The inventory has resulted in an update on the species present, their sizes and an overall assessment of the entire rainforest. As part of the survey, the rainforest was divided into smaller plots and each plant was labelled allowing for better monitoring and management of the rainforest (see Figure 1). The only other area with similar records and monitoring is the 100ha forest dynamics plot in Bukit Timah managed by the Smithsonian Institute. Thus the Gardens Jungle could be the site for a long term study of the growth of tropical trees in an undisturbed site surrounded by urban areas, probably the only one of its kind anywhere in the tropics.

#### Weaknesses and Potential for Improvement

Two main physical limitations affect the moisture in the rainforest -

1) the gardens jungle is located at one of the highest points in the gardens, resulting in a general draining of water away from the rainforest.

2) the edge effect due to adjacent open areas on all sides (Palm Valley, the Visitor Centre coach car park and Cluny road) also results in drying out of the forest.

- The boundaries of the rainforest have been densely planted up with *Dracaena fragrans* along Lower Ring Road, *Baphia nitida* along Cluny road and a mix of planting along Upper Palm Valley Road. The boundary along Marantha Avenue is buffered by the forest patch around the Ginger Garden. This effectively reduces the effect of wind desiccation.
- When the old concrete footpaths were removed and the boardwalk installed watering points were installed along the footpath. These should be used to attach sprinklers as and when the need arises.

The fragmented nature of Singapore's landscape has resulted in the Gardens Jungle being surrounded by urban areas and detached from other natural forests. The result is that the climate in the rainforest has changed and the plants do not flower and fruit as regularly. Also the germination of seeds and establishment of seedlings of plants in the rainforest has been altered, with a drastic reduction in recruitment of the next generation of plants. The result is that most trees species are represented by large specimens and no other plants.

 Seeds need to be collected from the rainforest when available, germinated in the nursery and replanted. Other mode of propagation (e.g tissue culture, marcotting, etc.) may need to be experimented on for rare rainforest species. This could result in highly valuable scientific papers on conservation of tropical rainforest species whose majority of seeds are recalcitrant and do not store well overtime in seed banks. • Native plants and/or seeds from other nature reserves need to be collected and introduced to the rainforest to improve the diversity.

The fragmentation and edge effects mentioned above have also resulted in many canopy gaps in the rainforest due to the demise of old trees not being filled with replacements.

• It is possible to plant fast growing native trees to fill these canopy gaps. Once the canopy gaps close the planting and establishment of other native trees is possible.

The Rainforest is surrounded by introduced plants in the Singapore Botanic Gardens. Some of the plants have established in the rainforest. These non-native plants compete with native plants for resources. Control of the non-native plants is essential. Plants to be removed include:

- Climbers Smilax sp., Dioscorea sanisibarensis, Thunbergia sp.
- Trees Castilla elastica, Hevea brasiliensis, Ceiba pentandra, Dracaena fragrans
- Palms Elaeis guineensis
- Shrubs Diffenbachia sp., Heliconia sp., Thaumatococcus sp.

Interpretation about the Rainforest exists at two of the 3 access points. There are a number of numbered sign boards in the rainforest that refer to a defunct leaflet which will be removed. Additional interpretation can be installed along the boardwalks within the forest without spoiling its natural ambience. The following interpretations to be installed:

- Heritage Trees
- Numbered sign boards to be replaced with interpretation
- Rattan at the entrance to the rainforest
- The panels at the rainforest plaza to be redone

10-year plan of Lawn U, V, N and M (Gardens Jungle)

#### Years 1–3: actions proposed

#### a) Inventory check, analyzing and de-accession of collection where necessary

- i) Update inventory.
- ii) Analyse collection over time.
- iii) Deaccession if necessary.
- iv) Addition of relevant new plant taxa to collection, if required.
- b) Interpretation
  - i) To provide interpretation signages for significant and interesting plants in the rainforest.
  - ii) Maintain labels and tags on plants.

#### c) Conservation and Propagation

- i) Collect seeds from trees and work with nursery to propagate.
- ii) Work with the nursery to collect plants in the other nature reserves for planting in the Gardens Jungle.
- iii) Work with Research & Conservation Unit to come up with innovative new propagation method using tissue culture/cloning,

synthetic seeds (seed encapsulation) etc. as seed bank may not be a solution for many tropical recalcitrant seeds.

## e) Tree Management Programme

- i) Regular scheduled tree inspection and maintenance.
- ii) Follow-up treatment for trees that are deteriorating in health.

## f) Non-native plant Management

i) Use volunteers and garden staff to control non native climbers, trees, shrubs and palms.

## • Years 4–6: actions proposed [as above]

- a) Inventory, analyzing and de-accession of collection
  - i) Revisit and update inventory
  - ii) Review of collection.
  - iii) Deaccession if necessary.
- b) Conservation and Propagation
  - i) Review the present collection strength and the collection preservation needs for the period.

#### c) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

## d) Non-native plant Management

i) Use volunteers and garden staff to control non native climbers, trees, shrubs and palms.

#### • Years 7–10: actions proposed [as above]

#### a) Inventory, analyzing and de-accession of collection

- i) Revisit and update inventory
- ii) Review of collection.
- iii) Deaccession if necessary.
- iv) Addition of relevant new plant taxa to collection, if required.

#### b) Conservation of Heritage Collection Gene Pool

i) Review the present collection strength and the collection preservation needs for the period.

#### c) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

#### d) Non-native plant Management

i) Use volunteers and garden staff to control non native climbers, trees, shrubs and palms.

# 10 Year Living Collection Management Plan

Lawns around Visitor Centre & Surroundings of NParks Headquarters

Date: Aug 2013

Manager: Rockney Wong

Section Head: Dr. Wilson Wong

# Lawns around Visitor Centre [Central Core: E.J.H Corner House, Cascade Garden & Palm Court, Lawn XA]

#### Landscape Content and Heritage Value

The conserved E.J.H. Corner House built in 1910 is named after Edred John Henry Corner, a botanist, who occupied the posts of Assistant Director of the Singapore Botanic Gardens (1926–1946) and Professor of Tropical Botany at the University of Cambridge (1965–1973). Beside the E.J.H. Corner House, there is a small domestic scale garden with lush greenery used by the Au Jardin Restaurant that currently occupies the building. The view from the road to Corner House Gate is delimited by the hedges formed by dense plantings of *Gustavia angusta* and *Gustavia superba*. Corner Green is a nearby lawn dominated by fine specimens of *Butea monosperma* (potential Heritage Tree) and *Hymenaea courbaril*.

Nearby the E.J.H. Corner House is the Cascade Garden that is characterised via its openended landscape concept with curving ribbons of granite waterfalls. There is a small collection of *Plumeria sp.* on one side of the Cascade Garden. This Garden leads to the Palm Court and the SBG Visitor Centre building on one end and another, to Palm Valley.

On opposite sides of the Palm Court are the Garden Shop and Casa Verde Restaurant. There are some circular islets planted with tall *Elaeis guineensis* and the textured trunks draped with cluster of ferns and other epiphytic plants. There are some fine specimens of *Dillenia*, *Elaeocarpus, Ficus* and *Couroupita guianensis* at the vicinity of Palm Court. Near the Garden Shop is a pergola that is covered with *Thunbergia grandiflora* that arches over a path that leads to NParks' Headquarters Building which help to protect visitors from the heavy falling fruits from *Hymenaea courbaril* overhead.

The SBG Visitor Centre is located near the junction of Cluny and Nassim Roads. A gateway is formed via the combination of the SBG Visitor Centre and National Parks Board Headquarters. This is a very crucial location by offering information services to visitors, visitors' amenities and the starting point for guided tours. The architecture of this building is appropriately rustic and regional, features exposed timber beams, sweeping wooden shingled roofs, vents and lattices decorated with coloured Madras stained glass that are commonly used in Peranakan houses to create a kampong atmosphere.

At the Visitor Centre entrance, there are a huge specimen of a *Pandanus* species, some gingers and bananas that welcome visitors as they enter from the drop-off point. Two statutes can also be found, namely, the Bull Frog, which is located near the banana plot while the other is a Snake, located opposite where the huge *Pandanus* species is. Both were erected in 1992 and are works of Joram Mariga.

A grand, old heritage rain tree *Samanea saman* (assumed to be late 19<sup>th</sup> century) spreads at the roundabout in front of Visitor Centre entrance. The landscape and plantings there are modern, dating from the 1990s, when Cluny and Dalvey Roads that bisected SBG were

expunged. Several fine specimens of shade-tolerant palm species, like *Johannesteijsmannia* and *Licuala*, are planted around the base of this tree.

#### **Present Condition**

The present condition of the area is generally good except for the *Elaeis guineensis* collection at Palm Court which are under-nourished and grown in very constrained space. Falling fronds are a hazard to visitors. Shady conditions encountered in some parts are welcomed by visitors but pose a challenge on plant selection for populating the area. Some of the earlier plantings need to be changed to more shade tolerant ones.

#### Constraints

Shady conditions of the garden space around the E.J.H. Corner House greatly limit the type of plants that can be successfully grown and currently impedes healthy growth of the existing *Plumeria* and flowering shrubs.

#### Strengths

This area features several fine specimens of shade-loving, understorey palms. Corner Green and Visitor Centre areas have heritage trees worth mentioning. E.J.H. Corner House has its own history that needs to be shared.

#### Weaknesses

There is a lack of interpretation of the significance of E.J.H Corner House, Palm Court and Cascade Garden and heritage trees.

#### **Potential for Improvement**

Interpretation for these areas should be installed. Automatic irrigation system should be installed to increase productivity and reduce reliance of manpower.

*Elaeis guineensis* planted at Palm Court should be reconsidered. Plant selection should consider the site constraints especially with the limited planting space and concerns of public safety due to falling fronds from the palms. Vertical gardens constructed on totem poles may be considered as a refreshing replacement for these palms in this area. Another idea is to build a trellis over the entire area to provide shade via the introduction of a suitable climber for growing inside the planters.

The shady conditions at E.J.H. Corner House, Cascade Garden and Palm Court present a site near the Palm Valley suited for a shade-tolerant understorey palm collection. A range of shade-tolerant plants, such as those from Acanthaceae, climbers for the trellises and genus *Tacca* can also be introduced for planting at these areas to add colour and diversity. Further planting of *Gustavia angusta* and *Gustavia superba* near the E.J.H Corner House to provide screening effect from Cluny Park Way and loading/unloading area should be performed.

Some of the tree surface roots are observed growing on footpaths near the E.J.H Corner House. In order to reduce the risk of public tripping over, it is highly recommended to remedy the situation via careful root pruning.

Proper maintenance and regular arboriculture assessments are needed for *Butea monosperma* situated at The Corner Green. Crown thinning of the dense tree canopies of *Chrysophyllum cainito* and *Terminalia catappa* located between the Cascade Garden and Corner House should be carried out regularly in order to allow sufficient sunlight to reach the plants growing below.

**10-year plan** [to be drafted by Lawn manager for feedback by senior SBG management]

- <u>Years 1–3: actions proposed [to include de-accessioning, acquisitions, interpretation]</u>
  - a) Inventory check, analyzing and de-accession of collection where necessary
    - i) Update inventory.
    - ii) Analyse collection over time.
    - iii) De-accession if necessary.
    - iv) Addition of relevant new plant taxa for collection.
  - b) Interpretation
    - i) Install interpretation for significant buildings.
    - ii) Prepare relevant labels and interpretation for existing or new plantings and heritage trees.
  - c) Conservation of Heritage Collection Gene Pool
    - i) Review the present collection strength in terms of conservation and botanical values in 2<sup>nd</sup> year and subsequent years.
    - ii) Formulate and implement different conservation strategies such as propagation and seed collection of valuable and rare plants of known provenance to maintain the gene pool.

#### d) Turf Management Programme

- i) To identify all steep slopes and propose to plant appropriate groundcover plants to reduce turf management activities.
- ii) Improve turf condition by proposed remedial actions such as hollow tinning and proper returfing\_where necessary.
- iii) Back filling and top-dressing for uneven ground especially near the edge of foot paths which has subsided over time due to soil erosion, compaction and movement.

#### e) Tree Management Programme

- i) Apply leaf litter regularly under the tree canopies at least to the crown drip line in order to minimise mechanical damage to tree surface roots, soil compaction and retain soil moisture.
- ii) Employ proper tree management program for Heritage and potential Heritage Trees such as *Samanea saman*, Rain tree in front of Visitor Centre main entrance, *Hymenaea courbaril* and *Butea monosperma* situated at The Corner Green.
- iii) Regular scheduled tree inspection and maintenance.
- iv) Follow-up treatment for trees and palms that are deteriorating in health and hazards such as termite infections and limited of growing spaces.

## f) Pest, Disease and Fertilising Management

- i) Monitoring chemical usage to prevent over use of chemical in the garden.
- ii) Documentation of data collections such as trial control measures on pest and disease of plants.
- iii) Understand the different requirement of nutrients for different plant taxa and apply fertilizers accordingly.

## g) Re-landscaping of E.J.H. Corner House

- i) Lawn analysis and update of inventory.
- ii) Introduce and propose new plantings.
- iii) Introduce different shade loving plants such as plants from Acanthaceae family.
- iv) Extend the planting at slope area of Corner Green to link the garden from Visitor Centre to E.J.H. Corner House area.
- v) Interpretation of significant planting theme.

## h) Re-landscaping of Cascade Garden

- i) Lawn analysis and update of inventory.
- ii) Introduce different variety of understory plants
- iii) Introduce the collection of *Tacca sp.*
- iv) Interpretation of relevant and significant plant species and collection.

## • Years 4–6: actions proposed [as above]

## a) Inventory, analyzing and de-accession of collection

- i) Update inventory
- ii) Review of plantings and collection such as improvement and sustainability of plants.
- iii) De-accession if necessary.
- iv) Addition of relevant new plant taxa for collection.
- b) Interpretation
  - i) Review for additional and improvement of interpretation.
- c) Conservation of Heritage Collection Gene Pool
  - i) Review the present collection and botanical value.

## d) Nomination of Heritage Trees

i) Work closely with plant records and arboriculture team to propose or nominate the possibility of potential Heritage Trees.

## e) Turf Management Programme

- i) To monitor groundcover condition at steep slopes and effectiveness to reduce dangerous turf management activities.
- ii) Improve turf condition by proposed remedial actions such as hollow tinning and other proper treatments.
- iii) Back filling and top-dressing for uneven ground especially near the edge of foot paths which has subsided over time due to soil erosion, compaction and movement.

## f) Tree Management Programme

- i) Apply leaf litter regularly under the tree canopies at least to the drip line in order to minimise mechanical damage to tree roots, soil compaction and keep soil moisture.
- ii) Employ and monitor tree management program for Heritage and potential Heritage Trees.
- iii) Regular scheduled tree inspection and maintenance.
- iv) Follow-up treatment for trees and palms that are deteriorating in health such as termite infections and limited of growing space.

## g) Pest, Disease and Fertilising Programme

- i) Recommend environmental friendly treatment or method such as biological control method in pests and disease management.
- ii) Monitoring of chemical usage to prevent over use of chemical in the garden.
- iii) Documentation of data collections such as trial control measures on pest and disease of plants.
- iv) Understand the different requirement of nutrients for different plant taxa and apply fertilizers accordingly.

## h) E.J.H. Corner House

- i) Lawn analysis and update of inventory.
- ii) Review the sustainability of plantings.
- iii) Additional of new introduced shade loving plants.
- iv) Improvement and addition of relevant interpretation.

## i) Cascade Garden

- i) Lawn analysis and update of inventory.
- ii) Review the sustainability of plantings and collection of *Tacca sp*.
- iii) Introduced new plant species.
- iv) Improvement and addition of relevant interpretation.

#### • Years 7–10: actions proposed [as above]

#### a) Inventory, analyzing and de-accession of collection

- i) Update inventory.
- ii) Review of plantings and collection such as improvement and sustainability of plants.
- iii) De-accession if necessary.
- iv) Addition of relevant new plant taxa for collection.
- b) Interpretation
  - i) Review for additional and improvement of interpretation.

#### c) Conservation of Heritage Collection Gene Pool

- i) Review the present collection and botanical value.
- d) Nomination of Heritage Trees
  - i) Work closely with plant records and arboriculture teams to propose or nominate the possibility of potential Heritage Trees.

#### e) Turf Management Programme

- i) To improve and monitor the condition of planted groundcover at very steep slopes and effectiveness to reduce dangerous turf management activities.
- ii) Improve turf condition by proposed remedial actions such as hollow tinning and proper treatment.
- iii) Back filling and top-dressing for uneven ground especially near the edge of foot paths which has subsided over time due to soil erosion, compaction and movement.

#### f) Tree Management Programme

- Apply leaf litter regularly under the tree canopies at least to the drip line in order to minimise mechanical damage to tree roots, soil compaction and keep soil moisture.
- ii) Employ and monitor tree management program for Heritage and potential Heritage Trees.
- iii) Regular scheduled tree inspection and maintenance.
- iv) Follow-up treatment for trees and palms that are deteriorating in health and hazards such as termite infections and limited of growing space.

#### g) Pest, Disease and Fertilising Programme

- i) Recommend environmental friendly treatment or method such as biological control method in pests and disease management.
- ii) Monitoring of chemical usage to prevent over use of chemical in the garden.
- iii) Documentation of data collections such as trial control measures on pest and disease of plants.
- iv) Understand the different requirement of nutrients for different plant taxa and apply fertilizers accordingly.

#### h) E.J.H. Corner House

- i) Lawn analysis and update of inventory.
- ii) Review the sustainability of plantings.
- iii) Additional of new introduced shade loving plants.
- iv) Improvement and addition of relevant interpretation.

#### i) Cascade Garden

- i) Lawn analysis and update of inventory.
- ii) Review the sustainability of plantings and collection of *Tacca sp*.
- iii) Introduced new plant species.
- iv) Improvement and addition of relevant interpretation.

#### <u>Surroundings of NParks Headquarters</u> [Central Core: Sunken Garden, Cycads Collection, Lawns XA , XD, XH Collections, Nassim Water Feature, Rain Tree Drive & Nassim Gate]

#### Landscape Content and Heritage Value

The National Parks Board Headquarters (HQ) Building features the Sunken Garden which is a shaded vertical wall garden. It is located at the 2<sup>nd</sup> floor of NParks HQ.There is a small collection of young cycads and a few conifers bordering the above-ground carpark and driveway of NParks HQ main entrance. These complement the older and larger cycad specimens in the adjacent Evolution Garden. The 3<sup>rd</sup> storey covered car park has several planter boxes with mature specimens of *Uvaria grandiflora* that climb over an overhead trellis to provide shade.

The Nassim Water Feature is a conservation research project and focal point that is located at the Nassim Gate roundabout and can also be accessed via foot along the footpath that connects the National Parks Board Headquarters Building and Raffles Building. Some of the aquatic plants had been planted include *Cyrtosperma johnstonii, Acrostichum aureum* and *Licuala spinosa*. The Nassim roundabout is located after the Nassim main entrance and fully planted with a wide variety of plants to welcome visitors such as the *Russelia equisetiformis, Osmoxylon lineare and Bauhinia kockiana*.

The Myristicaceae collection plot is located at Lawn XH near the magnificent water feature of Nassim Gate. A potential Heritage Tree candidate, *Horsfieldia irya*, has lightning protection installed. This tree needs regular arboriculture assessment to ensure it is structurally safe. A huge and ancient *Mesua ferrea* beside NParks HQ, which was uprooted in May 2012, was the last surviving remnant of rainforest cut off by the aforementioned roads before 1860 (Burkill 1918; Taylor & Wijedasa in *Gardenwise* 39: 25, 2012). There are *Hopea* and *Barringtonia* species collections located at Lawns XA and XD.

Along the Rain Tree Drive is planted with variety of colourful plants, such as, *Cyrtostachys renda*, *Mussaendra sp.* and *Plumbago auriculata*. It leads garden visitors towards the iconic Heritage tree, *Samanea saman* that stands stately in front of the drop-off point at the Visitor Center.

#### **Present Condition**

The present condition is good, though there are recurring problems with termite infestation of the trees at HQ areas such as Lawn XD.

#### Constraints

Soil compaction was observed at some of the planting areas and proper mulching should be applied to improve the soil condition for better plant growth. The *Cycads* collection along the 3<sup>rd</sup> storey car park area has a higher risk of being damaged by vehicles. Lack of sufficient water points for irrigation in this area is observed.

#### Strengths

Collection of rare palms and cycads and large trees like the stately specimen of *Samanea saman* (a heritage tree) at the Visitor Center.

#### Weaknesses

Various plants lack of plant labels and interpretation.

#### Potential for Improvement

Re-landscaping of Sunken Garden with an appropriate shade-tolerant plant selection for a sustainable landscape is necessary in the long term. For the cycad collection, the compacted soil there must be remedied for the health of the plants. For example, application of pine bark may be considered. Trees and conifers planted in the vicinity of the cycad collection such as *Gymnostoma rumphianum, Phyllanthus emblica, Platycladus orientalis, Pinus merkusii, Podocarpus macaphyllus* and *Araucaria cunninghamii* should be inspected closely and regularly for termite infestation and structural issues. Installation of water points, or an automated irrigation system, should be considered for sustainable landscape maintenance.

• <u>Years 1–3: actions proposed [to include de-accessioning, acquisitions, interpretation]</u>

#### a) Inventory check, analyzing and de-accession of collection where necessary

- i) Update inventory.
- ii) Analyse the collection over time.
- iii) De-accession if necessary.
- iv) Addition of relevant new plant taxa for collection.

#### b) Interpretation

- i) Creative and interesting way of interpretation for significant plants of conservation importance.
- ii) Prepare relevant labels and interpretation for existing or new garden plantings and collections.

#### c) Conservation of Heritage Collection Gene Pool

- i) Review the present collection strength in terms of conservation and botanical values in 2<sup>nd</sup> year and subsequent years.
- ii) Formulate and implement different conservation strategies such as propagation and seed collection of valuable and rare plants of known provenance to maintain the gene pool.

#### d) Turf Management Programme

- i) To identify all steep slopes and propose planting of appropriate groundcover to minimize dangerous turf management activities.
- ii) Improve turf condition by proposed remedial actions such as hollow tinning and proper treatments.
- iii) Back filling and top-dressing for uneven ground especially near the edge of foot paths which has subsided over time due to soil erosion, compaction and movement.

#### e) Tree Management Programme

i) Apply leaf litter regularly under the tree canopies at least to the drip line in order to minimise mechanical damage to tree roots, soil compaction and keep soil moisture.

- ii) Employ proper tree management program for Myristicaceae collection at Lawn XH, *Hopea species* collection at Lawn XA and *Barringtonia species* collection at Lawn XD.
- iii) Regular scheduled tree inspection and maintenance.
- iv) Follow-up treatments for trees and palms that deteriorating in health or hazards such as termite infection and limited of growing space.

## f) Pest, Disease and Fertilising Management

- i) Monitoring of chemical usage to prevent over usage of chemical in the garden.
- ii) Documentation of data collections such as trial control measures on pest and disease of plants.
- iii) Understand the different requirement of nutrients for different plant taxa and apply fertilizers accordingly.

## g) Sunken Garden

- i) Lawn analysis and update of inventory.
- ii) Introduce different plant species based on site condition.
- iii) Extend the planting at the both end of Sunken Garden wall.
- iv) Interpretation of significant plantings.

## h) Cycad Collection

- i) Lawn analysis and update of inventory.
- ii) Introduce different species of cycads for collection.
- iii) Interpretation *Cycads* species collection.

## i) Hopea species and Barringtinia species Collection of Lawn XA and XD

- i) Lawn analysis and update of inventory for *Hopea species* and *Barringtonia species* collection.
- ii) Increase the collection of *Hopea species* and *Barringtonia species*.
- iii) Interpretation for *Hopea* and *Barringtonia* collection.

## j) Myristicaceae Collection of Lawn XH

- i) Lawn analysis and update of inventory for Myristicaceae collection.
- ii) Increase the collection of Myristicaceae family.
- iii) Interpretation for Myristicaceae collection.

#### k) Aquatic Plant Collection of Nassim Water Feature

- i) Manage and improve the biological value.
- ii) Increase collection of aquatic plants.
- iii) Interpretation of aquatic plants collection.

## I) Enhancement planting at Nassim Gate and Rain Tree Drive

- i) Lawn analysis and update of inventory.
- ii) Enhancement planting with different variety of plants.
- iii) Interpretation and labels of significant plants.

#### • Years 4–6: actions proposed [as above]

#### a) Inventory, analyzing and de-accession of collection

- i) Update inventory.
- ii) Analyse collection over time.
- iii) De-accession if necessary.
- iv) Addition of relevant new plant taxa for collection.

#### b) Interpretation

- i) Review for additional and improvement of interpretation.
- c) Conservation of Heritage Collection Gene Pool
  - i) Review the present collection and botanical value.

## d) Nomination of Heritage Trees

i) Work closely with plant records and arboriculture team to propose or nominate the possibility of potential Heritage Trees.

## e) Turf Management Programme

- To improve and monitor the condition of planted groundcover planted at steep slopes and effectiveness to reduce dangerous turf management activities.
- ii) Improve turf condition by proposed remedial actions such as hollow tinning and proper treatments.
- iii) Back filling and top-dressing for uneven ground especially near the edge of foot paths which has subsided over time due to soil erosion, compaction and movement.

## f) Tree Management Programme

- i) Apply leaf litter regularly under the tree canopy at least to the drip line in order to minimise mechanical damage to tree roots, soil compaction and keep soil moisture.
- ii) Employ proper tree management program for Heritage and potential Heritage Trees.
- iii) Regular scheduled tree inspection and maintenance.
- iv) Follow-up treatment for trees and palms that deteriorating in health and hazards such as termite infections and limited of growing space.

## g) Pest, Disease and Fertilising Programme

- i) Recommend environmental friendly treatment or method such as biological control method in pests and disease management.
- ii) Monitoring of chemical usage to prevent over usage of chemical in the Garden.
- iii) Documentation of data collections such as trial control measures on pest and disease of plants.
- iv) Understand the different requirement of nutrients for different plant taxa and apply fertilizers accordingly.

#### h) Sunken Garden

- i) Lawn analysis and update of inventory.
- ii) Review the sustainability of plantings.
- iii) Additional of new introduced plant species.
- iv) Improvement and additional of relevant interpretation.

## i) Cycad Collection

- i) Lawn analysis and update of inventory.
- ii) Review the sustainability of cycads collection.
- iii) Additional of new collection.
- iv) Improvement and addition of relevant interpretation.
- j) Dipterocarpaceae and Barringtonia Collection of Lawn XA
  - i) Lawn analysis and update of inventory.

- ii) Review the sustainability of collection.
- iii) Additional of new collection.
- iv) Improvement and additional of relevant interpretation.

## k) Myristicaceae Collection of Lawn XH

- i) Lawn analysis and update of inventory.
- ii) Review the sustainability of collection.
- iii) Additional of new collection.
- iv) Improvement and addition of relevant interpretation.

## I) Aquatic Plant Collection of Nassim Water Feature

- i) Lawn analysis and update of inventory.
- ii) Review the sustainability of collection and biological value.
- iii) Additional of new collection.
- iv) Improvement and addition of relevant interpretation.

## m) Enhancement planting of Nassim Gate and Rain Tree Drive

- i) Lawn analysis and update of inventory.
- ii) Review the sustainability of planting.
- iii) Improvement and addition of relevant interpretation.

## Years 7–10: actions proposed [as above]

## a) Inventory, analyzing and de-accession of collection

- i) Update inventory.
- ii) Analyse collection over time.
- iii) De-accession if necessary.
- iv) Addition of relevant new plant taxa for collection.
- b) Interpretation
  - i) Review for additional and improvement of interpretation.

## c) Conservation of Heritage Collection Gene Pool

i) Review the present collection and botanical value.

#### d) Nomination of Heritage Trees

i) Work closely with plant records and arboriculture team to propose or nominate the possibility of potential Heritage Trees.

## e) Turf Management Programme

- i) To improve and monitor the condition of planted groundcover at steep slopes and effectiveness to reduce dangerous turf management activities.
- ii) Improve turf condition by proposed remedial actions such as hollow tinning and proper treatments.
- iii) Back filling and top-dressing for uneven ground especially near the edge of foot paths which has subsided over time due to soil erosion, compaction and movement.

## f) Tree Management Programme

- i) Apply leaf litter regularly under the tree canopies at least to the drip line in order to minimise mechanical damage to tree roots, soil compaction and keep soil moisture.
- ii) Employ proper tree management program for Heritage and potential Heritage Trees.

- iii) Regular scheduled tree inspection and maintenance.
- iv) Follow-up treatment for trees and palms that deteriorating in health and hazards such as termite infections and limited of growing space.

## g) Pest, Disease and Fertilising Programme

- i) Recommend environmental friendly treatment or method such as biological control method in pests and disease management.
- ii) Monitoring of chemical usage to prevent over use of chemical in the garden.
- iii) Documentation of data collections such as trial control measures on pest and disease of plants.
- iv) Understand the different requirement of nutrients for different plant taxa and apply fertilizers accordingly.

## h) Sunken Garden

- i) Lawn analysis and update of inventory.
- ii) Review the sustainability of plantings.
- iii) Additional of new introduced plant species.
- iv) Improvement and addition of relevant interpretation.

## i) Cycad Collection

- i) Lawn analysis and update of inventory.
- ii) Review the sustainability of *Cycads* collection.
- iii) Additional of new collection.
- iv) Improvement and addition of relevant interpretation.

## j) Dipterocarpaceae and *Barringtinia* Collection of Lawn XA

- i) Lawn analysis and update of inventory.
- ii) Review the sustainability of collection.
- iii) Additional of new collection.
- iv) Improvement and addition of relevant interpretation.

## k) Myristicaceae Collection of Lawn XH

- i) Lawn analysis and update of inventory.
- ii) Review the sustainability of collection.
- iii) Additional of new collection.
- iv) Improvement and addition of relevant interpretation.

## I) Aquatic Plant Collection of Nassim Water Feature

- i) Lawn analysis and update of inventory.
- ii) Review the sustainability of collection and biological value.
- iii) Additional of new collection.
- iv) Improvement and addition of relevant interpretation.

## m) Enhancement planting of Nassim Gate and Rain Tree Drive

- i) Lawn analysis and update of inventory.
- ii) Review the sustainability of planting.
- iii) Improvement and addition of relevant interpretation.

# **10 Year Living Collection Management Plan**

Lawns EG1 – 4 (Trellis Garden/Circle Line), EG 5 – 13, XJ & XK (Garage & Eco Garden) and EG14 & FL 1 – 4 (Foliage Garden)

Date: August 2013

Manager: Lai Simin

Section Head: Dr. Wilson Wong

<u>Trellis Garden and Circle Line (Lawns EG 1, 2, 3 &4)</u> [Bukit Timah Core: between Botanic Gardens station and Eco Garden, and along Bukit Timah Road boundary]

#### Landscape Content

The Trellis Garden was opened in October 2011 with the new Botanic Gardens station of the Circle Line MRT network. It serves as the Bukit Timah entrance of the Botanic Gardens. Exiting the train station and along the Bukit Timah Road boundary, the iconic rubber tree (*Hevea brasiliensis*) and gutta-percha (*Palaquium* sp.), surrounded by lemon grass (*Cymbopogon citratus*) reflect the Economic theme of Bukit Timah Core. Tall metal trellises flank both sides of the entrance plaza and arch over the winding footpaths that border small hills. Area is stark and few mature transplanted specimens of *Clitoria fairchildiana* are about the only shade providers in this young garden. On the hills, a variety of native trees/saplings are planted. Several are rainforest species such as *Quercus, Intsia* and *Dipterocarpus*. A single specimen of *Hopea ferrea* stands at the roundabout between EG2 and EG4. There is potential to develop this roundabout into an educational feature. One of the lawns, EG2, borders the new Downtown Line extension that is currently under construction.

#### **Present Condition**

The climber collection has established well and provides lovely shade to visitors. Many of the rainforest saplings will take some time to establish as they are slow-growing species.

#### Constraints

The undulating hills have an underlying waterlogged condition, which could limit species selection for planting. Species planted on hills dry out quickly while those on the ground suffer from waterlogging.

#### Strengths

Location, which is at the Bukit Timah Core entrance and close proximity with Kheam Hock Road. Species are planted close together, which would form a dense canopy in future years, supporting an uninterrupted biodiversity corridor from Kheam Hock Road.

#### Weaknesses

Interpretative labels are installed for some of the climbers but none for the trees. General lack of plant labels. Site is sunny and hot due to absence of shade from mature trees. Direct sunlight and heat is unsuitable for several rainforest species to establish and thrive. This is however, temporary.

#### **Potential for Improvement**

Landscape plans are currently drafted for the Downtown Line extension. It is important that species selected compliment the current planting plan at the Circle Line to reflect the economic and ecological theme of the Garden.

#### 10-year plan

• Years 1 – 3: actions proposed a) Inventory

- i) Update of inventory to include all new plantings
- ii) Addition of relevant plant taxa to collection
- b) Interpretation

i) Labelling of climber collection and new plantings of interest and installation of general plant labels for existing plantings.

c) Tree Management Programme

i) Formative and structural pruning of young trees and saplings

ii) Regular tree inspection and maintenance of transplanted trees along EG2 and 3

- iii) Follow up treatment for declining specimens
- d) Fertilising, pest and disease control

i) Climbers and trees to continue prescribed regime of regular fertilizing and leaf littering

ii) Appropriate organic pest and disease control methods to be applied when necessary

## Years 4 – 6: actions proposed [as above]

- a) Inventory, analysing and de-accession of collection
  - i) Revisit and update inventory
  - ii) Review of collection
  - iii) De-accessioning of screening plants for Downtown Line extension
  - iv) Addition of relevant new plant taxa to collection
- b) Interpretation
  - i) Labelling and interpretative signage for new plantings of interest
- c) Introduction of new species to the Trellis Garden
  - i) Successive planting of shrubs, epiphytes and groundcover species

ii) Update and/or expansion of climber collection to include native fauna-attracting species

- d) Tree management programme
  - i) Formative and structural pruning of young trees and saplings

ii) Regular tree inspection and maintenance, and follow up treatment for declining specimens

e) Fertilising, pest and disease control

i) Prescribed regime of regular fertilizing and leaf littering as required

ii) Appropriate organic pest and disease control methods to be applied when necessary

## • Years 7 – 10: actions proposed [as above]

- a) Inventory, analysing and de-accession of collection
  - i) Revisit and update inventory
  - ii) Review of collection
  - iii) De-accessioning of plants if necessary
  - iv) Addition of relevant new plant taxa to collection
- b) Interpretation
  - i) Labelling and interpretative signage for new plantings of interest
- c) Introduction of new species to the Trellis Garden
  - i) Successive planting of shrubs, epiphytes and groundcover species

ii) Update and/or expansion of climber collection to include native fauna-attracting species

d) Tree management programme

i) Formative and structural pruning of young trees and saplings

ii) Regular tree inspection and maintenance, and follow up treatment for declining specimens

e) Fertilising, pest and disease control

i) Prescribed regime of regular fertilizing and leaf littering as required

ii) Appropriate organic pest and disease control methods to be applied when necessary

<u>The Garage and Economic Garden (Lawns XJ & XK, EG 5, 6, 7, 8, 9, 10, 11, 12 & 13)</u> [between Evolution Garden and proposed northern boundary of Buffer Zone, and across towards Kheam Hock Road]

#### Landscape Content

This irregularly shaped parcel of land is the last portion of the former Economic Gardens in which the plantings survived its annexation as Raffles Memorial College (the remainder to the north, from Cluny Park Road to Evans Road, was apparently clear felled). The Garage is the only original College building fully inside the public area of SBG and occupies the lowest area of this parcel of land. The other former College housing and the current NUS Law Faculty property are upon the flat ground on the hill top and describe an arc. Between these two is a steep slope facing west and north. On the steeper west slope are 3 very tall oil palms from c. 1920, which accompany durian, cacao, cloves and nutmegs of likely similar age.

Continuing from Garage on Lawn XK is the new Economic Garden, reclaimed from a swampy piece of land in the 1980s. It is connected to the former Economic Garden via the Red Brick Path and Cluny Park Road. A new development in 2011, the Linear Car Park runs parallel to Cluny Park Road, from the Garage building along EG13 to Melati Gate, where it borders the Trellis Garden. West of The Garage are some large angsana trees (*Pterocarpus indicus*), possibly contemporary with the foregoing. At a distance to the east, below the north-facing slope (opposite the Jacob Ballas Children's Garden), is an old and possibly original rain tree (Samanea saman) bearing a superb epiphytic specimen of the native fern, Nephrolepis acutifolia, with fronds hanging down for metres. To the west of this tree is a small but important burial site, including graves dating from 1842 and 1881, the first believed to be the earliest in situ example in Singapore. The burial site is part of an area earmarked for the future expansion of the Children's Garden. Moving from the burial site across the plaza to the Bamboo holding area is the less-visited part of EG8. This area is gazetted for development of the Ethnobotany Garden to showcase culturally important economic plants. The bamboos here are slated to be transplanted to the Tyersall Learning Forest. Central water body in the Garden is the Eco Lake, where the black swans and Lesser Whistling ducks reside. Eco Lake was excavated and serves as a basin for water runoff from surrounding lawns (EG5, 7, 8, 9, 10, 11) where excess water is drained into Rochor Canal. Areas near the lake (EG5, 9, 10 & 11) are open lawns; wooden gazebos are erected on slightly elevated grounds around the Eco Lake for unobstructed views of the surroundings. There is an island (EG6) close to the Coconut plot in the Eco Lake. Plants have been left to grow wild on this island and maintenance is minimal. The collections in this area form part of relatively recent plantings following the addition of the land by SBG between 1983 and 2003, reflecting the economic theme of the former Economic Gardens that occupied the site from 1879 – 1919. Most of these plantings are within the area of the proposed World Heritage Site Buffer Zone.

#### **Present condition**

Mostly good. Majority of the plantings are relatively new and establishing. A few of the ageing specimens in the Fruit Tree collection in Lawn XJ and EG8 are leaning and require replacement. The beverage collection at EG7 and dye collection at EG12 require updating.

Transplanted trees around EG5 and 8 appear to have established and proper arboriculture assessments are required to review their stability.

## Constraints

The steeply sloping area to the south of the Garage is very narrow and served by only two, frequently congested paths. Eco Garden is also served by poor drainage systems and resulting water-logging due to the swampy nature of the ground. Waterlogged lawns limit species selection and inundated footpaths and lawns also cause great inconvenience to visitors during the monsoon season. There is underground soil movement as the earth is still settling, causing lawns and footpaths to sink. Water points are few and far between in Eco Garden. To reduce reliance on water tankers and manual watering during the dry season, a comprehensive irrigation system is required.

## Strengths

Open lawns which are potential planting space for expansion of plant collections. The Eco Lake is also host and breeding ground to native and migratory birds such as the whitebreasted waterhen, watercock, kingfisher species and the popular resident black swans.

## Weaknesses

Lack of interpretation for several collections. Some of the plant names have changed and their labels require updating.

## Potential for improvement

Current collections can be expanded to include terrestrial and aquatic crop plants. Workshops to illustrate traditional culinary uses of the economic plants can be conducted as part of an educational feature. Apart from the economic theme, the new Eco Garden also encompasses the ecological theme. Ecologically-important plants such as wild relatives of commercial cultivars can be introduced to enhance biodiversity and promote *ex situ* conservation. They shall serve as excellent educational material to illustrate the relationship between commercial varieties and the wild species and should be interpreted.

## 10-year plan

## • Years 1 – 3: actions proposed

- a) Inventory, analysing and de-accession of collection
  - i) Revisit and update inventory
  - ii) Review of collections
  - iii) De-accessioning and relocation of plants for re-development work (JBCG extension and Ethnobotany Garden)
  - iv) Addition of relevant new plant taxa to collection
  - v) Addition of new collections to Eco Garden (eg., edible crop plants)
    - Ethnobotany Garden
    - Rubber collection with Michelin?
- b) Interpretation
  - i) Labelling of new plantings
  - ii) Interpretative signage for key species of interest
- c) Conservation of wild species with provenance

i) Seed collection and propagation of wild species as part of *ex situ* conservation efforts

- d) Tree management programme
  - i) Regular tree inspection and maintenance, and follow up treatment
  - ii) Review of transplanted trees and maintenance
  - iii) Formative and structural pruning of young trees and saplings
  - iv) Removal of declining specimens
- e) Fertilising, pest and disease control
  - i) Prescribed regime of regular fertilizing and leaf littering as required
  - ii) Appropriate organic pest and disease control methods to be applied when necessary
- f) Turf management programme
  - i) Regular top-dressing of uneven/waterlogged lawns
  - ii) Reduction of turf areas by increasing mulching zones and suitable groundcovers
- g) Evaluation of drainage and irrigation system
  - i) In-depth assessment of Garden hydrology
  - ii) Prescription of appropriate measures to alleviate flooding
  - iii) Appropriate modes of watering to be applied

## Years 4 – 6: actions proposed

- a) Inventory, analysing and de-accession of collection
  - i) Revisit and update inventory
  - ii) Review of collections
  - iii) De-accessioning of plants
  - iv) Addition of relevant new plant taxa to collection
  - v) Relocation of Fruit Tree collection from EG8 for JBCG extension
- b) Interpretation
  - i) Labelling of new plantings
  - ii) Interpretative signage for key species of interest
- c) Conservation of wild species with provenance
  - i) Seed collection and propagation of wild species as part of *ex situ* conservation efforts
- d) Tree management programme
  - i) Regular tree inspection and maintenance, and follow up treatment
  - ii) Review of transplanted trees and maintenance
  - iii) Formative and structural pruning of young trees and saplings
  - iv) Removal of declining specimens
- e) Fertilising, pest and disease control
  - i) Prescribed regime of regular fertilizing and leaf littering as required
  - ii) Appropriate organic pest and disease control methods to be applied when necessary
- f) Turf management programme
  - i) Regular top-dressing of uneven/waterlogged lawns
  - ii) Reduction of turf areas by increasing mulching zones and suitable groundcovers
- g) Evaluation of drainage and irrigation system
  - i) In-depth assessment of Garden hydrology

- ii) Prescription of appropriate measures to alleviate flooding
- iii) Appropriate modes of watering be applied/installation of more irrigation points

## • Years 7 – 10: actions proposed

- a) Inventory, analysing and de-accession of collection
  - i) Revisit and update inventory
  - ii) Review of collections
  - iii) De-accessioning of plants
  - iv) Addition of relevant new plant taxa to collection
- b) Interpretation
  - i) Labelling of new plantings
  - ii) Interpretative signage for key species of interest
- c) Conservation of wild species with provenance
  - i) Seed collection and propagation of wild species as part of *ex situ* conservation efforts
- d) Tree management programme
  - i) Regular tree inspection and maintenance, and follow up treatment
  - ii) Review of transplanted trees and maintenance
  - iii) Formative and structural pruning of young trees and saplings
  - iv) Removal of declining specimens
- e) Fertilising, pest and disease control
  - i) Prescribed regime of regular fertilizing and leaf littering as required
  - ii) Appropriate organic pest and disease control methods to be applied when necessary
- f) Turf management programme
  - i) Regular top-dressing of uneven/waterlogged lawns
  - ii) Reduction of turf areas by increasing mulching zones and suitable groundcovers

<u>Foliage Garden (Lawns FL1, 2, 3, 4 & EG14)</u> [Bukit Timah Core: between Garage and Eco Garden, bordering LXK, Linear Car Park, EG 8, 9 and 10]

#### Landscape Content

Redeveloped from EG14 in 2013, the 0.5ha Foliage Garden is the newest addition to the Botanic Gardens. The once former carpark area with a flat terrain was sculpted into a hilly landscape with meandering footpaths served by four entrances. Each hill highlights a different group of foliage plants, including *Dracaena, Cordyline, Begonia, Nepenthes, Araceae* and *Acanthaceae* cultivars. The central area remains flat and supports a variety of groundcovers and mosses. A shallow pond excavated from the waterlogged surroundings showcases *Victoria* 'Longwood Hybrid' among other aquatic flora. The shady site is flanked by some large angsana (*Pterocarpus indicus*) and raintrees (*Samanea saman*). They host the epiphytic *Dendrobium* and *Hoya* species. A viewing deck under a central raintree provides an elevated overview of the Foliage Garden and glimpses of the Garage. A large specimen of *Nauclea orientalis* offers excellent shade to a small *Ardisia* collection near the entrance opposite EG8. Next to *Nauclea orientalis* is an uncommon tree, *Teijsmanniodendron pteropodum*, with fragrant pink inflorescence and interesting winged petiole which deserves more feature.

#### **Present condition**

Good.

#### Constraints

Dense foliage and terrain render arboriculture and horticulture maintenance difficult. High water table and underlying clayey soil limit species selection.

#### Strengths

Unique collection of cultivars.

#### Weaknesses

Cultivars may change and do not stay true to form depending on environmental conditions, which are affected by the monsoon season and amount of filtered sunlight.

#### **Potential for improvement**

Apart from leaf variegation and pigmentation, collection of foliage plants with different textures and modifications can be improved. Some common mass-planted cultivars/species can be removed for native/wild species with attractive foliage. Slope behind the hill of *Asplenium nidus* can be utilised to feature *Bougainvillea* as foliage plants to connect with the existing *Bougainvillea* collection on EG10.

#### 10-year plan

#### Years 1 – 3: actions proposed

a) Inventory, analysing and de-accession of collection

- i) Revisit and update inventory
- ii) Review of collections
- iii) De-accessioning of some common mass-planted species
- iv) Addition of relevant new plant taxa to collection

- b) Interpretation
  - i) Labelling of new plantings
  - ii) Interpretative signage for key species of interest
- c) Conservation of cultivars and wild species with provenance
- i) Seed collection and propagation to maintain/increase gene pool and stock
- d) Tree management programme
  - i) Regular tree inspection and maintenance
  - ii) Review and propose suitable arboriculture management methods
- e) Fertilising, pest and disease control
  - i) Prescribed regime of regular fertilizing and leaf littering as required
  - ii) Appropriate organic pest and disease control methods to be applied when necessary
- f) Monitoring of drainage system
  - i) Assessment of Garden hydrology
  - ii) Prescription of appropriate measures to alleviate flooding

## • Years 4 – 6: actions proposed

- a) Inventory, analysing and de-accession of collection
  - i) Revisit and update inventory
  - ii) Review of collections
  - iii) De-accessioning if necessary
  - iv) Addition of relevant new plant taxa to collection
- b) Interpretation
  - i) Labelling of new plantings
  - ii) Interpretative signage for key species of interest
- c) Conservation of cultivars and wild species with provenance

i) Seed collection and propagation to maintain/increase gene pool and stock

- d) Tree management programme
  - i) Regular tree inspection and maintenance
  - ii) Application of suitable arboriculture management methods
- e) Fertilising, pest and disease control
  - i) Prescribed regime of regular fertilizing and leaf littering as required
  - ii) Appropriate organic pest and disease control methods to be applied when necessary
- f) Review of drainage system
  - i) Assessment of Garden hydrology
  - ii) Application of appropriate measures to alleviate flooding

## Years 7 – 10: actions proposed

- a) Inventory, analysing and de-accession of collection
  - i) Revisit and update inventory
  - ii) Review of collections
  - iii) De-accessioning if necessary
  - iv) Addition of relevant new plant taxa to collection
- b) Interpretation
  - i) Labelling of new plantings
  - ii) Interpretative signage for key species of interest

- c) Conservation of cultivars and wild species with provenance
  - i) Seed collection and propagation to maintain/increase gene pool and stock
- d) Tree management programme
  - i) Regular tree inspection and maintenance
  - ii) Application of suitable arboriculture management methods
- e) Fertilising, pest and disease control
  - i) Prescribed regime of regular fertilizing and leaf littering as required
  - ii) Appropriate organic pest and disease control methods to be applied when necessary

# 10 Year Living Collection Management Plan

National Orchid Garden

Date: Aug 2013

Managers: Mark Choo David Lim

Section Head: Simon Tan (Covering till Nov. 2013) Elango Velautham
# National Orchid Garden Display and Lawn T

#### Landscape Content and Heritage Value

Interest in orchids first stemmed from former director Henry Ridley who started an orchid collection programme in 1888. It was later expanded by subsequent directors, I.H. Burkill and R. E Holttum. Since then, orchids have been synonymous with the Singapore Botanic Gardens (SBG). The National Orchid garden (NOG) was opened in 1995 by then Senior Minister Lee Kuan Yew after three years of construction. It consists of 2 hectares of display area and 1 hectare of nursery. NOG boasts an array of more than 600 orchid species and 2000 hybrids. It is situated on a hill with the westernmost limit being the highest and is tiered downwards to accommodate the orchid collections. Visitors to NOG are welcomed into NOG at the Orchid Plaza. Four Chrysophyllum cainito (Star Apple) surround a water feature covered in lithophytic aroids and begonias with a large Grammatophyllum speciosum (Tiger orchid) sitting on top. Inside NOG, the orchids and complementing foliage have been clustered into colour zones representing the four seasons. The seasons progress in a northwards direction with winter being the northernmost limit of NOG. Of heritage significance is Burkill Hall, strategically situated at the westernmost tip of NOG serving as a vantage point over the Gardens. Burkill Hall was constructed between 1867 and 1868 and was formerly the Gardens' Director's house up till 1969. It is named in honour of the only father-and- son pair to hold the post of Director of Singapore Botanic Gardens: Isaac Henry Burkill (1912-1925) and Humphrey Morrison Burkill (1957-1969). Along Burkill Gate Road leading up to the service entrance of NOG (Lawn T) are two heritage trees, both of which are Sindora wallichii. Opposite the two Sindora, is another heritage tree Parkia speciosa. It has large buttress roots and estimated to be 30 metres in height. In between the two Sindora is a magnificent Johannesteijsmannia perakensis, the only member of it genus to form a clear stem. It is complimented by other species of Johannesteijsmannia and Licuala cordata, a very unusual slow growing fan palm with almost perfect circular fronds. Sandwiched between VIP Orchid Garden and the Orchidarium is a prominent drooping Leptospermum brachyandrum. It's soft bark is subject to frequent vandalism. Although not condoned, the etchings on the bark have given the tree its uniqueness. The palm Hyphaene dichotoma is unique due to its unusual branching habit that is not often seen in the palm family. It is important as the only two plants of this species in the Gardens, are both found in NOG.

There are future plans for the next 2-3 years of expanding the NOG nursery to the adjacent allotted (c. 2010) Tyersall land.

#### **Other Significant Structures**

The two cranes standing atop a cascading waterfall at Crane Fountain symbolize peace and prosperity as they greet visitors entering NOG and the sound of running water also giving visitors a sense of peace and tranquillity. Adjacent to the birdcage is the Tiger Fountain, which rightfully has a *Grammatophyllum speciosum* nestled on

top. There are two fountains in the Bromeliad House, the Fan Palm Fountain and Farfugium Fountain as well as two sculptures, the Little Girl with Shell and the Elephant. All of which were donated by Lady Yuen-Peng McNeice. The birdcage was formerly used in Singapore Garden Festival (SGF). Following the SGF event, it was installed in 2008 and serves as a focal point and a pleasant photogenic spot in the summer zone. Walking northwards from the Crane Fountain is the Golden Arch. There are four overhanging arches which are mounted with *Oncidium* 'Golden Shower'. This area has now become a classic photo spot for tourists whom marvel at the bright yellow *Oncidium* sprays. There are two sun dials in NOG. One is located in the VIP Orchid Garden and the other is located adjacent to the Mirror Trellis.

#### **Collections:**

NOG consists of the following major collections:

#### I. Orchidarium

The Orchidarium is NOG's collection of species orchids. It is 0.3 hectare in size. There are approximately 600 orchids belonging to 97 genera. The Orchidarium is designed to mimic the natural habitat of orchids in the wild. Besides species orchids, there are also other unique botanical curiosities such as *Trevisia palmata, Tacca leontopetaloides* and *Philodendron goeldii*. The Orchidarium is split into four sectors representing Asia, South America, Africa and Singapore with each sector accommodating orchids from the respective continents.

#### **Present Condition**

All of the orchids in the Orchidarium are epiphytic. Planting is dense with an emphasis on different forms of foliage. The Orchidarium is heavily shaded. However it is ideal for growing *Begonia* species which are grown on the opposite side of the waterfall. Tree ferns have been planted on either side of the walkway to add height and accentuate the rainforest look. Collection lacks labels and interpretation.

#### Strengths

- Unique plants that are unlikely to be seen in any other garden in Singapore
- Wooden structures can be used for mounting of additional orchids.
- Species orchids that hail from as far away as Africa and South America.
  - Appeals to tourists and locals

## Constraints

There is a lack of space and the four sectors are under-represented. There aren't as many flowering orchids in the Orchidarium as species orchids do not flower as readily.

## Weaknesses and Potential Improvements

- Lack of interpretative signage and plant labels in general
  - Write up about orchids from Africa, South America, Asia and also about native orchids to Singapore.
- Over-shading from trees
  - o More light through the canopy will induce flowering

- Enhancement of species collection
  - $\circ$  Addition of species orchids

## II. VIP Orchid Garden

NOG regularly plays host to top-ranking officials and celebrities of different countries. An orchid hybrid would be named after them to commemorate their visit to the Gardens. The first VIP orchid is *Aranthera* Anne Black, named in 1956 after Baroness Anne Black, wife of the former Governor of Singapore. These VIP orchids are displayed in the VIP Orchid Garden beside Burkill Hall. The VIP Orchid display is changeable to showcase a selection of flowering VIP hybrids. The VIP Orchid Garden is designed like an English garden to complement Burkill Hall with the lion statues at the entrance and exit of the garden accentuating the English feel.

#### **Present Condition**

The VIP orchid collection consists of 16 temporary displays and 13 permanent displays. The temporary displays in ceramic pots are renewed whenever the flowers fade, except for those in permanent beds. Some of the plant labels have faded off and will be replaced by the end of 2013. Of concern is for *Paravanda* Nelson Mandela. This orchid takes a long time to establish and failure to establish results in a gradual loss of vigour. The filler plants are well-maintained and manicured to suit the intended look.

#### Constraints

The biggest constraint is the availability of VIP orchids in bloom for display during low flowering months.

#### Strengths

The VIP Orchid Garden is one of the feature attractions of NOG. It is the only English themed garden in NOG, hence complementing the former colonial house, Burkill Hall. It is also the showcase of a successful orchid breeding program.

#### Weaknesses and Potential Improvement

The showcase of VIP orchid collection is dependent on orchids that are currently flowering. If the particular VIP orchid is not flowering, it will not be displayed. Increasing numbers of stock plants regularly in PPN and PRD ensures flowering continuity of VIP orchids. Better interpretations through descriptions and tributes to significant VIP orchids such as *Paravanda* Nelson Mandela can be put in place. The location currently is not the best as it no longer along the tour route of VIP visits. It is proposed to be relocated during the redevelopment of NOG.

## III. Celebrity Orchid Garden

Like the VIP Orchid Garden, the Celebrity Orchid Garden is a collection of orchids named after personalities with significant contributions in their respective field of works. The Celebrity Orchid Garden is semi-circular in shape with five basins for display of orchids, 2 wooden structures and a further three beds on the opposite side of the footpath. Some famous celebrity orchids include *Dendrobium* Bindi Irwin, and *Ascocenda* Shah Rukh Khan and *Vanda* Andrea Bocelli.

#### **Present condition**

The Celebrity Orchid Garden consists of 12 celebrity orchids, of which 4 beds are replaced when the sprays of orchid flowers are spent. All celebrity orchids have updated labels. The filler plants have been well maintained. As orchids in the permanent beds are not always in flower, the Celebrity Orchid Garden may look devoid of flowers at times.

## Constraints

Accessing the basins whilst changing of orchids can be tedious as the basins are elevated above body level. Only when new celebrity visitors visit the Gardens can new celebrity orchids be named. Orchid naming after celebrities does not occur as often as the VIP orchid naming.

#### Strength

- There are always available plants for replacement whenever the flowers are spent. This ensures that there will always be orchid flowers for visitors to admire.
- The wide path at Celebrity Orchid Garden is able to accommodate a larger number of people at any one time as compared to VIP orchid garden.

#### Weakness and Potential Improvements

- Lack of additional space for more celebrity orchid beds.
  - There are plans to relocate Celebrity Orchid Garden in the near future.
- There is a need to develop more stock plants asexually or through micropropagation to bulk up displays .
- Plant labels do not give sufficient background about the celebrity and his/her orchid.
  - Intepretative signs can include a photo of the celebrity and a write-up on why the orchid was chosen.

## **IV. Cool House**

The Cool House rightfully belongs in the winter zone of NOG. Its purpose is to simulate a tropical montane forest. The collection is divided into orchids originating from the old world on the right-hand side of the board walk and those from the new world on the left-hand side. Almost all of the orchids in the Cool House are either epiphytic or lithophytic. The temperature in Cool House averages between 19° to 22° C. Mist is sprayed at half-hour intervals. Besides orchids, another focal point is the carnivorous plant collection located towards the exit.

#### **Present Condition**

When the misters come on, together with the sound of gushing water, visitors get a feel of what it is like in a montane forest. However, there is a need to update the

interpretation in the Cool House and labelling of the orchids and other miscellaneous plants. There has also been dieback of mosses, resulting in metal-netting and concrete walls being exposed. There have not been many new additions of orchids to the Cool House since Singapore Garden Festival.

#### Constraints

There is insufficient storage area for highland orchid stock plants as there is no available nursery cool houses to stock and maintain the cool climate species needed for replenishment for aged or unhealthy plants as the two air-conditioned glasshouses in Potting Yard are filled with miscellaneous research collection of herbarium taxonomists. Currently, existing stock is maintained on the ground floor of the Cool House, where light levels and air flow are inadequate. There are also access problems when maintaining orchids mounted to the rock structures as the area to work around is very small due to the varied size of surrounding rock structures and poor maintenance accessibility. It is also difficult to mount orchids onto rock structures as concrete nails are required. Due to the high humidity, orchid leaves need to be frequently wiped of algae.

#### Strengths

- Unique species that require a lower temperature to flower can be displayed
  - Examples are *Bulbophyllum echinolabium,* the *Bulbophyllum* with the largest flowers in the genus and *Maxillaria* species
- Classic botanical curiosities in the form of carnivorous plants such as *Nepenthes* are displayed.
- The Cool House is the earliest air-conditioned conservatory opened to the public in 2004 prior to the Gardens by the Bay conservatories that started in June 2012.
  - Besides viewing the botanically interesting plants, visitors also enjoy cooling off in the Cool House.

## Weaknesses and Potential Improvements

- Orchids close to the boardwalk are subject to theft and vandalism
  - o Installation of live security cameras
- Flowers close by the vertical glass panels face outwards as they orientate themselves to where the sunlight is shining from.
  - Inclusion of growth lights to allow flowers re-orientate themselves to face the boardwalk.
- Lack of interpretative signs and labels about montane forests and their type of plants
  - Signs can be attached to rock structures and not just on the boardwalk
- Not many local nurseries supply highland orchids. The best opportunity to purchase them is during Singapore Garden Festivals when there are overseas orchid nurseries selling at the shops. Other possibility is to work with overseas botanical institutions to start plant exchanges or purchase online.

- The Cool House has the potential to be enlarged to accommodate a larger variety of highland plants including *Azalea* and *Rhododendron* species
- There is no monitoring device of temperature. There is potential to develop a monitoring device that also allows staff to control temperature. When temperature is lowered at night, it can be used as a trigger for flower initiation.
- There is plan to overhaul the cooling system to one that is more energy efficient and take up lesser floor space.
- It is proposed to redesign the cool house to allow visitors to walk the lower level of cool house to enjoy the plants planted below. There is plan to expand the cool house to allow us to showcase more of the highland plants in our collections.
- It is also proposed to build a cool growing house in NOG nursery during the redevelopment to house our cool growing orchids as well as initiating flowering of our orchid hybrids.

## V. Tan Hoon Siang Mist House

The Tan Hoon Siang Mist House was named in honour of Tan Hoon Siang, a descendant of successful philanthropist Tan Tock Seng. It is named the Mist House because when the misters come on every half an hour, the entire house is shrouded in a fine mist. The Mist House showcases unusual orchid hybrids from around the world, often with vibrant colours and odd shapes. The collection is arranged based on different orchid alliances. Popular with visitors is the collection of fragrant orchids, with *Rhyncovanda colmarie* and *Vanda* Mimi Palmer providing a spicy and chocolate-like sweetness respectively.

#### **Present Condition**

The displays in the Mist House consist of unique and brightly coloured orchids. The orchids are grouped broadly based on their botanical alliances. The pathway meanders past pots with monopodial orchids and wooden structures mounted with epiphytic orchids. The orchid flowers appear to visitors to always be in bloom as they are renewed on a weekly basis. The arrangements of orchids provide visitors with many photo opportunities.

#### Constraints

The roof of the Mist House is not completely sheltered from rain. Hence, after successive periods of rainfall the orchid blooms do not last as long. The low height of the Mist House roof reduces air flow and results in uneven light penetration.

#### Strengths

- Misting effects adds an element of the unexpected for visitors.
- High density of contrasting orchid blooms nestled in rainforest foliage.
- The fragrant orchid section provides interaction for visitors.

#### Weaknesses and Potential Improvements

- Lack of any form of interpretation
  - Signage depicting background information on *Phalaenopsis*, *Oncidiums* and *Dendrobiums*, as these genera are regularly featured in the Mist House. Instead of interpretative signage, flat screen televisions can also be used to play educational videos but have to take into account of the misting affecting circuitry.
- Raising of roof to allow better air movement through the Mist House
  - Additional use of *Huperzia* spp., and the like, can be hung from the raised roof without obstructing visitors' path and views.
  - Trees in Mist House are also able to grow to a larger height and have better form.
- The Mist House structure has not changed since its construction in 1994. There is potential to expand the Mist House through NOG 13 and also create a shelter that connects Mist House with Bromeliad House.
- Plastic shelter to be placed over Mist House to prevent excess rain water from damaging flowers during rainy seasons.

#### VI. Lady Yuen-Peng McNeice Bromeliad House

The Lady Yueng-Peng McNeice Bromeliad House was named after its sponsor, Lady Yuen-Peng McNeice, who generously donated a large collection of bromeliads acquired from Shelldance nursery, Florida in 1994. Among the the bromeliads, there are *Tillandsia* species seen mounted on wooden structures together with *Ananas* species that represent the pineapples in the Bromeliad House.

#### **Present Condition**

The entire collection has been replanted, with old growth removed. The bromeliads have been re-clustered with members of the same species. The plant labels need to be updated and the collection re-inventorised.

#### Constraints

The architectural forms of the bromeliads are often overshadowed by the brilliance of the orchids in the Mist House. Often visitors bypass the Bromeliad House and proceed straight to the Cool House.

(The small space and the similar growing condition is a big cause of all our bromeliad looking the same)

## Strengths

-'Elephant' and 'Little Girl with Shell' sculptures provide a light-hearted feel to the Bromeliad House

-Colourful bromeliad leaves found throughout Bromeliad House creates a visual break from the diverse collection of orchid flowers.

## Weaknesses and Potential for Improvement

-*Tillandsia* collection can be improved. Showcase of even more *Tillandsia* species with different forms

-Need for more interactive interpretations, linking bromeliads to their growth in the wild.

-Lack of large specimens of bromeliads. Possible exchange with Gardens by the Bay. -The crown of most bromeliads stores rain water, despite application of BTI, it remains a potential source of mosquito breeding.

# 10 year plan of NOG Display and Lawn T

- <u>Years 1–3: actions proposed [to include de-accessioning, acquisitions,</u> <u>interpretation]</u>
- a) Inventory check, analyzing and de-accession of collection where necessary
  - i) Update inventory.
  - ii) Analyse collections over time.
  - iii) De-accession if necessary.
  - iv) Addition of new orchid species relevant to Orchidarium and Cool House

# b) Interpretations

- i) Labels where required for general collection.
- ii) Fabrication of new interpretative signage for Celebrity Orchid Garden with write-up and picture of celebrity.
- iii) Interpretation signage for Orchidarium describing orchids from the four sectors.
- iv) To provide interpretation signage for Cool House describing characteristics of montane habitat. Signage not limited to boardwalk, may be attached to rock structures.
- v) Educational signage to be placed within Mist House.

# c) Conservation of Heritage Collection Lineage

- Review the present collection strength in terms of conservation and botanical values in 2<sup>nd</sup> year and subsequent years.
- ii) Formulate and implement a conservation strategy such as propagation and seed collection of valuable old and rare plants of known provenance to maintain the lineage.

# d) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health

# e) Pest, Disease and Fertilising Programme

- i) Collect data on successful fertilizer programme that are in use in other orchid nurseries.
- ii) Maintain pesticide spraying regime of orchids.
- iii) To study the need of fertilizers for orchids and foliage plants and application of appropriate fertilizers.

iv) Environmental friendly pesticides/fertilizer trials and subsequent incorporation into management regime.

## f) Redevelopment of National Orchid Orchid

- i) Replacement of the Entrance Plaza
- ii) Relocation of VIP orchid garden and Celebrity orchid garden
- iii) Improvement and expansion of Cool House
- iv) Replacement of Mist House & Bromeliad House
- v) Replace with energy efficient air-conditioning in Cool House
- vi) To air-conditioned 3 shelters and add in interpretation
- vii) Revamp the Heritage Orchid Display
- viii)Addition of new attraction: Orchid Safari
- ix) Revamp Orchidarium
- x) Improvement of Interpretation
- xi) Erection of more plant trellis to create more shade for visitors
- xii) Replacement of existing trellis
- xiii) Replacement of water fountains
- xiv)Installation of misting to cool ambient temperature for visitor's comfort
- xv) Replacement of irrigation system

#### g) Lawn T

- i) Removal of self-sown Oil Palm.
- ii) Install heritage signage for *Parkia speciosa*.
- iii) Periodic removal of *Dioscorea sansibarensis*.
- iv) Potential area to introduce suitable regional tropical rainforest saplings

## • Years 4–6: actions proposed [as above]

## a) Inventory, analyzing and de-accession of collection

- i) Revisit and update inventory
- ii) Review of collection.
- iii) De-accession if necessary.
- iv) Addition of relevant new plant taxa to collection

#### b) Interpretation

Labels and interpretation where required for general collection.

## c) Conservation of Heritage Collection Lineage

i) Review the present collection strength and the collection preservation needs for the period.

#### d) Nomination of Heritage trees

i)

i) To work with Plant Records and Arboriculture to decide the possibility of naming the first heritage tree in NOG display

area. One potential tree may be *Leptospermum brachyandrum* at the exit of VIP orchid garden.

# e) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

## f) Pest, Disease and Fertilising Programme

- i) Addition of another spraying dumper to hasten the time taken to spray orchids and foliages.
- ii) Propose and apply fertilising programme to meet the needs of the collection.
- iii) Environmental friendly pesticides and fertilizers to be incorporated more into existing regimes.

## g) Lawn T

- i) Removal of self-sown Oil Palm.
- ii) Periodic removal of *Dioscorea sansibarensis*.
- iii) Continue maintenance and monitoring of old trees

## • Years 7–10: actions proposed [as above]

## a) Inventory, analyzing and de-accession of collection

- i) Revisit and update of inventory
- ii) Review of collection
- iii) De-accession if necessary.
- iv) Addition of relevant new plant taxa to collection, if required

## b) Interpretation

i) Labels and interpretation where required for general collection.

## c) Conservation of Heritage Collection Lineage

i) Review the present collection strength and the collection preservation needs for the period.

## e) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

## f) Pest, Disease and Fertilising Programme

- i) Propose and apply fertilising programme to meet the needs of the collection.
- ii) Environmental friendly pesticides and fertilizers to be incorporated more into existing regimes.

## g) Lawn T

- i) Removal of self-sown Oil Palm.
- ii) Periodic removal of *Dioscorea sansibarensis*.
- iii) Continue maintenance and monitoring of old trees

# National Orchid Garden Nursery (Lawn Z)

#### Landscape Content and Heritage Value

The NOG Nursery was built in 1995 to supply orchids to NOG and is not accessible to public. It is one hectare in size. The nursery is built on a slope facing west and stands where the early Economic Garden trial area of SBG was situated. The orchids are grown on metal benches which can be covered in shade netting if needed. Of heritage importance is an Alstonia angustiloba located near the side entrance to Lower Palm Valley Road. It is the only heritage tree in NOG nursery. There are also several large trees in the nursery compound. These include three large Khaya grandiflora with impressive trunk sizes and heights of approximately 30m. These trees do not have any heritage status yet but can be nominated in the future if this plot is opened up for public access. There are also several rare Durio species such as the three very old Durio graveolens (Red Durian) which dates back to the time when this area was part of the Economic Garden and also Durio kinabaluensis that has frequently flowered but failed to fruit due to squirrel damage to flowers. Besides the many tall trees in NOG nursery, there are a pair of Duabanga grandiflora situated next to the Seedling Shade House worth noting. Their estimated height is approximately 20 metres with interesting short-lived flowers. On the northern side of the nursery is a large sprawling tree, Elateriospermum tapos .It's fallen leaves are used for leaf mulching.

#### **Other Significant Structures**

The main office block which houses the NOG Nursery office also houses the worker's rest area. There are also facilities for re-potting and maintenance of orchids. There are also three store rooms which house a variety of nursery supplies. Besides that, there is the Species Shade House and the Seedling Shade House. The Species Shade House stores orchids that belong in the Orchidarium and the Seedling Shade House is used as a growing-out area for seedlings that have been de-flasked.

#### **Present Condition**

The present condition is average and in need of upgrading. Some of the shade netting on the benches needs to be removed. As the topography of the nursery is steeply sloping and is not terraced, accessing some of the benches can be hazardous when wet and the protruding tree roots can be a trip hazard. The shade cast by the tall trees allows little light onto the orchids and thus orchids in affected areas flower irregularly. The large trees themselves are monitored regularly by the Arboriculture team and appear to be in good condition.

#### Constraints

There is a lack of shade houses, thus subjecting orchid flowers to damage by squirrels. As some of the benches are on slopes and the ground is not terraced, it makes accessing the area rather tedious and dangerous.

#### Weaknesses

As the nursery is on a slope, gradual erosion of soil may be detrimental for large trees. The potting area is exposed to wind and rain. Sand and other media is left in jumbo bags because the excess shower prevents staff from preparing soil mixes for planting in advance. Invasive tree roots have also grown into the tarmac, as a result, dumpers or trolleys go over the roots with bumps and shakes, causing the orchids to sway and potentially get damaged.

#### **Potential for Improvement**

When Tyersall extension is developed, the space can be utilized to grow more orchid species and hybrids. Orchids from NOG's satellite nurseries, i.e. Pasir Panjang Nursery and Peirce Road Depot, can be accommodated and consolidated here. The nursery area in this extension can also be opened up to the public to provide behind-the-scene aspects needed to support NOG display. This would provide an excellent opportunity to show the stages of work involved in putting an orchid on display.

#### **10 Year Plan of NOG Nursery**

# • <u>Years 1–3: actions proposed [to include de-accessioning, acquisitions, interpretation]</u>

#### a) Inventory, analyzing and de-accession of collection

- i) Update inventory
- ii) Analyse collection over time.
- iii) De-accession if necessary.
- iv) Addition of stud plants that can be used for orchid breeding.

#### b) Conservation of Heritage Collection Lineage

- i) Review the present collection strength in terms of heritage values in 2<sup>nd</sup> year and subsequent years.
- Formulate and implement a conservation strategy such as micro-propagation /seed collection of valuable old and rare orchids of known provenance to maintain the lineages.

#### c) Tree Management Programme

i)

- i) Regular tree inspection and maintenance.
- ii) Follow-up treatment for trees that are deteriorating in health.

#### d) Pest, Disease and Fertilising Programme

Continuous exploration into non-chemical treatment for controlling pests & diseases.

- ii) Propose and apply fertilising programme to meet the needs of the collection.
- iii) Environmental friendly pesticides and fertilizers to be incorporated more into existing regimes.

## e) Structures

- i) Implementation of irrigation system in the NOG Nursery
  To include automated water pumping mechanisms, treatment and storage facilities and sprinkler/mister outlets.
- ii) New benches, hanging racks and shade nettings.

# f) Terracing of slopes

- i) To increase growing area for orchids and allow more benches for expanding stock of orchids.
- ii) For areas that are obstructed by large tree roots, elevated platforms can be constructed.

## g) Improvements to Shade Houses

i) Upgrade structural and ventilation systems for the two shade houses.

## • Years 4–6: actions proposed [as above]

## a) Inventory, analyzing and de-accession of collection

- i) Update inventory
- ii) Analyse collection over time.
- iii) De-accession if necessary.
- iv) Addition of stud plants that can be used for orchid breeding.

## b) Conservation of Heritage Collection Lineage

- iii) Review the present collection strength in terms of heritage values in 2<sup>nd</sup> year and subsequent years.
- iv) Formulate and implement a conservation strategy such as micro-propagation and seed collection of valuable old and rare orchids of known provenance to maintain the lineages.

## c) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

## d) Pest, Disease and Fertilising Programme

- i) Recommend possible non-chemical treatment for controlling pests & diseases.
- ii) Propose and apply fertilising programme to meet the needs of the collection.
- iii) Environmental friendly pesticides and fertilizers to be incorporated more into existing regimes.

## e) Centralization of PPN, PRD and NOG Nursery

i) With the space allocated from Tyersall extension, all orchids from PPN and PRD to be centralized in NOG Nursery.

## f) Educational Programme

- i) Inclusion of Micro-propagation Lab to NOG Nursery Facility.
- ii) Proposed classrooms for teaching orchid propagation and hybridisation. To have an adjoining library for reference books on orchids.
- iii) To have an educational tour detailing the steps of how orchids are hybridised, propagated, grown out and eventually displayed in NOG.
- iv) To include public-interaction facilities

## g) Additional cool house solely for storage of highland orchids

i) Existing orchids in the Cool House can be propagated and grown out.

## h) Nomination of Heritage Trees

- i) To work with Plant Records and Arboriculture to decide the possibility of nomination of more Heritage trees.
- ii) *Durio graveolens, Khaya grandiflora, Duabanga grandiflora* and *Elateriospermum tapos* potentially can be allocated heritage status.

## i) Quarantine Area

- i) Space needs to be allocated to quarantine new orchids
- ii) More space needed for storage of seedling flasks from Micropropagation lab

## j) Combined Office

i) New centralised office building to support both NOG Display and Nursery staff

## • <u>Years 7–10: actions proposed [as above]</u>

## a) Inventory, analyzing and de-accession of collection

- i) Update inventory
- ii) Analyse collection over time.
- iii) De-accession if necessary.
- iv) Addition of stud plants that can be used for orchid breeding.

# b) Conservation of Heritage Collection Lineage

v) Review the present collection strength in terms of heritage values in 2<sup>nd</sup> year and subsequent years.

vi) Formulate and implement a conservation strategy such as micro-propagation and seed collection of valuable old and rare orchids of known provenance to maintain the lineages.

## c) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

## d) Pest, Disease and Fertilising Programme

- i) Recommend possible non-chemical treatment for controlling pests & diseases.
- ii) Propose and apply fertilising programme to meet the needs of the collection.
- iii) Environmental friendly pesticides and fertilizers to be incorporated more into existing regimes.

## e) New Labelling System

 To look into the possibility of using barcode labels so the scanned data can be directly uploaded onto inventory system with Plant Records Unit.

# **10 Year Living Collection Management Plan**

Evolution Garden, RB, Healing Garden & Fragrant Garden

Date: August 2013

Manager: Jane Lau Jie Ying

Section Head: Dr. Wilson Wong

#### **Evolution Garden**

#### Landscape Content and Heritage Value

The Evolution Garden is located within the Central Core of the Botanic Gardens. The former SBG workers' accommodation used to occupy this area. The workers were re-housed offsite and their former homes demolished during the 1970s. The south-western and eastern edges of the area have older plantings of timber trees (especially Dipterocarpaceae) and even some potentially native remnants of Heath Forest, represented by old tembusu (Cyrtophyllum fragrans), besides a couple of late 19<sup>th</sup> century Economic Garden plantings of white gutta (Palaquium obovatum) and tamarind (Tamarindus indica). The Evolution Garden is well-designed to showcase the diverse Plant Kingdom as a dynamic and ever-changing living entity, which is responsible for making the once fiery planet Earth into a habitable place to live and thrive in. Visitors can embark on a journey through time at the Evolution Garden which displays adequately interpreted educational planting along a spiralling trail that descends the slope through the series of epochs beginning with the lifeless Earth and ending with the flowering plants. The entrance includes a display of huge columns of petrified wood (real fossilised tree trunks). A large rock shelter at the Garden's entrance adds to the feeling that you have gone back in time, almost before 'prehistory'. The journey of Evolution Garden starts with the harsh and largely lifeless Earth represented by models of volcano spewing, molten lava and scalding mud after crossing a bridge. This bridge displays a very useful evolution timeline interpretation sign that puts into perspective the recent evolutionary history of species. Amongst the artificial rocks, visitors will find models of stromatolites (the oldest still extant marine algae) which used photosynthesisto produce oxygen as a by-product. The earliest plants were believed to have evolved from algae. Mosses and liverworts (bryophytes) followed soon after the harsh landscape of artificial rocks. Visitors will notice the mosses and liverworts nestled between the cracks of the rocks, very much in the same manner as their ancestors would have colonised the landscape millions of years ago. *Psilotum*, fern allies and true ferns showcase how the bryophytes evolved into the pteridophytes.

The Carboniferous section also includes modelled extinct giant club mosses (Lepidodendron). Further down, there is a fine collection of large cycads planted between rocks among the vascular plant group, the gymnosperms, which are plants that produce "naked seeds". The cycads are survivors in our modern world, dating back to ancient times representing the Cretaceous period. One of the highlights is a beautiful large Vietnamese cycad believed to be 1000 years old. At the end of the cycad collection, visitors will pass by a small pond that is afloat with *Nymphaea* (water lily). This serene display is representative of what existed in the late Cretaceous period, when the first flowering plants stood alongside the more primitive seed-bearing plants like the conifers and cycads. A ground cover of *Piper sarmentosa* represents the palaeoherbs that can be found near the pond, which then leads to a dry pine savanna (late Miocene) represented by grass species and *Pinus merkusii*.

The landscape display changes after the pine savanna area to represent the earth around 650 million years ago as plants began to evolve further and colonised more of the land. *Magnolia champaca* represents the earlier flowering plants of this period of the evolution which gradually merges with a man-made rainforest landscape representing recent times. In the rainforest section, plants such as the dipterocarps, fig trees (*Ficus* sp.) and large *Caryota no* palms and ground covers, shrubs and climbers dominate, recreating a typical tropical rainforest look. The

Evolution Garden's fencing adjacent to the slopes of lawn XH is planted with various tropical flowering climbers.



## Fig.1: Evolution Garden Map

#### **Present Condition**

The Evolution Garden has an educational role. The route around the garden makes use of the contours of the site and plant habit. The current collection showcases some of the ancient tropical plants that tell the story of evolution, such as mosses, whisk ferns, horsetails, cycads and waterlily. The bryophyte collection consists of 6 species of mosses and 3 species of liverworts followed by 1 whisk fern and 5 species of fern allies. *Angiopteris evecta, Cyathea* tree ferns and others native fern species represented the Pteridophytes collection. The cycad collection is the key feature plant collection in this garden, which consists of around 25-30 species from Cycadaceae and Zamiaceae.

In Evolution Garden, *Stelechocarpus burahol* (Keppel fruit tree) is one of the interesting Annonaceae planted in the early flowering plant portion of the garden. Tall and large *Magnolia champaca* (Chempaka) trees, with its strongly fragrant yellow flowers are planted here too. Birds are always attracted by the aril of the fruits of the chempaka. As the visitors venture deeper into the rainforest section, various dipterocarps, fig trees, palms and many others trees such as, *Scorodocarpus borneesis, Vatica rassak, Flacourtia inermis* and *Terminalia catappa* can be observed.

#### Constraints

- There is soil wash-off at the slopes where the pteridophyte collection now resides.

- The steep planting site at the rainforest zone that runs along Cluny Park Way tend to have trees uprooting during the rainy seasons.

#### Strengths

- The terrain has been utilised very well in the design of the Evolution Garden, which is a first class educational asset.
- There is ample space for potential expansion for collections, namely, bryophtyes, pteridophytes, gymnosperms and angiosperms.
- Horticulture management is relatively routine and minimal.

#### Weaknesses

- Interpretation of specific plants can be further improved for this Garden.
- Lack of diversity of species for various collections for showcase in the Evolution Garden.
- Araucaria and Pinus species in the gymnosperms collection are prone to termite attack.
- Cycad collection is prone to scale and caterpillar attacks.
- Overgrown tree, *Terminalia catappa*, that casts much shade, has caused slow-growing trees to dieback in the rainforest display area.
- Some of the fibre glass artificial rocks have cracked and even given way in some parts.

## **Potential for Improvement**

- More plants can be introduced to create a botanically diverse plant collection.
- Pheromone-based termite baits should be introduced to provide long term biological pest management for the gymnosperm collections.
- Regular tree inspection and tree pruning to manage the trees and permit penetration of sunlight for plants in the Evolution Garden.
- Models and various structures need to be inspected routinely. For example,

#### **Raffles Building & Colonial Houses**

## Landscape Content and Heritage Value

Raffles Building (RB) was formerly the Raffles Hall until the mid-1980s. It was the first residential hall to be established at the Bukit Timah campus of Raffles Memorial College, Singapore's first tertiary educational institution. It is now a conservation building. Several trees planted in the vicinity that predated the construction of the Raffles Hall, which opened in 1958 still stands. In particular, *Palaquium obovatum*, a heritage tree that was planted behind RB, could be now more than 110 years old. It may have been planted by H. N. Ridley, c. 1897–99, when the area was part of the Economic Gardens. Besides that, there is a row of Rain Trees (*Samanea saman*), *Swietenia macrophylla* that were planted in front of RB and *Pithecellobium dulce, Calophyllum inophyllum, Fagraea fragrans* planted behind RB, most probably during the same period, to provide the greenery and shade around the building. National Parks Board redeveloped RB during 2009-2010 after reaquisitioning this property and it now houses the Operations Branch of the Board. The

front portion of the RB features a relatively young collection of mostly wild provenance Myrtaceae. In 2013, a cafeteria for staff and public was opened. Landscape surrounding the cafeteria and greenery found on the rooftop of the cafeteria consist of largely ornamental plants of commercial origin.



# Fig.2: Location of Raffles Building and House 1-6

There are six colonial bungalows,, numbered 1 to 6, located along Red Brick Path as shown in the map (Fig.2) were built in the 1920s. They used to house the academic professors of the former Raffles College. Of particular importance is the central bungalow which was the residence of the President of the College. Like RB, the six colonial bungalows are also conserved buildings. Today, there is an old heritage rain tree, *Samanea saman* that is located between House 2 (NUSS Guild House) and House 3 (National Parks Board's Facility Branch). The oldest of the buildings is the Field Assistant's house, i.e, House 6, completed in 1919.

## **Present Condition**

The front porch of the RB and its carpark feature mainly a small Myrtaceae collection of plants from Malaya, Borneo and Australia. Around the building, there are also other trees, like *Syzygium polyanthum, Swietenia macrophylla, Antidesma bunius* and *Ficus* species that were planted prior to the reaquisitioning of RB which provide shade for the young saplings of the Myrtaceae collection.

Some ornamental landscaping plants were planted around the Colonial Houses 1-6 in order to provide greenery to enhance the areas. House 1 housing the CUGE (Centre for Urban Greenery & Ecology) office is mainly planted with fruit trees e.g. *Mangifera indica, Mangifera odorata, Ziziphus mauritiana* and some herbs and spices, such as, *Pandanus amaryllifolius, Piper nigrum,* 

*Citrus x microcarpa* and *Murraya koenigii*. House 2 housing the, NUSS Guild House is surrounded by a few large Sea Apple Trees (*Syzygium grande*) and a *Podocarpus* hedge for screening purposes.

House 4 is a restaurant which is managed by NParks SBG Operation Branch . There are a few rain trees and *Callerya atropurpurea* trees which provide a vibrant red and purple colour when the blooming commences. Fragrant shrubs, such as, *Magnolia figo, Wrightia religiosa, Murraya paniculata* and *Coffea sp.* are part of the landscape in front of the building which connects to the Fragrant Garden. A large old *Barringtonia asiatica* and a few Tembusu trees can be found around House 5, which is the Institute of Policy and Planning, a part of the National University of Singapore's Bukit Timah campus .

House 6 houses the National Biodiversity Centre which is located next to the Healing Garden's Gambir Gate and RB footbridge and is surrounded by lush greenery. There is a small collection of plants from the Annonaceae and some interesting understorey herbaceous plants, such as, *Eurycoma longifolia, Angiopteris evecta, Crinum asiatica,* etc. These plants help to create a diverse forested-looking landscape.

## Constraints

The space in front of RB area is limited for long term growing of the Myrtaceae collection. Vehicular and human traffic obstruction around the RB footpath and carpark are potentially caused by the over-coverage of the plants narrowing certain areas accessibility.

## Strengths

- The area showcases a range of *Syzygium* species from Myrtaceae with different regions:
- 1) Singapore, Malaya, Borneo, Indonesia
- 2) India, China, Philippines
- 3) Australia, New Zealand
- 4) Africa
- Horticulture management is relatively routine and minimum.

## Weaknesses

- Lack of interpretation of the Myrtaceae Collection
- Lack of interpretation of the significance of the Heritage Trees
- Existing plants in the Myrtaceae collection can be better planted according to their origins if space permited

## **Potential for Improvement**

- Interpretation of Myrtaceae Collection needs to be created.
- Site should be populated with more plants of known provenance and can also be used for *ex*situ conservation of appropriate species to create a botanically diverse plant collection.
- Regular tree inspection and tree pruning to manage the size of plants in the Myrtaceae Collection for healthy plant growth, and traffic and pedestrian safety, and convenience.
- Existing plants in the Myrtaceae collection can be transplanted while young and arranged according to their origins.

#### **Healing Garden**

#### Landscape Content and Heritage Value

Opened in 2011, Healing Garden is a 2.5 ha complex of winding paths over sloping and terraced ground, displaying some 400 species used medicinally in SE Asia and laid out in the shape of the human body. It aims to educate the visitors on the traditional medicinal usage of plants and the importance of conserving them. This garden is designed and planted as a friendly, therapeutic and tranquil place.

Healing Garden has 3 entrances, namely, Neem Gate (along red brick footpath), Gambir Gate (next to the Centre for National Biodiversity) and Gelam Gate (next to RB Carpark). It is closed on Mondays for horticultural maintenance.

This Garden is laid out thematically relating to various systems of the human body:

#### I.Head, Neck, Ear, Nose and Throat

Plants grown in this area are commonly used to relieve headaches, soothe throat infections, as well as, ease nasal congestion. The plants featured in this section are also used to treat various ailments such as sinuses, influenza and eye-problems.

#### **II. Respiratory and Circulatory System**

Herbal plants have always played an important role in enhancing the health and treating ailments of the respiratory and circulatory systems. The plants in this section are used to treat the ailments of the heart, chest, lungs and blood.

#### **III.Digestive and Related Systems**

Plants in this section are used as remedies for stomach-aches and ailments affecting the bowel, bladder, liver, kidneys and gall bladder.

#### **IV. Reproductive System**

Nature abounds in resources that help to nurture the conception and birth of new life. The plants in this zone are used for infertility as well as to enhance the health of the reproductive system. Some of them are also used as aphrodisiacs.

## V.Muscle, Skeleton and Skin

Many herbal plants have anti-inflammatory properties which help to reduce symptoms of swelling and pain. Plants in this section are used for ailments of the muscles, tendons, ligaments and joints. These plants are also used to treat bone, spine and nervous system problems.

#### VI.Toxic

Plants play a very crucial role in helping to sustain life. However, some plants may contain substances that are poisonous. These plants may be used medicinally, but with extreme care and caution.

The logo of the Healing Garden is the *Melastoma malabathricum*, a native shrub commonly known as Singapore Rhododendron, which has folk medicinal uses.

Healing Garden has installed some interpretative signs to showcase the medicinal plants. Some are in English and Mandarin as well as a few braille signs (a trial). There is an iPhone and Android app guide that can be downloaded for free; a first for SBG thematic gardens. The application describes

the plants and uses and also includes images of about 175 species of plants and their approximate location in this garden.

Some old trees dating back to the SBG colonial era's Economic Gardens can be found here. *Pentadesma butyracea,* a heritage tree, is more than 110 years old can be found in the Healing Garden. It was planted by Ridley, during 1897–1899, when the area was part of the Economic Gardens. Beside the *Pentadesma*, there is a huge *Barringtonia asiatica* located at Head, Neck, Ear, Nose and Throat area. Others include an old Penaga Laut tree (*Calophyllum inophyllum*) lying on its side, but very much alive and playing host to native epiphytic *Bulbophyllum* orchids and other epiphytes at the Muscle, Skeleton, Skin and Nervous Systems area. The Healing Garden surrounds the historic Field Assistant's House (i.e. House 6), completed in 1919 for the soon-to-be-redundant manager of the Economic Gardens' land, most of which was annexed for Raffles Memorial College in the early 1920s. There are also old oil palms in the garden that date back to c. 1920 when the area was part of the Economic Gardens and grown as sources of seed for the nascent plantation industry at that time.



Fig.3: Healing Garden Map

#### **Present Condition**

The Healing Garden is a newly developed area where the trees were initially planted closely for screening purposes and also to provide shade for visitors who visit the garden. Some full sun shrubs, also medicinal plants, have started to show sign of poor growth due to excessive shade cast by dense overhead tree canopies. A small portion of medicinal plants are annuals that have short life-spans and need regular replacement.

#### Constraints

Bare patches caused by soil washed off on slopes in the Healing Garden. There are also poor, compacted soils which lacked organic matter found in many parts of the Garden.

#### Strengths

Healing Garden is a world class display garden on tropical healing plants that is accessible to all, botanically diverse, aesthetically pleasing, restful to the mind and body, and most importantly, educational. The conservation of medicinal plants and the fast-forgotten knowledge of their traditional medicinal usage are important.

#### Weaknesses

- Lack of interpretation of the significance of the Heritage Trees and former Economic Gardens, including the Field Assistant's House.
- Some newly planted medicinal plants show sign of stress due to insufficient watering and poor soil conditions found in the garden.

#### **Potential for Improvement**

- More plants can be introduced to create a botanically diverse medicinal plant collection.
- Routine watering and mulching with leaf litter application are crucial to improve plant health and quality in Healing Garden.
- Regular tree inspection and tree pruning to manage the trees and permit light penetration to the ground below in Healing Garden.

## Fragrant Garden

#### Landscape Content and Heritage Value

The Fragrant Garden is newly opened in 2013 and showcases many species of fragrant plants. Various fragrant plants are also grown on both sides of the Red Brick Path to welcome and lead visitors to the Garden. The Healing Garden's western portion features an elevated platform and viewing deck that overlooks the path that descends to the Evolution Garden. There are two impressive African baobab specimens that cling to the west-facing slope beneath the Fragrant Garden's platform and viewing deck. The garden also feature some of the old oil palms that date back to c. 1920 when the area was part of the Economic Gardens and grown as sources of seed for the nascent plantation industry at that time.

The sign of the Fragrant Garden features the Tembusu flower. The flowers of this native tree, which is commonly planted in Singapore, are sweetly fragrant in the evening. The south-western and eastern edges of the area have older plantings of timber trees (mainly Dipterocarpaceae) and

even some potentially native remnants of Heath Forest, represented by old Tembusu trees (*Cyrtophyllum fragrans*). There are a couple of late 19<sup>th</sup> century Economic Garden plantings of white gutta (*Palaquium obovatum*) and tamarind (*Tamarindus indica*).

## **Present condition**

The Fragrant Garden showcases many species of plants that have evolved with fragrance. The blooms attract butterflies and visitors will be able to spot these and other insects fluttering amongst the plants in the day. The garden is also an ideal spot for night time visits as many of the plants give off their scents during the evenings. The boardwalk and viewing deck are beautifully lit at night to enhance the visitors' experience of the Fragrant Garden.

# Constraints

- All the plants in Fragrant Garden are full sun plants that require regular irrigation. A part of the collection is planted on sloped areas of the Garden and these require attention to ensure they are well watered and fed.

# Strengths

 The garden is also an ideal garden that showcases interesting fragrant plants that have numerous uses that range from traditional uses in religious ceremonies and rituals and folk medicine, aromatherapy to the mega-industry of traditional and modern perfumery.

## Weaknesses

 Lack of interpretation for Fragrant Garden entrance sign. Some of the fragrant shrubs are planted too far into the flower bed and should be moved nearer to the footpath for visitors to appreciate them. Lack of diversity as many repetitive plantings fill the limited area.

# **Potential for Improvement**

- More plants to be introduced to create a more botanically diverse fragrant plant collection.
- Routine watering and mulching with leaf litter application is crucial to improve the plant health in Fragrant Garden.
- Regular tree inspection and tree pruning to manage the trees in Healing Garden.

# 10-year plan of Evolution Garden, Raffles Building, Healing Garden and Fragrant Garden

# Years 1–3: actions proposed [to include de-accessioning, acquisitions, interpretation]

- a) Inventory check, analysing and de-accession of collection where necessary
  - i) Update inventory.
  - ii) Analyse collection over time.
  - iii) Deaccession if necessary.
- b) Interpretation

i)

- Label and interpretation signages for key collections & heritage trees in Evolution Garden, RB, Healing Garden and Fragrant Garden.
- c) Conservation of Heritage Collection Gene Pool
  - i) Review the present collection strength in terms of conservation and botanical value in 2<sup>nd</sup> year and subsequent years.

ii) Formulate and implement a conservation strategy such as propagation and seed collection of valuable old and rare plants of known provenance to maintain the gene pool.

# d) Turf Management Programme

- i) Remedial action for improving the turf and soil conditions such as hollow thinning and top dressing as required.
- ii) Returfing for areas that are poor and balding or replacement with appropriate ground cover plant or application of leaf mulch.
- iii) Leveling of soil to permit mechanisation to improve productivity.

# e) Tree Management Programme

- i) Regular scheduled tree inspection and arboriculture maintenance.
- ii) Follow-up treatment for trees that are deteriorating in health.
- iii) Opening of tree canopies to permit penetration of sunlight for healthy growth of plants growing below/nearby.

# f) Pest, Disease and Fertilising Management

- i) Collect data on pest and disease problems and from trials of simple control measures and documentation of such data.
- ii) To study the need of fertilisers for the different plant taxa and apply suitable fertiliser regime.

# g) Evolution Garden - Bryophytes Collection

- a. Interpretation of Bryophytes collection
- b. Maintain the current mosses and liverwort species

# h) Evolution Garden - Pteridophytes Collection

- a. Introduce 2 new species yearly
- b. Interpretation of Pteridophytes collection
- c. Maintain the current collection

# i) Evolution Garden - Gymnosperm Collection

- a. Interpretation of Gymnosperm collection
- b. Maintain the current cycad collection

# j) Evolution Garden - Angiosperm Collection

- a. Introduce 2 new species from Magnoliales order yearly
- b. Interpretation of Angiosperm collection
- c. Maintain the current flowering plant collection

# k) RB - Myrtaceae Collection

- a. Introduce 3 new species for planting yearly
- b. Interpretation of Myrtaceae collection
- c. Maintain the current collection

# I) Healing Garden

- a. Introduce 10 new species for planting yearly
- b. Interpretation of 10 medicinal plants yearly
- c. Maintain the current collection

# m) Fragrant Garden

- a. Introduce 3 new species for planting yearly
- b. Interpretation of 3 fragrant plants yearly
- c. Maintain the current collection

# Years 4–6: actions proposed [as above]

a) Inventory, analyzing and de-accession of collection

- i) Revisit and update inventory
- ii) Review of collection.
- iii) Deaccession if necessary.
- iv) Addition of relevant new plant taxa to collection, if required.

## b) Interpretation

i) Labels and interpretation where required for general collection.

## c) Conservation of Heritage Collection Gene Pool

i) Review the present collection strength and the collection preservation needs for the period.

## d) Nomination of Heritage trees

i) To work with Plant Records and Arboriculture to decide the possibility of nomination of Heritage trees.

## e) Turf Management Programme

- i) Remedial action for improving the turf and soil conditions such as hollow thinning and top dressing as required.
- ii) Returfing for areas that are poor and balding or replacement with appropriate ground cover plant or application of leaf mulch.
- iii) Leveling of soil to permit mechanisation to improve productivity.

## f) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

## g) Pest, Disease and Fertilising Programme

- a. Recommend possible non-chemical treatment for controlling pests & diseases.
- b. Propose and apply fertilising programme to meet the needs of the collection.

## h) Evolution Garden - Bryophytes Collection

- a. Introduce 2 new species for planting yearly
- b. Maintain the current mosses and liverwort species

## i) Evolution Garden - Pteridophytes Collection

- a. Introduce 3 new species for planting yearly
- b. Interpretation of 2 plants from Pteridophytes collection yearly
- c. Maintain the current collection

## j) Evolution Garden - Gymnosperm Collection

- a. Introduce 3 new species for planting yearly
- b. Interpretation of 2 plants from Gymnosperm collection yearly
- c. Maintain the current collection

# k) Evolution Garden - Angiosperm Collection

- a. Introduce 3 new species from Magnoliales order yearly
- b. Interpretation of 2 plants from Angiosperm collection
- c. Maintain the current flowering plant collection

## I) RB - Myrtaceae Collection

- a. Introduce 3 new species for planting yearly
- b. Interpretation of 2 Syzygium species in Myrtaceae collection
- c. Maintain the current collection
- m) Healing Garden
  - a. Introduce 10 new species for planting yearly
  - b. Interpretation of 10 medicinal plants yearly
  - c. Maintain the current collection
- n) Fragrant Garden

- a. Introduce 3 new species for planting yearly
- b. Interpretation of 3 fragrant plants yearly
- c. Maintain the current collection

## • Years 7–10: actions proposed [as above]

## b) Inventory, analyzing and de-accession of collection

- i) Revisit and update inventory
  - ii) Review of collection.
- iii) Deaccession if necessary.
- iv) Addition of relevant new plant taxa to collection, if required.

## b) Interpretation

i) Labels and interpretation where required for general collection.

## c) Conservation of Heritage Collection Gene Pool

i) Review the present collection strength and the collection preservation needs for the period.

## e) Turf Management Programme

- i) Remedial action for improving the turf and soil conditions such as hollow thinning and top dressing as required.
- ii) Returfing for areas that are poor and balding or replacement with appropriate ground cover plant or application of leaf mulch.
- iii) Leveling of soil to permit mechanisation to improve productivity.

## f) Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

# g) Pest, Disease and Fertilising Programme

- i) Recommend possible non-chemical treatment for controlling pests diseases.
- ii) Propose and apply fertilising programme to meet the needs of the collection.

# h) Evolution Garden - Bryophytes Collection

- i) Introduce 1 new species for planting yearly
- ii) Maintain the current mosses and liverwort species

## i) Evolution Garden - Pteridophytes Collection

- a. Introduce 3 new species for planting yearly
- b. Interpretation of 2 plants from Pteridophytes collection yearly
- c. Maintain the current collection

# j) Evolution Garden - Gymnosperm Collection

- a. Introduce 3 new species for planting yearly
- b. Interpretation of 2 plants from Gymnosperm collection yearly
- c. Maintain the current collection

## k) Evolution Garden - Angiosperm Collection

- a. Introduce 3 new species from Magnoliales order yearly
- b. Interpretation of 2 plants from Angiosperm collection
- c. Maintain the current flowering plant collection

## I) RB - Myrtaceae Collection

- a. Introduce 3 new species for planting yearly
- b. Interpretation of 2 Syzygium species in Myrtaceae collection
- c. Maintain the current collection
- m) Healing Garden

- a. Introduce 10 new species for planting yearly
- b. Interpretation of 10 medicinal plants yearly
- c. Maintain the current collection

## n) Fragrant Garden

- a. Introduce 3 new species for planting yearly
- b. Interpretation of 3 fragrant plants yearly
- c. Maintain the current collection

# 10 Year Living Collection Management Plan

Jacob Ballas Children's Garden

Date: July 2013

Manager: Craig Williams

Section Head: Dr. Wilson Wong

#### Jacob Ballas Children's Garden

#### Landscape Content and Heritage Value

Although a relatively new addition to SBG, Jacob Ballas Children's Garden has the distinction of being Asia's first dedicated Children's Garden. It was opened on Children's Day on 1<sup>st</sup> October 2007. Access to adults is restricted to those accompanied by under 12's, making it a much loved sanctuary for children. It is situated at the far north east corner of SBG.

The garden consists of a series of natural play features, linked by themed plantings, used for programmes devised by SBG's Education team. It has recently begun to house conservation material, including native plants, with a view to introducing children to some of the riches of the fast disappearing Malesian Flora.

The main features are the Visitor Centre, Sand Play area, Maze, Survival Garden, Suspension Bridge, Sensory Garden, Epiphytes Galore, the Potting Garden, the Tree House, the Fantastic Forest, the Pond, the Waterfall Cave and the Classrooms.

In the six years since JBCG opened, some of the Garden's trees have matured, creating much needed shade, but also causing problems for some of the thematic plantings that require more light than they currently get. The ravages of time and heavy usage by small feet have also been apparent in many of the garden's planted areas, particularly the turf. A renovation program is underway to revitalise these areas.

An extension of JBCG, aimed at catering to young teens as well, is being planned and will occupy the adjacent part of the Eco Garden and the graveyard site opposite the car park. This will include a farm garden, beverage plot and paddy field. Forward planning for the existing site, presented here, takes these future developments into account to avoid unnecessary repetition.

#### **Other Significant Structures:**

Aside from the shelters dotted through the garden, there are four classrooms for outreach programming, a visitor centre for reception and the Party Place, which is rented out for children's celebrations.

#### **Collections:**

There are no major collections in JBCG, but in its quest to nurture an interest in plants and ecology in its visitors, it functions much like a miniature botanic garden, with many small themed groups of plants. Its many habitat niches have allowed an *ex-situ* conservation collection to begin to be built. In the interest of capturing children's imagination, and emphasizing the Garden's logo, a collection of butterfly/moth host plants and nectar plants has begun to be developed. As there is no quality butterfly garden in SBG and the micro habitats and space in JBCG could attract an even broader range of species than at present, a dedicated butterfly trail is proposed, including the more charismatic and usually overlooked moth species.

#### Visitor Centre

The main feature of the VC is the Mystree, a sculpture depicting a tree made up of children. The sculpture is by the London-based Israel artist, Zadok Ben-David. Entrance to the main garden is across a bridge over a bio-swale.

#### **Present Condition**

Functional.

#### Constraints

Some planting around VC is in rain shadow and requires regular manual watering.

#### Strengths

The planting along the bio-swale, mainly of *Heliconia* and *Musa* gives the entrance an exciting, lush jungle-feel. Walking under the bridge, along the swale feels adventurous.

#### Weaknesses & Potential Improvements

Mixed planting in the car park is functional but could be more inspiring and the broken screen of *Gustavia* is a wasted opportunity to provide a more atmospheric welcome.

The Mystree's rusty steel finish coupled with the red lava stone has a scorched and barren appearance. Some planting underneath would provide a softer more welcoming entrance. Green roof technology could be used to overcome shallow, concrete lined pool and drain.

Temporary themed banners occasionally add life and interest to VC but there are two long walls that could host a photo montage of the rich biodiversity inside, helping to build excitement and sharpen keen eyes. Ideally these photos would be compiled from visitors, so creating a sense of ownership. This may be easier to facilitate when the Extension is built.

The lack of water under the bridge is disappointing and the form of the rocks makes it difficult to traverse. Flooding the whole swale and creating a boulder strewn, streamside path would open up a very large, almost never used space for natural play, forest stream planting and create a new wildlife habitat, potentially attracting new dragonfly spp. for study in Education Depts. workshops.

Interpretation of *Heliconia* – exotic, co-evolution with hummingbirds, who would die without constant nectar supply.

## Water Play Area

Concrete basin with a series of mini fountains and water jets.

#### **Present Condition**

Pump repaired earlier in the year and presently in good working order Adjacent planting is very tired and worn.

## Constraints

Restricted space around the edge means it becomes very crowded at times

#### Strengths

Probably the most popular feature in JBCG due to irresistible cooling effect of water.

#### Weaknesses & Potential Improvements

Placement of most alluring 'honey pot' right at the entrance to garden mean a lot of visitors go no further than here!

Unimaginative and ugly structures which do not encourage creative and cooperative water based learning. Ideally, it would be completely redesigned.

Previously children were encouraged to water plants but they drowned! Present bare, waterlogged areas can be planted with marginals, which will take any amount of water. Worn area to right of entrance can be paved to allow buggy park, as presently pushchairs destroy planting around the edge and makes area look tatty.

Lack of paving on *Pseudobombax* side also needs attention due to high footfall.

#### Sand Play Area

Large sand pit with musical, spinning, and excavating play features.

#### **Present Condition**

Scoop is brand new, musical feature looks dated and is a bit worn, but still does the job.

#### Constraints

Specifics of Sara book mean *Caesalpinia pulcherrima* need to be grown here.

#### Strengths

Popular feature, despite blazing heat.

*Pseudobombax* – perfect climbing tree for this age group and great natural play feature. Saga tree at Party Place end continuously drops its jewel-like fruits, which are eagerly collected by treasure hunters! Also hosts a number of parasites, which are kept in check by good populations of the beautiful Painted Jezebel and Peacock Royal butterflies.

#### Weaknesses & Potential Improvements

Predominant metal and plastic look of play features.

Lack of shade over sandpit.

Migration of sand onto adjacent areas. This has already been mitigated on Maze side by a grass screen planting. The sunny side of this may be augmented with nectar plants in the future. Bed on opposite corner may need further barrier.

## Maze, Revolving Blocks & 'English Garden'

Small maze with painted animal gates. Next to the first entrance is a small group of *Cycas rumphii* and an attractive Banana plot. Opposite is a small dye-plants plot, a duplicate of the one opposite the Potting Garden.

The Revolving Blocks, next to the maze are large scale photo puzzles with animal and fruit themes.

The English Garden, opposite the block area, is an attempt at a flower rich herbaceous border.

#### **Present Condition**

Extensive re-planting and a new 'Melting Chocolate Hills' cutting (and fertilising) regime has seen the Maze improve greatly over the last year. Still has some holes and it will take time for the newly planted specimens to grow into the others.

The Revolving Blocks are slightly weather worn and the planting around them is an unattractive hotchpotch.

The English Garden rarely lives up to its name!

#### Constraints

There is a little too much shade towards the back of the maze for optimum growth of *Syzygium*. Similarly, the English Garden is too crowded and shaded by its trees to flower well

#### Strengths

Maze is a popular and increasingly attractive feature. Dye plants plot receives good amount of sun.

#### Weaknesses & Potential Improvements

Painted animal gates are hard to read, of seemingly little interest to most kids and cause frustration as you can see through them but cannot pass. This leads to pushing through at the edges, which causes the *Syzygium* to die there and create more holes. Maze would be more atmospheric if more traditional, with no gates.

Nothing at the centre of the Maze! Install the bottom-like Coco de Mer seed and/or some kind of bell, to signal the achievement of reaching the centre.

Remove/move shrubs immediately behind the maze, and ensure regularly pruning of trees in the area to allow necessary light to reach it.

No interpretation of Cycads: exploit dinosaur connection by placing Dinosaur footprints on either side of the path. Enhance cycad planting, move some of the Bananas, plant *Equisetum giganteum* & *Cyathea* draw attention to Evolution Garden.

Selectively remove some trees in the English Garden and link it to the proposed flower-rich butterfly trail.

#### Survival Garden

Economic plants collection given the Desert Island spin. Useful plants, staple crops and edible 'wild' species, presently grown in one long border.

#### **Present Condition**

Relatively good, after recent replanting and expansion.

#### Constraints

Cotton and peanuts do not grow very well due to shade. Coconuts and Pucuk Pakis would also prefer more sun.

#### Strengths

Strong concept to introduce the importance of plants to man.

#### Weaknesses & Potential Improvements

Needs creative interpretation. A wrecked rowing boat on a sandy area, planted with the Coconuts, and an SOS note in a bottle would make the concept live. *Crescentia* opposite are attractive but plentiful at present (although many seem to be coming to the end of their lifespan) the space they occupy would be better used expanding the Survival Garden.

Expand collection, especially to include more niche, locally used species. Introduce Rubber.

When the JBCG Extension is developed, there will be a dedicated 'Paddy Field' so it is probably not worth introducing a miniature one here permanently. As the Potting Garden will be taken out of this side of the garden at that time, the Survival Garden will become more essential.

#### Suspension Bridge

Hugely popular swinging rope and wooden plank bridge, which crosses a shallow ravine. Originally banks were turfed but sections of the *Ficus* collection on one side has matured and killed the grass.

#### **Present Condition**

Some nice mature *Ficus*. Planting is ongoing to make the area lusher and bring out the jungle adventure atmosphere. A small collection of ex-situ conservation plants has begun under and around the bridge.

## Constraints

Sloping site. Shaded area.

## Strengths

Area has a good wild feel, with a great atmosphere. Mature canopy that can be used to establish.

#### Weaknesses & Potential Improvements

Another bridge that feels like you should be crossing water. Installing a pump to make this flow permanently would enormously improve the atmosphere, growing conditions and create new planting possibilities.

Site is still too hot and dry for some of the plants introduced during the drought period, when it needs regular irrigation. Automatic irrigation would allow a huge range of Malesian rainforest understory spp. to be conserved in this and neighbouring areas.

Should be the beginning of a new conservation focussed Forest Adventure, which would stretch from here to the Bukit Timah Road side, highlighting tropical rainforest ecology, through use of charismatic species from lowland mixed Dipterocarp forests. Planting around the classrooms, the relatively bare area between here and the Waterfall cave and the Tree House lawn will improve the atmosphere raise humidity and minimise drying winds.

#### Sensory Garden

Large themed space encompassing several areas dedicated to each sense.

#### **Present Condition**

Poor. A confused collection of plants with fragrant leaves, rhizomes and flowers (some of which will not flower) grown in rather dull stacks of recycled tyres.

#### Constraints

Neighbouring trees have shaded out the current space to detriment of many species

#### Strengths

All children love Mimosa pudica!

#### Weaknesses & Potential Improvements

Dire need for clarity and interpretation. Each collection needs to be reassessed, simplified, improved and replanted where individual species can grow successfully. An assessment of the value of surrounding trees and potential improvements if they are removed is required. The results should be weighed up against the possibility of spreading senses around into spaces that receive more sunlight and utilising the current space as part of the new Forest of Adventure.

Trellises for climbers look old and very ugly and if not removed/replaced, should be painted so they become less visible/more presentable.

Sight Garden is mainly mutant horticultural selections that can be seen in 1000s across Singapore. Replaced with a choice selection of species with variegated leaves and other unusual morphological adaptations.

Spice of Life Small spice garden.

#### **Present Condition**

Poor. A jumble of actual spice plants, with medicinal plants and fillers.

#### Constraints

Only the front receives sun.

#### Strengths
Two well established Vanilla planifolia.

## Weaknesses & Potential Improvements

Needs to be purged of non spice plants, new species brought in and replanted so that species receive the best possible conditions the area can offer. There may be a need to selectively remove some nearby trees and reduce canopies to let more sun in to the front. Interpretation lacking and present sign is old and decaying.

#### **Epiphytes Galore**

Epiphyte showcase, accessed through a shelter. Three metal frames at the sides of an arena are hung with mainly orchids and ferns on plaques and one with pots of Nepenthes. There are also two large trunk sections, one planted with Bromeliads and one with a mix of Orchids and Hoya.

#### **Present Condition**

Poor.

#### Strengths

The two trunk plantings are quite successful and well established. Children are fascinated by *Nepenthes*.

#### Constraints

Too much shade for most orchids to flower.

Frames not suited to display of plaques and the poles used to dress, need replacement every other year due to rot.

Children regularly damage *Nepenthes* by filling pitchers with palm kernel mulch or emptying digestive fluids.

# Weaknesses & Potential Improvements

Create 'Lost World' planting to display an improved epiphyte collection, expanding into adjacent fallen tree trunk space (with better light quality), planting edges to bring seclusion and mystery, using tribal sculptures as mounts, removing ugly concrete benches, dress up metal frames to look like hut walls and install rustic green roofs.

Start ant-plant collection. Bring in new trunk sections to house planted *Nepenthes* collection, so upper plants are out of reach and receive better light.

# The Potting Garden

Edible plants collection

#### **Present Condition**

Good. Recently re-soiled and planted.

#### Constraints

Access restricted to guided tours and prior arrangements disappoints some visitors.

#### Strengths

Well sited with a good and continuously improving collection of plants.

#### Weaknesses & Potential Improvements

Interpretation needed. This can be carried over, in some form, into the extension and may include some cultural groupings i.e. Malay dish food plants etc.

Complete exterior mixed border style planting up to path, including as much repetition of inside planting as growing conditions allow so as to give a good experience to those not guided.

#### <u>The Tree House</u>

Wooden tree house, with two orange plastic slides. Built between mature *Ficus*. There is a small flowering herbaceous planting at one corner, opposite a sunny lawn.

#### **Present Condition**

Good. Recently re-sanded.

#### Constraints

Sloping site means sand slowly erodes. *Ficus* roots need regularly keeping in check as they attempt to envelop the structure.

#### Strengths.

Popular feature where children can play in the sand in shade. Since it has been re-sanded, it is being used as much as a beach as for the Tree House and its slides. Sunny area on one side.

#### Weaknesses & Potential Improvements

The plastic look of the slides spoils the natural feel of the house. It would be nice to clad them to appear as fallen tree trunks.

The sunny border of the lawn opposite is the perfect space to continue the flower rich new herbaceous border, including nectar plants, Vanda 'Miss Joaquim' (which needs day long sun to flower) and sun lovers from the Sensory Garden.

#### The Fantastic Forest

A short path that cuts through a section of a much larger, partially wooded area that borders Bukit Timah Road. A series of mushroom sculptures surround a small plaza at the start of the path.

#### **Present Condition**

Under-utilised.

#### Constraints

The spell breaking noise of Bukit Timah Road.

## Strengths

Large un-exploited space.

#### Weaknesses & Potential Improvements

Under-utilised area with great potential for new Malesian forest species planting and adventure trail. This will also help to deaden the noise of the road a little The mushroom sculptures are the perfect location for a compost heap, to demonstrate the process of decomposition and stem the tide of precious organic matter out of the garden.

#### <u>The Pond</u>

Long flooded section of the swale, swollen into a pond at each end. The toilet end is the site for *Victoria* 'Longwood Hybrid'. The other has a Floating Platform, another *Pseudobombax* and a collection of important marginals and aquatics. Next to this is a concrete caterpillar planter, planted with butterfly host plants. Between the two is a tunnel of old Frangipani and a log crossing. At the side is a dense planting of very varied mainly small trees.

#### **Present Condition**

Mainly good, except the tree planting, which is over a concrete-like compacted base. Here some taxa struggle. Frangipani struggles without regular fertilising.

#### Constraints

Substrate under roadside tree planting and Frangipani. Shade from neighbouring trees at nectar plants area.

#### Strengths

All features here are very popular. Host plants much appreciated by guides who can now often show complete metamorphosis process.

Genuine conservation success! Planting *Aristolochia acuminata* in this area has helped make JBCG a stronghold for the rare Common Rose butterfly and the extremely rare Common Birdwing also sometimes breeds here.

# Weaknesses & Potential Improvements

Invasive Red Eared Sliders and Snakeheads should be removed and replaced with native species.

Expand host plant selection and augment with nectar plants

Interpretation for Lotus and new signage for Papyrus needed.

Pseudobombax far less used and though attractive, space could be put to better use if more sun was allowed in.

Canopies of Tabebuia that cause afternoon shade can be regularly reduced.

#### The Waterfall Cave

#### **Present Condition**

Currently undergoing extensive planting, following re-soiling as area was almost bare until 6 months ago.

#### Constraints

Only two planting pockets built into cave are in a rain shadow. Cave looks out towards toilet block. *Gustavia* wall screens it but is very monotonous. Set pebble drain into Pond, which looks like a driveway cannot be planted conventionally.

#### Strengths

Exciting and popular feature. Humidity from waterfall.

#### Weaknesses & Potential Improvements

Very unnatural finish to fake stone and pond surround. Planting has begun to soften and disguise this and once *Cyathea* 'tunnel' has matured, should add enjoyment to the cave approach/exit.

Plant bold leaf shapes in front of *Gustavia*, to break screen up and gradually replace. Replace with Malesian riverine species on toilet side.

# The Classrooms

Shady edge of the swale which drains into the pond. Borders the road leading to NUS.

#### **Present Condition**

Neglected but atmospheric.

#### Constraints

Shady. Presently inaccessible to visitors due to railing.

#### Strengths

The sloping bank on the road-side offers a nice planting opportunity for larger understory shrubs.

#### Weaknesses & Potential Improvements

Monotonous planting of *Nephrolepis exaltata*. Looks like a dry river bed. If flooded, would provide another great space for *ex-situ* conservation planting and an adventurous continuation to the stream-side trail that would start in the Extension. As with all the many locations dominated by *Tabebuia rosea* in JBCG, choice mixed Dipterocarp forest tree species should be introduced, so they can establish under the canopy, allowing the exotic to be phased out slowly. **10-year plan for JBCG**[to be drafted by Lawn manager for feedback by senior SBG management]

# • <u>Years 1–3: actions proposed [to include de-accessioning, acquisitions,</u> <u>interpretation]</u>

# Interpretation

- i) Install new large scale signs to interpret selected key species.
- ii) Install new signage and non-signage based interpretation to title and conceptualise the themes of within the garden.
- iii) Install small picture based labels to replace traditional botanical labels for selected key species, including all Spice of Life, Survival Garden & Sensory Garden plants.
- iv) Reassess interpretation in light of JBCG extension.

# Inventory check, analyzing and de-accession of collection where necessary

- i) Update inventory.
- ii) Analyse collection
- iii) Deaccession if necessary.
- iv) Addition of relevant new plant taxa to collection, with emphasis on strengthening Education workshop themes and where possible on conservation material.

# Turf Management Programme

- i) Repurpose non-play turf areas for planting where appropriate
- ii) Optimise quality of turf in areas where it will succeed

# Tree Management Programme

- Begin planting of choice native and Malesian conservation material, with focus on seed dispersal and plant/animal interaction, to cater to future Education workshop needs
- ii) Begin deaccession of poor specimens and non-essential trees inhibiting progress of key plantings.
- iii) Regular scheduled tree inspection and maintenance.
- iv) Follow-up treatment for trees that are deteriorating in health.

# Pest, Disease and Fertilising Management

- Schedule key species prone to pests that must be kept in good appearance and ascertain best organic practice for control. To include monitoring of effect of appropriate fertiliser regimes.
- ii) Interpret species richness through garden ecology with plants as the foundation stone.
- iii) Establish protocols for fertilising (and non-fertilising) regimes of plant groupings and taxa and apply.
- iv) Monitor diseased specimens and control spread through removal if necessary.

# **Butterfly and Moth Trail**

- i) Begin collection & propagation of native host plant and nectar source taxa
- ii) Plant trail of known host and nectar source species, including key nonbutterfly, Education workshop species requiring sun.
- iii) Work with Education to develop accompanying workshop programme.
- iv) Work with Nature Society of Singapore Butterfly Interest Group to target species that can be attracted into the garden.

#### **Swale Development**

- i) Work with National Biodiversity Centre to develop habitat suitable for optimum Dragonfly species and numbers.
- ii) Flood sections during development of JBCG Extension
- iii) Develop adventure trail during development of JBCG Extension
- iv) Target appropriate native and Malesian riverine taxa for introduction to new habitat. Focus on ex-situ conservation of threatened taxa.

# • Years 4–6: actions proposed [as above]

#### Interpretation

- i) Assess interpretation in the light of developments within Education workshop programming, new technologies and visitor interaction.
- ii) Continue to label new taxa in child-friendly manner and interpret important taxa as they are introduced to collection.

#### Inventory, analyzing and de-accession of collection

- i) Revisit and update inventory
- ii) Review of collection.
- iii) Deaccession if necessary.
- iv) Addition of relevant new plant taxa and conservation material to collection.

#### **Turf Management Programme**

- i) Review condition of any turf areas in JBCG, including extension, as trees mature and find alternative solutions to unsustainable areas.
- ii) Optimise quality of turf in areas where it is necessary and will succeed

#### Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

#### Pest, Disease and Fertilising Programme

i) Stay up to date with non-chemical integrated pest management methods and apply to necessary taxa.

- ii) Stay up to date with tropical companion planting techniques as they develop and utilise accordingly.
- iii)Propose and apply fertilising programme to meet the needs of the collection.

# **Butterfly and Moth Trail**

- i) Introduce new native host and nectar plants
- ii) Monitor affect of developing tree canopies on plant performance
- iii) Monitor host plant usage and assess with Butterfly Interest Group assistance how to proceed with target Lepidoptera species. Focus on expanding habitat range of vulnerable species.
- iv) Propose to Streetscape that Park Connector Network be used to develop host plant corridors to connect to Nature Reserves.

# **Swale Development**

- i) Introduce and further develop riverine taxa collection as begun yrs.1-3
- ii) Keep trail in good condition

# • <u>Years 7–10: actions proposed [as above]</u> Interpretation

- i) Assess interpretation in the light of developments within Education workshop programming, new technologies and visitor interaction.
- ii) Continue to label new taxa in child-friendly manner and interpret important taxa as they are introduced to collection.

# Inventory, analyzing and de-accession of collection

- i) Revisit and update inventory
- ii) Review of collection.
- iii) Deaccession if necessary.
- iv) Addition of relevant new plant taxa and conservation material to collection.

#### Turf Management Programme

- i) Review condition of any turf areas in JBCG, including extension, as trees mature and find alternative solutions to unsustainable areas.
- ii) Optimise quality of turf in areas where it is necessary and will succeed

#### Tree Management Programme

- i) Regular tree inspection and maintenance.
- ii) Follow up treatment for trees that are deteriorating in health.

#### Pest, Disease and Fertilising Programme

- i) Stay up to date with non-chemical integrated pest management methods and apply to necessary taxa.
- ii) Stay up to date with tropical companion planting techniques as they develop and utilise accordingly.

iii) Propose and apply fertilising programme to meet the needs of the collection.

# **Butterfly and Moth Trail**

- i) Introduce new native host and nectar plants if necessary
- ii) Continue to monitor affect of developing tree canopies on plant performance.
- iii) Continue to monitor host plant usage and assess with Butterfly Interest Group assistance how to proceed with target Lepidoptera species. Focus on expanding habitat range of vulnerable species.

#### Swale Development

- i) Monitor success of introduced taxa and continue to expand collection where appropriate
- ii) Continue to keep trail in good condition

# 10 Year Living Collection Management Plan

**Plant Resource Centre** 

Date: August 2013

Senior Manager : Teo Sunia

Section Head : Mr Elango Velautham

# **Background**

The Plant Resource Centre (PRC) was completed as part of the the Bukit Timah Core development in 1995. It is approximately 1.2 hectare sited between the Jacob Ballas Children Garden and the Economic Garden at the northern end of the Gardens.

The PRC consists of an Administration block, Potting block, storage facility, a quarantine house and two propagation houses. The outdoor area comprises of the shade houses and an open area for the trees, climbers and shrubs. The main vehicular access is from Bukit Timah Road.

Prior to the construction and opening of the PRC at the current location in 1995, there were two nursery units established in SBG, i.e. the Plant Introduction Unit (PIU) and the Plant Resource Unit. These units were later merged and relocated at PRC. Both units used to be situated at the Potting Yard and later the Plant Resource Unit was relocated temporarily at the Bukit Timah area near the University and the PIU stayed at the Potting Yard till 1995. Since its inception in 1995 the PRC played dual roles as Plant Introduction Unit as well as Plant Nursery. Together with researchers' collection trips in the region, many new species and cultivars were tested for introduction into the botanical garden, Singapore's parks and streetscapes. The Plant Records Unit (PRU) was formed in late 1995 and had its office in PRC. Staff of this Unit is responsible for computerising SBG's living collection data into a propriety database software known as BG-BASE (NParks Annual report 1995-1997). The Plant Records Unit was later relocated at the Botany Centre Office in 2006.

#### Present

The PRC supports the Singapore Botanic Gardens through the propagation and maintenance of the garden's research and living collections, education and outreach activities and exhibition and events.

#### **Collections:**

Main collections in Plant Resource Centre consist of :

- I. Ginger Research Collection Under the supervision of a ginger researcher
- II. Hoya Research Collection Under the supervision of a Hoya researcher
- **III.Palm collection**
- IV. Cycad collection
- V.Aroid collection
- **VI.Fern** collection
- VII.Begonia collection
- VIII. Native plant collection
- VIII. Miscellaneous collection

#### **Constraints:**

- The PRC infrastructure is sixteen years old. Problems with irrigation system, and drainage are reoccurring with its aging pipes
- Propagation and quarantine house facilities are of limited capacity and not well designed to hold increase production or introduction

- Horticulture workers lack plant knowledge and skills plus overall manpower shortage.
- Retraining of contract workers with each new term contractor every 3 years. Needs constant supervision

## Strengths

- The BG Base records indicate the current collection at PRC is at 5868 accessions which includes both research and display plants.
- Good collection of rare native plant species.

#### Weaknesses

- Demand and supply projection
  - i. There is no systematic demand projection from the lawn for their plant display and collection. This has resulted in the over- crowding of large tree specimens in the in tree section. Many tree specimens do not have good growth form as they have been cramped closely together for many years. They are either pot-bound or are rooted into the ground.
- Tracking of collection and inventory system in nursery
  - i. Currently all plant movement and quantities are manually updated into BG Base by the centralised PRU after receiving standard forms (such as incoming plant materials/plant request/death/ propagation/germination reports) submitted monthly by all SBG HEE managers and researchers. Over the years, nursery management has not been able to update and change labels that are faded in time and loss of labels create difficulties in searching of accessioned collections in stock.
  - ii. Plant accession labels have to be painstaking pasted on aluminium tags. It is time consuming and requires a pair of dedicated hands.
  - iii. Movement of plants in and/or out of the nurseries are sometimes not dutifully reported to the nursery management by staff taking plants or introducing plants into the nursery, resulting in inventory quantities shortcomings when reports are sent to PRU.
- Irrigation
  - i. Manually operated irrigation is currently time consuming having to manually switch on controls for the different zones at 5 locations.
- Research in horticulture
  - i. No research is carried out in terms of propagation methods, germination records, growth rate etc to understand and better conserve various plant species
  - ii. No documentation of propagation protocols available for various native and/or rare species grown in the nursery over the years.

# - Quarantine House.

There is a need to improve and rebuilt the Quarantine House in order to be able to monitor introduction of new species from various field collections locally and overseas. Isolation facilities are essential to ensure no introduction of unwanted foreign pests and diseases into the main established nursery collection. Currently due to overall lack of growing and holding space, the Quarantine House has also been turned into a temporary holding area and thus limiting proper monitoring of new plants introduced into the nursery collection. This lack is a high risk as inadvertently introduction of unknown pest and diseases into the current collection is a real possibility and can cause major loss of collection built over the years.

# **Potential Improvements**

- Clear focus of overall collections:
  - i. Three main goals planned for the PRC Collection:
    - Acquisition of landscaping plants for display through PPN, purchase from commercial nurseries and plant exchange programmes.
    - Conservation/research acquisition of species with provenance through plant collection trips

PRC is central to plant propagation and introduction exercises. To improve collections, many new introductions are needed and we will explore MoUs with neighbouring countries to foster collaborations in conservation and horticultural research and exchanges. Main collaborators will be Malaysia, Indonesia, Thailand and Philippines. Others may also include tropical Central, North and South American countries.

- Introducing technology for tracking of collections and inventory system
  - i. Asset tracking software (eg. RFID, QR code, barcode ) could be explored to efficiently track and update collection materials linked to the database
- Automation to increase productivity and efficiency
  - i. Irrigation system, plant production system can be automated and centralised for better output.
- Improved infrastructure
  - i. Approved up-grading of infrastructures will address the drainage, water usage efficiency, and increase propagation house capacity, replacement of timber and concrete benches and installation of new shade houses are required.
  - ii. Proposed training area for outreach activities with interns, volunteers and the public
  - iii. General holding areas need to be expanded to cope with future increases in collection for research and conservation while awaiting planting in suitable areas in SBG lawns.
- Staff training

- i. Staff to have hands-on training to support and train other workers.
- Improvement of Quarantine House
  - i. Enlarging the Quarantine House and installation of proper glasshouses, with climate controlled isolation bays, potting area and an incinerator room to meet quarantine standards for the wide range of plants that are being introduced from field collections and exchanges.
- Better support Research Collections
  - i. With all the improvements met, PRC will be better equipped in managing research collections, with improved irrigation, skilled staff, good infrastructure etc.

# **10-Years Management**

# 1-3years

# Facility

 PRC facility improvement to better meet the needs of the diverse plant collections and training /outreach

# Existing Collections (including Research Collections)

Review and revitalise the tree/palm/climber collections in the PRC to have healthy
plants with good plant form suitable for planting in the SBG lawns, cull unhealthy
specimen and change illegible old tag covered with algae. Overgrown tree specimens
rooted to the ground are to be removed or transplanted out to free up space for
new collection. Also to grow arboriculturally sound specimens for introduction into
the Gardens.

# Plant records/Inventory

- Update plant inventory, analyzing and de-accession of collection where necessary.

# **Training and Outreach**

- To continue to provide hands on training to Landscape Technicians, Horticulture officers with skills needed to grow the very broad range of plants in the nursery
- To continue training and cultivating interest in the community and contribute to plant conservation with collaborations through volunteer outreach, cadets and interns programmes
- Documenting propagation protocols of various species will be an important knowledge transfer process for the nursery and vital for conservation purposes as there is currently no protocol in place for tropical plant propagations.

# Conservation

- Conservation of SBG Heritage Trees' lineage
  - i. To establish the present collection strength in terms of conservation and botanical values for propagation

- Formulate and implement a succession strategy such as propagation (cuttings, tissue culture etc) and seed collection of valuable old and rare plants of known provenance to maintain the original lineage.
- iii. To compile and document propagation protocols on growing various plant materials of high conservation needs.

# <u>4-6 years</u>

**Collections** (including Research Collections)

- Improved facility will facilitate the increase propagation and inventory capacity of conservation plants of this region where many species are threaten with habitat destruction.
- To work with researchers in Herbarium on plant-collecting trips to the South East Asia region to acquire optimal germplasm.
- To acquire new plants through plant purchase from commercial nurseries, public gardens exchange, plant introduction, plant breeding programmes that can be introduced for display in the lawns
- Renewal of MoUs with relevant botanical institutions

#### Plant records /Inventory

- Explore and propose technology to track collections and inventory and plant demand
- Explore and introduce technology to improve the tagging process of accessioned plants

# **Training and Outreach**

- To work with Community Development Council (CDC) to tap local job seekers with temporary positions to fill position for Landscape Technicians, Assistant Horticulture officers with skills needed to grow the very broad range of plants in the nursery

#### Conservation

- Conservation of SBG Heritage Trees' lineage

i. Formulate and implement a succession strategy such as propagation (cuttings, tissue culture etc) and seed collection of valuable old and rare plants of known provenance to maintain the original lineage.

ii. To work with the respective lawn mangers to acquire genera and species currently not in SBG lawn collections in order to enhance their living collection in the garden.

# 7-10 years

Review of management plan and implementation overtime.

# 10 Year Living Collection Management Plan

Arboriculture

Date : August 2013

Arboriculture Team: Senior Manager: Shee Zhi Qiang Manager: Dennis Sng Manager: Ang Xing Qi Senior Officer: Md Fadli Bin Baharudin

Section Head: Elango Velautham

#### **Present condition**

- i) The Garden is generally divided into 4 areas. Namely Tanglin Core, Central Core, Bukit Timah Core and National Orchid Garden (NOG).
- ii) Currently there are 34 Heritage Trees in the Garden most of which were planted in the early decades of the last century, while a few are thought to pre-date the Gardens. These trees have experienced a wide variety of environmental changes caused by the extensive development that has taken place around the Gardens and in the Gardens themselves. Many of the heritage trees are in physiological decline, due to environmental stressors and natural senescence. By virtue of their grand stature and old age, heritage trees also attract a high rate of visitorship, which introduces additional stressors including soil compaction, vandalism, and unintended damage from over-enthusiastic visitors.
- iii) There are currently 3 sets of Standard Operating Procedures in place. They are,
  - a. Tree Inspection
  - b. Tree Pruning
  - c. Tree Selection & Planting.

The tree inspections are scheduled according to the nature, category and location of the trees. Trees with important heritage values like our Heritage Trees are inspected once every 3 months, as are trees with high risk targets, such as those planted near car parks and major thoroughfares. . The target inspection frequency of the remaining trees is once every 6 months.

Pruning work is prescribed based on the findings in the Tree Inspection reports and carried out under the supervision of Certified Arborists. The main objectives of pruning works are to improve tree growth form and to ensure public safety. If a tree is recommended for removal, a replacement tree will be planted, taking into consideration species characteristics, lawn/area analysis and the availability of nursery stock.

iv) Tree inspections are carried out by the arboriculture team, comprising 4
 ISA-certified arborists, and the lawn management team, of whom 7 are
 ISA-certified arborists. A first-level visual inspection is conducted on every
 tree in the inventory. Trees that require additional investigation are
 referred for second-level inspection, which may involve aerial assessment

and the use of resistographs and tomographs to assess the internal structure if the tree.

#### Weakness

- Many of the trees in the Gardens, including the Heritage trees, are gradually deteriorating in health and approaching the end of their natural life span. It is important to implement succession plans to maintain the heritage lineage of these trees. This can be accomplished by cloning or propagation (eg. via seed collection, cuttings, marcots, grafts, etc).
- ii) There is currently no Standard Operation Procedure (SOP) for maintaining Heritage Trees, collecting of specimens from trees and maintaining trees which are meant for ex-situ conservation. An SOP should be written to ensure that all aspects of tree health and structural integrity have been addressed and that comprehensive documentation is kept on all treatments carried out on each tree.
- iii) The Gardens' arborist team conducts inspections at least once a year to evaluate the physiological health and structural integrity of trees in the Gardens. These inspections are captured in a set of tree inventories, one for each of the four cores. While the inventories contain comprehensive information on the current health and safety of each tree, they are not structured in a way that allows expedient analysis of the data. They lack geospatial information to pinpoint the location of each tree, have to be updated manually, and are not backed up in a separate location. Most inspections are carried out on paper forms and maps and manually entered into Excel spreadsheets kept on the NParks server. The database system currently in use, BG-BASE, is unable of supporting arboricultural requirements as this software was originally intended for living collection, nursery , herbarium and library database. However, a tree assessment module is being developed and is expected to be released within a year's time.
- iv) Many trees in the Gardens have structural defects and are thus more prone to failing in severe weather. Examples of this are trees which have a leaning structure, co-dominant trunks and trees with root systems which have been compromised due to the development of buildings, roads and walkways. Very large old historical trees and heritage trees represent a high proportion of trees with such defects.

- v) The trees in the Singapore Botanic Gardens support a wide variety of epiphytic, parasitic, and climbing plants. These plants are routinely removed from the trees found in parks and streetscapes, which leaves the Gardens as one of the few remaining repositories of such plants outside of the nature reserves. Some climbers found in the trees on the lawns, e.g. the *Entada polystachya* at Lawn F, are even believed to predate the establishment of the Gardens. This repository of epiphytic, parasitic and climbing plants is currently unmanaged due to the lack of comprehensive information on their population size, location and impact on the trees that they grow on.
- vi) The four dominant pests in the Gardens are termites, squirrels, mosquitoes and bees. Termites are one of the major pests affecting the trees in the Gardens, predominantly the gymnosperms. Squirrel damage is similarly prevalent throughout the Gardens, resulting in the destruction of flowers and new shoots on trees. Squirrels also gnaw on the bark of certain tree species, e.g. Sterculia spp., causing damage to the cambium layer and disrupting the live tissues, which in turn affects tree health and may potentially result in branch failure. Mosquitoes are often found breeding on cavities and pockets of trees and it is also found on large leaves and palm fronds on the forest floor. Although they do not have an adverse effect on the botanical collection, they are potential carriers of dengue fever, which is potentially fatal to humans. Bees provide many benefits to the botanical collection as pollinators, but have the potential to disrupt arboriculture work or cause severe discomfort to allergic individuals.
- vii) Apart from problems mentioned above that plague arboricultural management in the Garden, many growth problems of trees seen today are products of mismanagement in terms of wrongly selected tree species, wrong pruning, guying & staking techniques, improper planting, lack of watering, fertilising and absence of Leaf Litter Management (LLM). Leaf litter was always swept and discarded, and only in recent years this has been introduced. However, LLM is inconsistent and irregular, and even when carried out, was done wrongly.
- viii) Currently, the Arbo team is not actively involved in publications in arboriculture. Any significant management of trees that takes place, the information is not channelled to appropriate papers and thus does not reach other arboriculture practitioners at large.

#### Potential for improvements

#### a) Heritage Trees management

Our heritage tree management plan has two overall aims – to safeguard the viability of existing specimens and to preserve the genetic lineages represented by these specimens.

- I. To safeguard the viability of our existing heritage trees, we will formulate a 10-year management plan for each tree, addressing three broad categories – environmental conditions, physiological health and structural integrity. Each management plan will propose solutions to extend the safe, useful lifespan of the tree and to encourage visitors to experience the trees without causing excessive negative impact. Such solutions may include soil treatment, mechanical support, or installation of boardwalks, fencing etc to reduce soil compaction, among others. Each plan will be reviewed every three years based on annual tree inspection records. Since many of the heritage trees are either emergent above the canopy or isolated in the middle of an open lawn, we will install lightning protection systems in all heritage trees to mitigate the effects of lightning strikes on these trees.
- II. To preserve the lineages of our heritage trees, we will attempt to propagate (seedlings, cuttings, grafts and tissue culture) from each tree. The same will be carried out in conjunction with our ongoing programme for ex-situ conservation of rare or endangered tree species. Working with the Plant Resource Centre, propagules will be nurtured in the nursery and eventually planted out onto the lawns, to serve as replacements in case the parent tree has to be removed. The success of this programme will be reviewed annually to evaluate the need for further collection or development of other propagation techniques.

# b) Ex-situ conservation of trees.

- I. Existing materials for conservation shall be identified and recorded.
- II. Proper pruning records and SOP shall be implemented to manage these trees. This is to ensure that the trees do not develop significant arboriculture problems when they mature.
- III. Watering and fertilizing regime shall be implemented to ensure optimum growth of the trees.

IV. Fruiting materials or cuttings shall be harvested when available and sent for propagation. This is to ensure continuous preservation of the tree species and conservation of its genetic material. Methodology and the success rate of propagation shall also be documented, for the refining of future propagation efforts by any relevant parties.

# c) Maintaining and installation of Lightning Protection System (LPS)

- Existing LPS will be inspected biennially for functionality. Damaged LPS or LPS that are about to become embedded in the trees shall be replaced after each inspection.
- II. LPS shall also be installed in lightning-prone trees and trees that have been granted heritage status.

# d) Management of high risk trees.

- I. Existing trees in various outdoor car parks, I.e. HQ car park, Linear car park, JBCG car park, Raffles Building car park are currently inspected once every 3 months. This is to ensure public safety as these places are highly utilised and risk should be managed. If need be the frequencies may be increased or reduced as safety requirements change.
- II. A regular pruning programme implemented currently to manage high risk trees in car parks, will render some trees weak over the long term. Such trees, together with risk-prone and storm-vulnerable trees will be considered for culling and replaced with more suitable species. This will include replacing these existing species in our car parks: *Syzygium grande, Khaya senegalensis* and *Terminalia ivorensis*.
- III. Planting of replacement trees will be carried out where needed. Trees with relatively lower risk will be planted as part of the plan to phase out the undesirable trees with arboriculture problems.
- IV. The target inspection frequency for trees growing along roadsides is currently 6-monthly, and we may need to increase the frequency to quarterly inspections. This is to ensure the safety of road users and garden visitors.

# e) Use of technology in tree inventory and inspection

١. While we await the creation and incorporation of arboricultural modules in BG-Base, the tree inventories will be centralised into an in-house relational database system, such as MS-Access that will be set-up in the interim. The database will be structured to allow expedient conduct of the following analyses – change in tree health and safety over time, prioritisation of trees according to risk, types of follow-up actions in response to inspection results, and tree failure trends. The arborist team will work with the Plant Records Unit and external partners to create a Geographical Information System for the Gardens. 3D aerial mapping is a new technology that will be employed within the next year, and this is useful in the mapping of the topography and trees in the Gardens, as well as provide information on the health of the upper canopy, which cannot be observed from the ground. Handheld electronic devices may also be used to allow instant updating of the databases via web synchronisation, as well as backing up of data on cloud servers, if possible, by working with NParks IT. Wireless technologies will be explored extensively and incorporated into the daily work of the arboriculture team.

# f) Categorisation of trees

- All trees will be categorised according to their status or potential problems. This aims to segregate and group trees with common problems, which will enable us to better prioritize, prescribe inspection frequencies and allocate adequate maintenance programmes.
- II. The categorisation of trees includes :

-Heritage Trees,

-Trees in Car parks,

-Trees with valuable conservation material,

-Roadside Trees,

-Pest-affected trees,

-Trees with structural defects (lean, co-dominant, anchorage etc),

-Trees growing along roads and pavements with compromised root system

# g) Standard Operation Procedure (SOP)

- I. New SOP will be developed for the following processes
  - Maintenance of Heritage Trees
  - Maintenance of all trees-LLM, Watering (Soil and leaf litter layers independently), fertilising.
  - Tree removal SOP
  - Specimen collection for herbarium & DNA vouchers and for nursery/in vitro propagation.
  - Maintenance of ex-situ conservation materials that are near threatened or extinct in the wild, strictly adhering to the growth requirements and pruning as and when needed according to appropriate growth requirements, such as Orthotropic vs. Plagiotropic growth management (OPGM). This is absolutely critical to avoid future problems, especially in young trees.
- II. Verification of work done on site will be done via a verification form. This is to ensure tree works are carried out accurately and other parties involved are well notified. In addition, it will also help us to document and track tree works done on trees and also specimens collected. This single sheet of information is easily retrievable, and leads to a larger dataset if needed.

# h) Tree profiling

i) Moving forward as a research institute, with aims of leading conservation arboriculture, we hope to document each tree species' performance in terms of their distinctive physical and physiological growth characteristics. This allows us to build knowledge of their potential failure risk or usage/aesthetic/urban potential and hence, ensure that we have a proper tree management plan implemented for each tree species. The knowledge gained will be published for the benefit of society. The arbo team aims to become the primary source of tree profile information as SBG has a diverse collection of trees that is continually growing.

# I) Integrated pest management

I. A pest management strategy will be formulated to address our current pest problems with the main aim of addressing arboricultural pests. This

will consist of immediate actions for eradication and long term treatment for keeping the pests under control.

# J) Management of trees with structural problems

I. Tree inspections have to be reviewed to identify trees with structural defects. For trees which have multiple co-dominant stems and weak attachments, a Cobra® dynamic cabling system will be installed to hold and support the multiple stems. Propping, guying and staking systems derived from scientific analyses (biomechanics etc) will be implemented on leaning/problematic trees to provide structural support. Leaning trees will also be monitored at least once a month to determine the trees are leaning progressively more. Structural supports will be installed on a case-to-case basis, with priority given to trees with high heritage value and rare species. Other potential solutions include leaf litter management (leading to naturalised soil de-compaction) and possible fencing-off of the vulnerable trees with compromised root systems.

# K) General tree management

- I. A tree file will be created for each tree specimen by the arborist-incharge in phases (see Meeting Level 1 Goals). It will contain the tree's inspection and maintenance history. This tree file will also contain all other relevant information on the tree. This collection of data is important for us to study the tree's growth and may help us to formulate better approaches to tree care.
- II. To ensure that the health of our living tree specimens are sustained into the future, we will ensure that all our trees have a systematic regime of fertilisation, watering and leaf litter management. All trees are to be monitored that they have sufficient fertilisation, water and leaf litter during the routine tree inspection. All trees in SBG shall be managed by this SOP: Leaf Litter Management, Fertilising, and Watering.

# L) Epiphyte and climber management plan

Our epiphyte and climber management plan will comprise two stages

 a survey of the epiphytic, parasitic and climbing plants found within the Gardens, and the formulation of appropriate management guidelines based on the survey. The National Biodiversity Centre may be engaged to study the utilisation of these plants by various fauna

and to evaluate their conservation value. Older and larger specimens such as the *Entada polystachya* on Lawn F may warrant individual assessments and solutions. In the case of the *Entada*, it is entirely supported by three dead trees adjacent to Swan Lake. We will develop a tunnel trellis to support the *Entada* while removing the three dead trees.

# **10-Year Arboriculture Management Plan**

- Goals:
- Level 1) Ensuring safety and long term tree health

Level 2) Improving productivity in tree management (use of technology and staff training)

Level 3) Contributions to science (tree knowledge) and ecological services (promoting biodiversity, facilitating ex-situ tree conservation)

# Meeting Level 1 Goals - Ensuring safety and long term tree health

General tree	Compiling a	Includes:	
management	comprehensive	1) Tree inspections records for all	Year 1-3
	tree inventory	trees	
		<ol><li>Risk-level/ value of trees</li></ol>	
		<ol><li>Pruning records</li></ol>	
		<ol><li>Horticultural maintenance records</li></ol>	
		i.e. pruning, leaf litter management	
		(LLM), fertilising,	
		5) Phenology – fruiting, flowering,	
		new leaf flush	
		<ol><li>Physical growth i.e. tree height and</li></ol>	
		girth	
		Pick Catagorias:	Voor 1 2
		1) High rick troop Car	rear 1-5
		1) Fight list liees - Cal	
		trees/restricted root zone (trees	
		with root zone compromised by	
		development)	
		<ol> <li>Medium risk – trees with targets</li> </ol>	
		3) Low risk – trees without targets i.e.	
		saplings	
		High value trees – i.e. heritage trees,	

	historical trees, critically endangered.	
Tree files	<ul> <li>Phase 1:</li> <li>Compiled for all high risk trees and high value trees</li> <li>Includes: <ol> <li>Environmental conditions in which the tree is growing in i.e. on slope, light regime</li> <li>Structural defects</li> <li>Physiological issues i.e. pest &amp; viral attacks, nutrient deficiencies,</li> <li>Recommended follow-up actions</li> </ol> </li> <li>Phase II &amp; III:</li> <li>Tree files for the rest of the collection including new saplings</li> </ul>	Year 1-3
	<ul> <li>Tree files to be reviewed periodically:</li> <li>1) To check if the recommended follow-up actions taken were effective and if any other solutions to be explored.</li> <li>2) Capture photographs of tree progress</li> </ul>	Year 4-6
SOP	Establish & Review SOPs for: 1) Tree inspection 2) Tree planting 3) Tree pruning	Year 1-3
	Management of high risk trees	Year 1-3
	Management of high value trees	Year 1-3
	Root-zone management (includes, leaf litter and fertiliser application)	Year 1-3
	Watering regime during dry season	Year 1-3
	Decision making guidelines for management of epiphytes and climbers on trees	Year 4-6
	Lightning Protection System (LPS) <ul> <li>Decision making guidelines to</li> <li>install LPS on trees</li> </ul>	Year 1-3
	- Maintenance of LPS on trees	Year 1-3

<ul> <li>Integrated Pest Management <ul> <li>Preventive Plan (e.g. monitoring plans)</li> <li>Reactive Plan: A guide to determine the severity of the problem and provide guidelines to reach possible mitigating solutions and if necessary.</li> <li>Termites</li> <li>Squirrels</li> <li>Mosquitoes</li> <li>Bees</li> </ul></li></ul>	Year 1-3

# Meeting Level 2 Goal - Improving productivity in tree management (use of technology and staff training)

Mobile hand- held devices for		Aim: For instant updating of tree inspection and inventories.	Pilot Year 1-3
tree inspection		For instant coordination and communication with contractor.	
		With instant backup of data on cloud servers	
Relational Database Management System		To facilitate analysis of data so as to make informed management decisions. (i.e. change in tree health and safety overtime, tree failure trends, prioritisation of trees according to risk and value).	Pilot Year 1-3
		Full capacity	Year 4-6
Remote Sensing	3D aerial	Aim:	
Capabilities	mapping	<ol> <li>To facilitate tree canopy inspection for tree health</li> </ol>	Pilot Year 1-3
		<ul><li>2) To facilitate overall SBG mapping</li></ul>	Year 4-6
Staff training	Skill Upgrading	Arboriculture skills of the Arborist will be upgraded with respect to needs of performing arboriculture works in the Garden with a more hands-on approach	Year 4-6

Meeting Level 3 Goal - Contributions to science (tree knowledge) and ecological services (promoting biodiversity, facilitating ex-situ tree conservation)

Tree Profiling	Aim: For SBG Arboriculture	Pilot Year 1-3
	Unit to become the primary	
	source of tree profile	Year 4-6 (to promote
	information for our diverse	and advocate Tree
	tree collections.	Profile information
	Information includes:	application among
	To document each tree	local arborists)
	species' performance in terms	
	of their distinctive physical and	Year 7-10 (to promote
	physiological growth	and advocate Tree
	Tree failure rate	Profile information
	Tree growth rate	application among
		arborists
		internationally)



MANAGEMENT ZONES BY LAWNS

# APPENDIX iii LIST OF ECOLOGICAL SURVEYS



# APPENDIX iii LIST OF ECOLOGICAL SURVEYS

Subject	Year and Surveyor	Notes
Butterfly survey	Published January 2009, Khew Sin Khoon	On-site observation and compiled checklist by a nature society butterfly enthusiast on butterflies sighted in SBG.
Flower-visiting bees and wasps survey	Published 2013, Soh Wen Wen	
On-going survey identifying hot-spots of <i>Amphidromus</i> <i>inversus</i>	Carried-out 2010/11 onwards, Dr. Cai Yixiong	
Bird survey	Published 2008, Morten Strange	On-site observation and compiled checklist by a nature society enthusiast.
Rainforest survey	Carried-out 2009-2011, Singapore Botanic Gardens staff	
Dragonfly survey	Carried-out 2009, National Biodiversity Centre Staff	Preliminary survey
Lichen survey	Carried-out 2001, Dr. Harrie Sipman	Invited research collaborating with Raffles Museum for Biodiversity Research and School of Biological Sciences, National University of Singapore. Research Grant: RP 154- 000-049-112
Moss surveys	Carried-out 1999 and 2005, Dr. Benito Ta	Observational surveys
Biodiversity data from the National Biodiversity Centre's BIOME database	1822-2011	
Spider survey in the Rainforest	Carried-out 2011 and 2012, Court, Wan, Low & Cai	
Bird survey	Carried-out 1989, 1998, 2004 and 2008, Morten Strange, Lim Kim Seng, Subaraj and others	Checklist compilation and on-site observation recorded by nature society bird enthusiasts.
Bird Survey	Carried-out 1898, H. N. Ridley	Observational sightings and documentation.
Tyersall Woods Part 1, tree survey	Carried-out Nov 2008 – Feb 2009, various	Led by the National Biodiversity Centre
Tyersall Woods Part 2, tree survey	Carried-out Nov 2008 – Feb 2009, various	Led by the National Biodiversity Centre

APPENDIX iv CHRONOLOGY



# APPENDIX iv

# CHRONOLOGY

Concise chronology of the Singapore Botanic Gardens' history (items in blue are believed to be well preserved and authentic today; other key heritage events are highlighted in red). Written by N.P. Taylor (Director of the Singapore Botanic Gardens).

Date	Historical event/action [data source] <sup>1</sup>	Notes
Before 1859	A number of 'heritage' trees thought to antedate the foundation of SBG, e.g., the Cyrtophyllum fragrans (Tembusu) that features on the S\$5 banknote and the Alstonia pneumatophora (Pulai basong) NE of Swan Lake – it is assumed that these are omitted from the appendix in the first Guide to the Gardens by Fox (1889), because they had not been planted by Gardens' staff. Similarly, the origin of the remaining sago palm clump at SBG's boundary with Holland Road near Main (Tanglin) Gate may be as early.	<ul> <li>With the exception of the Gardens Rainforest, most of the area acquired in 1859 is thought to have been cleared of extant vegetation.</li> <li>The Alstonia is indicative of former swamp forest.</li> <li>The sago palms are mentioned by Burkill [Gard. Bull. 2: 98 (1918)] as being allowed to remain by Murton; they are visible in a postcard, c. 1920.</li> </ul>
1842	The grave of an important Hokkien Chinese and his wife, believed to be the oldest burial in situ known for Singapore post 1819, is located on land between the modern Jacob Ballas Children's Garden (JBCG) car park and NUS campus; a more elaborate adjacent grave of presumed family relatives dates from 1881 and may be an early example of inter-racial marriage [email rec. 6.10.2011, from Hui Yew-Foong: yfhui@iseas.edu.sg]. The 1842 grave is not located within the area of the original botanic gardens, but on the land added in 1879. These graves were preserved when Raffles College was built on this land in the 1920s and are marked as masonry structures on the 1924 topographical map of the British colony.	A decision is needed on how to interpret these graves, when the planned extension of the JBCG into this area occurs (but communication needs to be handled carefully in view of URA's rules); either way, their protection/ preservation is very important on cultural grounds. NB. the grave of a man who died in 1833, in the Bukit Brown Cemetery [cf. ST, Sat. 15.10.2011], was moved there in the 1940s, hence the SBG burial is an older in situ example [Tan Beng Chiak, email rec. 10.01.2012].
1850s	Cast-iron gazebo originally constructed at Admiralty House in Grange Road – said to be the oldest built structure currently at the Singapore Botanic Gardens.	This was transferred to the Botanic Gardens in 1969, subsequently restored and is now located overlooking Swan Lake.

<sup>1</sup> Items not referenced are mostly taken from Tinsley, B. (2009). *Gardens of Perpetual Summer. The Singapore Botanic Gardens*. National Parks Board / Singapore Botanic Gardens, or from the earlier principal source by I H Burkill, *Gardens Bull. Straits Settlements*, vol. 2 (1918) and SBG annual reports.

Date	Historical event/action [data source] <sup>1</sup>	Notes
1859	The re-established Agri-Horticultural Society acquires 22.4 ha in Tanglin gifted by its leading member, businessman Hoo Ah Kay ("Whampoa"), on lands in part formerly down to plantations (probably of gambier – Uncaria gambir), bounded to the south by Napier Rd (now Holland Rd) and soon after the British military barracks, and to the east and north by Cluny Rd, and to the west by the Tyersall Istana of the Temenggong. This is the founding year of SBG. Hoo's gift was facilitated by the Colonial Govt, who also provided convict labourers to SBG. Previous land owners are identified in Burkill's history of SBG (1918).	Described as "a haunt of tigers", the area of mainly secondary vegetation included 6 ha of 'virgin' rainforest, which in somewhat modified form, exists today and is an important genetic resource for the region, holding representatives of various species otherwise extinct in Singapore [Gardenwise 24: 10– 11 (2005)]. It is being reinforced with species thought to have been native in Singapore, but now either very rare or extinct on the island.
1860– 1864	Lawrence [originally Laurence] Niven, a Scottish nutmeg plantation manager employed on Prinsep's estate (between Orchard Rd and the 'Brass-Bassar' canal), was engaged as SBG Manager, soon clearing the southern part of site of secondary vegetation; Bandstand Hill terraced and laid out with flowerbeds, Bandstand area defined 1860/61; roads allowing one-way traffic curved around the hill; soon after Maranta Ave, Liane Rd, Upper & Lower Ring Roads, connecting paths, and later road to Main Gate established (at present Tanglin Gate site). The Bandstand area was used for concerts more or less continuously until the 1970s (the Bandstand's structure was built only in 1930). Niven designed the 1860s layout of SBG. His landscape design style resembles that of the 18 <sup>th</sup> C English Landscape Movement or Victorian municipal park.	At this date Bandstand Hill was the highest point in the Gardens at 33 metres above sea level. Public vehicular traffic was permitted to enter the Gardens until the 1960s. His interest in taking the Manager's position likely reflected the fact that nutmeg had suffered a major decline due to disease. Whampoa had sold his share in Willans' nutmeg plantation for the construction of Tanglin Barracks. Niven's family included other well known garden managers. Niven Rd, Singapore, is named after him.
1861	Niven planted a Tiger Orchid on ground at the junction of the Office Gate Rd and what became the Main Gate Road. The orchid is still there and is now 4 metres in diameter	<i>Fide</i> I H Burkill, SBG Illustrated Guide (1927), p. 30
1862	Temenggong planted the avenue from Napier (now Holland) Road to the Tyersall Istana with Tembusu trees (see Burkill, Gardens Bull. 4(2): 70, 1927). These include some of those currently marking the western boundary of The Dell (Lawn G) and those along the Tyersall Avenue.	These Tembusu will all be included within SBG when the Tyersall Learning Forest extension is fully incorporated into the Gardens and the original Tyersall Ave expunged. The average girth of the 15 remaining single-trunked trees in 2013 was 3.62 metres (after 150 years).
1866	12.1 ha of extensions to the site at the west and north- west acquired/purchased; Swan Lake excavated in the western extension (earliest extant designed water body in Singapore) and both it and the NW extension included an area of swamp forest [Gardens Bull., Straits Settlements 2: 100, 107], which in the case of the latter survived until at least 1915. Govt contributing \$50/month to Niven's salary	See Gardens' map, l.c. 32 <sup>1</sup> .
Date	Historical event/action [data source] <sup>1</sup>	Notes
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1867	Manager's residence, later named Burkill Hall, began construction within the north-west extension, on a hill 35 metres above sea level (building completed 1868). Burkill Hall is now a Conserved Building. It is the oldest building constructed in situ and was occupied as the home of successive Superintendents and Directors until 1969; it was restored in the 1990s as part of the development of the National Orchid Garden, which now surrounds it [Gardenwise 40: rear cover, 2013].	The Agri-Hort Society's Secretary entered into a contract in 1867 with a Chinese builder for the construction of the Manager's house, although its start is often erroneously given as 1866. The building is currently available for hire for private functions, whilst the ground floor area is open to the public and includes interpretation of SBG's orchid breeding and VIP naming programme.
1869	Govt support for Niven increased to \$100/month.	
1870	Annual report of Agri-Hort Soc mentions that plants had been supplied to gardens at Saigon, Mauritius and South Kensington (London), whilst Bogor (Buitenzorg, Java), a Dutch colonial garden, had gifted many plants to SBG.	Plant exchange has been an activity characteristic of botanic gardens since early in their history and was common in colonial times.
1871	In March the Society held a flower show in temporary buildings upon the band parade area, which was attended by the King of Siam [Straits Times, 25.03.1871]. It is also recorded that a military band played upon the adjacent parade area.	The event was recorded in a photograph by Mr Sachtler, preserved at the Nat. Archives (UK). This shows the King and (?) Straits Governor, in front of the buildings, and may also show Whampoa and Lawrence Niven in the crowd.
1874	Agro-Horticultural Society's debts incurred by the above land purchases and developments resulted in transfer of SBG's management to colonial government (the legal process was completed only in 1878). Govt advertises that SBG is now open to all members of the public, not just the Society's subscribers (who retained the right to cut flowers).	At this stage the Gardens, according to I H Burkill, were of pleasant parkland in character, but had no scientific value.

Date	Historical event/action [data source] <sup>1</sup>	Notes
1875	Henry James Murton, a young gardener-botanist, appointed Superintendent (as Niven's superior, who, however, died while on leave and was buried in his native Scotland (in 1886) and over next 5 years introduced many plants from Sri Lanka, Malaya (plant-hunting expeditions for gutta-percha), and via exchange with Kew, Mauritius, Australia (Brisbane) etc., turning the former parkland into a credible botanical garden, founding its herbarium and library, developing its role in economic botany and introducing species that eventually became new crops, e.g., Pará rubber and African oil palm (from Peradeniya BG), today major money-earners in SE Asia. Thus, SBG joined the ranks of many other British colonial gardens being founded across the world at this time [Crane, P. (2001), Gardenwise 16: 4–8]. Murton's annual report for 1875 apparently had an appendix listing the plants in cultivation in SBG, but this is lacking in SBG's archive. Supplementary lists were publ. in 1879 & 1880. From early photographs (as confirmed in Burkill's history) the southern part of SBG is seen to have mainly very young trees, since Murton was the first to plant up the area as an arboretum, which had yet to mature.	Murton's appointment recommended by Sir Joseph Hooker, Director, RBG Kew, where he had been trained. Prior to SBG he was in Sri Lanka for 3 months, acquiring plants for SBG. Murton is credited with establishing the first collection of orchids at SBG, a plant group that was to become pre- eminent in the Gardens history – see entry for 1925. The herbarium and botanical library were the first in Malaya. From 1875 the Gardens also housed a significant zoological collection, including various large animals (bear, rhino, leopards, tigers etc.), only smaller ones being retained after 1878, until closure in 1904/05 (but see entry for 1896). An article by Ridley [Agricultural Bulletin 6(2): 38 (1907)] says that the oldest oil palm in SBG had reached 40 feet in height after [c.] 30 years. It is possible that Bogor had already supplied SBG with oil palm.
1876	Botanical artist, Marianne North, visits and records SBG, reporting Nepenthes as growing in the Gardens' Rainforest [M. North, (1980), A Vision of Eden, 94. RBG Kew]. Straits Times published anonymous letter warning SBG visitors of the risk of tigers and leopards escaping from the Gardens' zoo [ST 11.11.1876].	North's paintings of Singapore are on display in the gallery bearing her name at RBG Kew, but do not include images of SBG. The cages had been vandalised by an unknown person to release the animals, but was unsuccessful.

Date	Historical event/action [data source] <sup>1</sup>	Notes
1877	22 seedlings of Hevea brasiliensis ('Pará rubber') arrived in June from Kew – Murton kept 12 seedlings and planted these at SBG – see entry for 1895; an earlier consignment received the previous year had apparently failed [Desmond, R. (1995), Kew, 257]. Murton also introduced various kinds of coffee, the first major agricultural industry in the Federated Malay States. First Economic Garden being laid out (on the 1866 NW extension). Various rockery structures begun and installed over next 2 decades in diverse areas of Gardens. Upon the death of the Rhinoceros its wallow between Swan Lake and Napier (now Holland) Road converted to a lily pond, which in more recent times became the Marsh Garden.	[Remaining rubber seedlings were sent to Perak and Malacca where at least 1 original specimen survives]. George Smith appointed Head Gardener, but died in April 1878. By 1879 the first Economic Garden had been established including various kinds of coffee, tea, cacao, sugar cane, rubber, avocado, cardamom and various timber and fruit trees (in the area of the present Symphony Lake).
1070	Delase established accur Church Deed automas (Office	See entry for 1969.
1878	Gate Road). Rubber saplings planted out (see above), cf. Gardenwise 28: rear cover image (2007).	tigillarium by Office Gate Road may be the sole survivor of this planting.
1879	Catalogue of collections supplementary to that appended to 1875 report published. Contiguous area of 41.1 ha (known as the 'Military Reserve') acquired to north of Gardens for experimental cultivation of economic crops, incl. the above (all except the southernmost part of this area was subsequently annexed from 1921, then in parts returned to SBG over the next 82 years). Palm Valley established.	Total area of SBG reached 75.6 ha. SBG Herbarium had accumulated more than 3,000 determined species. The 'Military Reserve' had been occupied by Chinese, probably for the cultivation of gambier, fruit trees and indigo (see entry for 1843). Walter Fox appointed Head Gardener.
1880– 1881	Murton sacked (1880). Kew-trained Nathaniel Cantley appointed Superintendent, soon erecting a building to accommodate the herbarium & library; also carefully labelled living collections in line with modern classifications; appointed qualified staff. He was on sick leave from March 1881 and took a collection of some 1,500 dried Gardens' specimens to Kew for identification (however, few are known to have been retained in the Kew Herbarium, perhaps because they were of poor quality). Before returning, he acquired living specimens for SBG from Kew (260 examples) and British nurseries.	Cantley was Assistant Superintend- ent at Pamplemousses BG, Mauritius, prior to arrival at SBG. He established nurseries for ornamental plants and plant sales outlets, for the production of 100s of 1000s of street trees, and for reforestation in Singapore, were started in 1881. Rationalized staff accommodation on site. Murton's final catalogue of the Gardens' collections, those added in 1879, published by Govt Printer, but contains many typos.

Date	Historical event/action [data source] <sup>1</sup>	Notes
1882	Ridley Hall constructed (as office building and herbarium), subsequently used by the Director from 1888. 'Plant House' constructed for public flower shows, displays of potted plants and annuals, and for revenue generation from plant sales (permanent roof completed 1885 and later extended for orchids – now the Fernery); many Singapore city trees planted under Cantley's supervision. In SBG, Malayan timber trees were planted in the 'Military Reserve' extension (it is presumed that these formed the area identified on subsequent maps as the 'Arboretum'). Some of these timber tree plantings persist today. Seed of Samanea saman, the rain tree, received in quantity and grew rapidly – it is possible that the oldest examples in SBG are from this time. Nursery built in 1 acre of former rainforest, now known as the Potting Yard. Sometime during or shortly after 1882 The Dell at the north end of Swan Lake was begun, initially as a place for ferns. This feature still survives and has a unique enclosed jungle-like character, though it has undergone various modifications.	Ridley Hall is currently in need of refurbishment following termite damage. The Plant House has been repaired and modified on the original site many times over the years and it is clear that not much is original – the main uprights resemble RSJs and may derive from its last major refurbishment in the 1950s [a separate file detailing its history is available]. The oldest rain trees now at SBG appear to be that near the Nassim Gate Visitor Entrance and another by the Chinese graves (both visible in 1948/1950 aerial photos). Information on and illustrations of The Dell can be found in IH Burkill, 'The Botanic Gardens, Singapore Illustrated Guide' (1927) and by the same author in Gardens Bull. 4(2): 69–77 (1927) – see Gardenwise
1883– 1884	Cantley commissioned to prepare survey of Straits Settlements' forests in view of their rapid loss; he identified Forest Reserves. In 1884, he re-established the	40: 18 (2013). In 1884 Cantley was appointed Director of the newly set up Forest Department, giving SBG an early
1886	Penang BG and SBG retained its control until 1946. Main Gate pillars completed (begun 1885).	role in forest conservation. The modern pillars at Tanglin (Main) Gate are spaced as per the originals.
1888	Henry Nicholas Ridley (b. 1855) appointed first Director, SBG. Established Gardens as a world centre for the study of tropical botany and its economic application, later popularizing rubber; credited with describing c. 1,000 plant species new to science from Malaysia etc., and author of >500 scientific papers; elected FRS in 1907; died in 1956, after a long retirement, in which he worked at Kew [Gardenwise 25 (2005) incl. various accounts of his life]. Before coming to SBG, Ridley had worked at the Natural History Museum in London and had undertaken an expedition to Brazil. At the time of his arrival as Director there were believed to be 1,000 mature examples of Hevea brasiliensis growing at SBG's Economic Gardens.	Cantley had died while on sick leave in Feb. 1888. Ridley was dubbed "Mad" or "Rubber" Ridley etc. for his perseverance in the face of much opposition to introduce rubber as a commercial crop, developing an improved technique for tapping the latex without damaging the tree – see entry for 1895. According to Lamb (2010: 61) Ridley was the great-great grandson of John Stuart, 3 <sup>rd</sup> Earl of Bute, the botanical adviser at Kew to Princess Augusta, mother of King George III.

Date	Historical event/action [data source] <sup>1</sup>	Notes
1889	Guide to the Gardens written by Fox, prior to Ridley's arrival, published. Lawn F (west side of Swan Lake) planted with Leguminous trees [Gardens Bull., Straits Settlements 2: 105], of which the heritage tree Callerya atropurpurea is presumed to be a survivor, whilst others potentially of this age include Caesalpinia coriaria and Baikiaea insignis. Orchid House extension to Plant House built (now a fernery).	The 'Lawns' A–M [planting beds/ areas] Fox identified by letters, which are still in use today; Lawns O–Z were designated at a later date. Fox's Lawn lettering does not correspond with that adopted from 1913 onwards (as used here). It is assumed that planting lists appended to Fox's Guide omit trees extant at the time the Gardens were acquired.
1889	More than 1,000 Pará Rubber saplings from SBG planted at Bukit Mandai (a further 2,000 added in 1892). Ridley reports that tembusu was regenerating in the Military Reserve (Economic Gardens)	A number of old tembusu can be seen in the former Economic Gardens today (Bukit Timah Core)
1890	Construction of house on the hill in the Military Reserve (Economic Gardens) for Mr James de Alwis, who had produced 78 coloured botanical drawings (the house no longer exists). The drawings of the de Alwis brothers are preserved at SBG's Library. SBG charged with controlling rhinoceros beetle attacking coconut in the Straits Settlements, which was also affecting palms in the Gardens.	The botanical artists, the de Alwis brothers, produced drawings that are highly regarded. The younger brother, Charles, was more prolific making 185 artworks from 1899 until 1907. His older brother had left in 1894 over low pay.
1891	Agricultural Bulletin of the Malaya Peninsula established by SBG; later (1901) as Agricultural Bull. Straits and Federated Malay states. Cluny Lake, on either side of Cluny Road where it crossed the site, excavated in an area of swamp (on the SBG map dated 1925 this had shrunk to a mere pond after in-filling in 1922–23, but it was later extended southwards as Symphony Lake in 1975). A dead fig tree on the island in Swan Lake was replaced with palms and Pandanus. Palm plantings extended down Palm Valley.	Earliest serial publication from the Malay Peninsula devoted to plant sciences. Restyled as the Gardens Bulletin, Straits Settlements in 1913 (q.v., but backdated to 1912). The large clump of the Nibung palm, Oncosperma tigillarium, that occupies the island in Swan Lake may date from this time.
1892	An escaped pet crocodile had taken up residence in Swan Lake and subsequently attacked a worker. The lake was temporarily drained and the crocodile exterminated.	The crocodile is mentioned in Ridley's annual report [and in ST 23.01.1892].
1893	Ridley names Vanda 'Miss Joaquim', since 1981 Singapore's national flower [Gardener's Chronicle 24 June 1893]; today a section of the Gardens near Bandstand Hill is devoted to a display of c. 20,000 examples of the hybrid. Modern molecular techniques have confirmed its parentage, but indicate that the pollen parent was V. hookeriana.	Originally determined as V. hookeriana × V. teres, and originating in Miss Agnes Joaquim's Tanjong Pagar garden. Hybrid adopted in Hawaii for use in traditional flower garlands from 1926.

Date	Historical event/action [data source] <sup>1</sup>	Notes
1895	SBG Library's oldest book, Otto Brunfel's 'Pavli Aegi' (1531) gifted to Ridley by the British Museum. Tan Chay Yan plants 16 ha of rubber on his estate in Malacca (Bukit Lintang), the seeds sourced from Ridley at SBG (some refs say 1896, but Tan's biography has 1895).	Responsibility for Forest Dept ceased. This was the first occasion that Ridley's long-running promotion of rubber was taken seriously; by 1901 Tan C Y had expanded his Malaccan plantings to 1,200 ha.
1896	Letter to Mid-day Herald, 20.05.96, complaining about the cruel feeding of a live dog to a tiger donated to SBG 1895	This contradicts Burkill's statement (1918) that larger animals were not kept at the zoo after the 1870s
1897– 1899	West-facing hill slope in the southern part of the Economic Gardens planted with gutta. Ridley, H.N. Birds in the Botanic Gardens, Singapore. Journal of the Straits Branch of the Royal Asiatic Society 31: 73–89 (1898).	2 trees of white gutta, Palaquium obovatum, survive.
1900	Ridley's 'Flora of Singapore' published [Journal of the Strait's Branch Royal Asiatic Society 33: 27–196]. A photo said to date from early 20 <sup>th</sup> century shows Palm Valley already well developed <sup>2</sup> .	Ridley's Flora was based on his own field collections and the extensive holdings of the SBG Herbarium.
1902	Sand supplied for a children's playground on Bandstand Hill.	From this date it would thus appear that SBG was also specifically catering for a family audience.
1903	New herbarium/library building began construction on Lawn D (W of where the modern Botany Centre stands), completed and specimen cabinets installed in 1905.	[see annual reports and Gardenwise 20: 13–15 (2003)].
1904	Exhibition of diverse fibres extracted from plants in SBG mounted in Kuala Lumpur and demand for fibre plants had increased. Besides species just planted (see notes, right), ramie, pineapple, <i>Agave, Pandanus &amp; Karatas</i> were used	Ann. Rep. states that <i>Sansevieria</i> <i>zeylanica, S. guineensis, S.</i> <i>cylindrica, S. kirkii, Fourcroya</i> <i>gigantea</i> & <i>Musa textilis</i> were planted in Economic Gardens
1905	Annual report mentions an avenue of red-stemmed palms, which most likely refers to the current ave of Cyrtostachys renda, the sealing wax palm, now the brand logo of SBG.	[Gardenwise 24: rear cover (2005)]. This is a swamp forest species. The avenue was replanted in 1936.
1907	Annual report includes mention of a demand for oil palm seeds following an article by Ridley in the Agricultural Bulletin [vol. 6(2): 37–40 (1907)]. It is assumed seed was supplied from Murton's original plantings or their offspring. Plantations of oil palm were first established in Peninsula Malaysia a decade later, but were never attempted on any scale in Singapore itself. Later, from the 1960s, it supplanted rubber as the main plantation crop in SE Asia, but it is clear that by then stock from other sources was being used	A dense grove of oil palms is visible in the 1950 aerial photograph of the valley in the southernmost part of the land annexed for Raffles College. Seven of these specimens survive, the tallest being c. 10 metres, and all have smooth trunks indicating great age. They may date from a planting planned in 1920 [Gardens' Bull. 2(7): 217 (1920)].
1910	House for Assistant Curator built. This was later occupied by the Asst Director, E J H Corner in 1929 and is known as "EJH Corner House" [Gardens Bull. Straits Settlem. 2: 108].	This house, whose address was originally 30 Cluny Rd, is currently used as a fine-dining restaurant.

2 Desmond, R. & Hepper, F.N. (1993). A Century of Kew Plantsmen, Fig. 59a. The Kew Guild, Royal Botanic Gardens, Kew, Richmond, UK.

Date	Historical event/action [data source] <sup>1</sup>	Notes
1912	I. Henry Burkill appointed Director, continuing the Gardens' activities as established by Ridley etc., but appointing more scientific staff and increasing the research outputs. Published first history of the Gardens, 1918. A new series of the Agricultural Bulletin (as founded by Ridley in 1891) was launched (its title changed, see below).	After retirement (in 1925), Burkill published the monumental 'Dictionary of the Economic Products of the Malay Peninsula' (1935), incl. 36,000 entries on the uses of tropical plants.
1913	From Part 6 (December) of Volume 1 (see above) renamed as The Gardens Bulletin, Straits Settlements, which continues in publication today as The Gardens' Bulletin Singapore. Band performances attracting crowds of 1,000.	The preface of Part 6 indicates that the preceding 5 parts of Vol. 1 should be considered as part of the new journal.
1914	Observations made of the Earth's magnetism at SBG. The point in question is marked by an arrow installed in the bed of Symphony Lake pointing towards Greenwich, London.	The site for these observations was selected by the Royal Greenwich Observatory and Carnegie Institution, USA [ST 31 Dec 1979].
1915	Cluny Lake deepened and adjacent swamp filled in.	[ST, 29 May].
1917	Records indicate that by this year 7 million rubber seeds had been distributed from SBG to establish colonial plantations and it is likely that most such plantations originated from SBG stock, which seeds were sold to generate income for the Gardens. Singapore Housing Commission sought to acquire Economic Gardens land for their purposes, so transplanting of specimens commenced.	By 1920, Malaya was producing 50% of the world's rubber, facilitating the manufacture of tyres for the newly mass-produced motor car industry founded by Henry Ford. In 1921, 34.8 ha of this land was taken for Raffles Memorial College
		instead, leaving only 6.3 ha of the original Economic Gardens intact.
1918	Map of SBG published by I H Burkill indicates northern experimental plots of the Economic Garden planted with rubber (the majority of plots), sago, coffee, plantains, pineapple etc. The map also has the lettering of the Lawns begun in Fox's Guide (1889) extended northwards to the southern boundary of the Economic Gardens. Accommodation for Gardens' workers is marked as 8 or more buildings including for Watchmen.	Haji Sidek Bin Kiah was a botanist in the SING Herbarium, having been born on site at SBG in staff accommodation in 1932 [Gardenwise 39: 6 (2012)]. Rasidah binte Zali, a long-serving gardener at SBG, was likewise born on site in 1958.
1919	'House 6' completed in January as the Field Assistant's quarters (C X Furtado was appointed as Field Assistant in 1923, but later titled as Botanist). More trees threatened by housing development (as above) transplanted to Lawn Z, now the site of the National Orchid Garden and its nursery. Some of the very large specimens of Khaya, durian and tamarind in the orchid nursery may represent survivors from this time. T F Chipp appointed Asst Director (until 1920).	House 6 must have been started before the loss of the Economic Gardens land was known. It is currently occupied by the NParks National Biodiversity Centre, but should ideally be made accessible to the public in view of its historic significance.

Date	Historical event/action [data source] <sup>1</sup>	Notes
1920	Now named Holttum Hall, a 2-storey building, later used as the Director's office and orchid propagation laboratory, was under construction (completed in 1921). Later, the upper storey was in use as an in vitro orchid propagation facility until the 1970s.	Currently in need of refurbishment following internal adaptation as a modern office space and recent termite damage.
1921– 1924	SBG land at northern end of site (all except the area incl. staff accommodation at the southern end of the Economic Gardens) transferred by Colonial Govt for Raffles Memorial College, the first college of higher education in Singapore, which opened in 1929; studies in economic botany effectively ceased. The official colonial map of the Tanglin area, published 1924, shows the Gardens landscape, lakes and buildings prior to the annexation of the 'Economic Gardens'. The original plantings of rubber were destroyed for the College's sports fields, but propagations were taken of two high yielding trees (grown from seeds in 1884) and planted on Lawn C near the present Botany Centre; none of these survives (the last fell on 26.06.2013), but third generation saplings were planted in 2009.	Some of this land was returned to SBG in 1983/86 and 2003, q.v., and includes early 20 <sup>th</sup> century buildings (Houses 1–5 and the Garage built 1925–28; House 4 was the College Principal's dwelling) and the Chinese graves mentioned for 1842. [For the fate of the rubber plantings, sources of information etc., see Burkill, H. (1971), Straits Times Annual: 101–107 and Gardenwise 30: 26–27 (2008)]. Sun rockery built near modern NOG entrance (1922).
1923	A meeting (Dec.) between I H Burkill and senior Straits Settlements and Federated Malay States foresters & agriculturalists had resolved to move the Singapore Herbarium and its research to Kuala Lumpur, whilst SBG was to become a branch of the Public Gardens in KL.	This move never occurred, perhaps as a consequence of administrative dithering and slumps in the price of rubber, which severely affected the region's economy [Wong, K.M. Gardens Bull. 64(1) (2012)].
1925	Eric Holttum appointed Director (previously Assistant Director 1922–1925), giving more focus to horticultural displays and the creation of new orchid hybrids, ultimately founding a new industry with these in Singapore; the first to be registered was Spathoglottis 'Primrose', in 1932. New Gardens Map published, showing reduced area following loss of land to Raffles College and nursery grounds where Cluny Lake had previously existed.	Began orchid propagation by novel in vitro methods in 1928, successfully raising the first hybrid seedlings the following year. Holttum Hall housed his orchid laboratory. Introduced the now familiar Bougainvillea, Plumeria etc., to the island's parks and gardens.
1927	I H Burkill, Illustrated Guide, The Botanic Gardens Singapore, published.	Includes photographs by Burkill, Holttum, E H Wilson & J F Rock.
1929	Sundial Garden constructed, the only landscape feature of formal rectangular design in SBG. Its location was already defined by an oval path on the 1925 map of the Gardens and may have been the site of Cantley's 1882 rosary [Ann. Rep. 1882; Gardenwise 21: 15–17 (2003)]. Its water tanks were added later (1970s) and the corner statues c. 2006.	Includes sundial designed by Ursula Holttum, Director's wife. The area in question had previously housed Murton's orchid/plant house, which was removed by Cantley. Raffles Mem. College houses (now inside SBG), named Jasper Young House, Kedah House, Johore House & Mansfield Lodge after sponsors.

Date	Historical event/action [data source] <sup>1</sup>	Notes
1929– 1946	E J H Corner, Asst Director, SBG, enriched the Gardens' scientific output and reputation with studies of fungi, Ficus, palms, swamp forests and the conservation of the Malaysian flora, including his popular book, 'Wayside Trees of Malaya' (1940). A biography of Corner by his son, John, is to be published in 2013. The Asst Curator's house occupied by Corner was subsequently known as EJH Corner House.	Corner is famous for the innovation of using trained monkeys to collect material from tall rainforest trees and as teacher of many successful students; after leaving SBG he taught at Univ. Cambridge, UK, retiring in 1973 as Professor Emeritus of Tropical Botany.
1930	Bandstand built on the previously empty performance area. This building has been restored on various subsequent occasions, but is essentially as originally constructed. An image of it was published in the annual report for 1951. Second Herbarium building constructed on area now occupied by Botany Centre [Gardenwise 20: 13–15 (2003)]. Orchid hybridisation programme commenced.	Contrary to what is sometimes assumed, the Bandstand parade area was not built upon until this date – there is a photograph of it as an open parade ground, dated 1877. New sand pit for children (cf. 1902). [Ann. Rep. 1948: 4].
1932	Concrete tanks at foot of Plant House steps installed.	
1935	Pergola built from re-used bricks and timber to connect Upper and Lower Ring Roads to SW of Bandstand.	This is assumed to be the structure that exists today at Lawn O, but it has been rebuilt meanwhile, in 1957.
1937	Low brick wall south of Bandstand (terrace) built.	Bricks matching those in pergola (see above).
1942– 1945	Japanese occupation of Singapore during WW2, but SBGs' scientific work was allowed to continue and the Gardens largely safeguarded from destruction, following an early intervention by colonial governor, Sir Shenton Thomas. The steps that descend to the Plant House were constructed during this period with bricks made by allied PoWs from Changi Prison; they are marked with arrows indicating the status of their makers, who are believed to have been employed in the building of the steps. SBG's horticultural staff were mostly sent to work on the infamous Burma-Siam railway where 22 of them died, leaving the Gardens bereft of gardening expertise in the years following the war, with a consequent deterioration in standards.	Meanwhile valuable research was carried out, partly as collaborations between the Japanese and British, despite the two countries being at war. In 1995, Australian PoW veterans visited the steps to admire the bricks they had made while imprisoned. Corner, in The Marquis, states that the Gardens Rainforest was damaged by shells and storms, but the amount of damage seems to have been minor when judged from subsequent aerial photography.
1947	SBG became a founder member of the partnership to prepare the 'Flora Malesiana'. From vol. 11(4), SBG's science publication was renamed 'Gardens Bulletin, Singapore' and included a short account of events at SBG during the war.	Flora Malesiana is ongoing (2012), but hampered by a regional lack of traditional plant taxonomists. The Straits Settlements had ceased to exist, hence the change in the journal's title.

Date	Historical event/action [data source] <sup>1</sup>	Notes
1948	SBG Annual Report states that sales of 6885 plants raised \$5348. Coir dust in use for weaning orchids raised in vitro.	(Coir is a by product of coconut production).
1948– 1965	J Sinclair appointed Curator, then (1955) Keeper of the Herbarium. Published valuable research on regional Annonaceae and Myristicaceae, as well as sea grasses.	Aerial photographs taken between 1948–1960s show the layout of the Gardens, including some of the trees that now have heritage status.
1949	Upon relinquishing the directorship of SBG to M R Henderson, Holttum was made Professor of Botany at University of Malaya, the first person appointed to this role; Corner, Henderson and Holttum published a series of key works on Malayan botany and horticulture, 1949–1956 <sup>2</sup> .	Holttum later retired to Kew, where his research on ferns continued for decades until he was well into his 90s (he died in 1990).
1950	Avenue of Caribbean royal palms planted along Office Gate Road.	60+ years on, these have matured, but only those beside the Cissus pergola survive.
1951	Nature Reserves Ordinance places SBG in charge of 8,000 acres of natural vegetation.	This included the Bukit Timah Nature Reserve.
1954– 1955	J W Purseglove appointed Director, who responded to the growing interest in orchids by establishing an Orchid Enclosure in 1955, the first devoted to this plant group and forerunner of the National Orchid Garden (1995).	The Enclosure was sited where the Ginger Garden now stands. An Herbarium annex for spirit collections constructed [Gardenwise 20: 13–15 (2003)].
1956	Tradition of VIP orchid namings begun with Aranthera 'Anne Black' (after Lady Black, colonial Governor's wife).	[SBG Ann. Report 1956: 9, plate V].
1957	H M Burkill, son of the former Director and employed as Asst Director from 1954, succeeded Purseglove; he trained local protégé, Chew Wee Lek, briefly his successor in 1970. Burkill (jnr) was born on site. Water feature in quadrangle of Plant House began excavation.	During the following decade SBG went into decline as staff resources were constrained during the transfer of Malaysia from colonial rule. Purseglove published an important historical and contemporary account of SBG in Trop. Agriculture, Trinidad 34(3): 165–189.
1958	Raffles Hall (later 'Building') constructed as part of expansion of Raffles College.	Now occupied as office space by NParks staff.
1959	SBG's 100 <sup>th</sup> anniversary celebrated by the publication of accounts of its purpose and history by Holttum, Purseglove and both Burkills. PM, Lee Kuan Yew, opened first of a series of concerts/shows organised by Ministry of Culture and attended by an audience of 22,000 – these were to promote racial harmony and a national culture.	[Gardens Bull. 17(2): 125–154 (1959) etc.]. A later concert in the series with night lighting attracted an audience of 30,000. Concerts/ shows continued in 1960.

Date	Historical event/action [data source] <sup>1</sup>	Notes
1961– 1962	Rare snail, Amphidromus inversus, discovered on trees beside Potting Yard (Rainforest) and recorded subsequently. Swan Lake drained to catch turtles that were damaging water plants. Preparations made to close Gardens to vehicular traffic (1962) for public safety.	This was the first record of the species from Singapore and is a measure of the biological importance of SBG's Rainforest. The draining of the Lake produced a catch of snakeshead fish (Burkill photo).
1963	Lee Kuan Yew planted the first tree at Farrer Circus. Singapore Botanic Garden's AG Alphonso produced a Guide to Tree Planting, which was printed in four national languages.	
1964– 1965	Herbarium and Library building from 1903 rebuilt on same site but enlarged, then extended in 1968 and again in 1972 (mean-while herbarium temporarily stored in various locations in Singapore). Tea kiosk constructed on Lawn H.	Foreign researchers acquired in cooperation with Univ. of Malaya in return for training local staff. Wooden Main Gates replaced with ironwork.
1967	Further development of the "Garden City" campaign, led by Prime Minister Lee Kuan Yew, resulted in SBG's focus diverting from botanical research towards supporting the greening of Singapore (cf. entry for 1880). A desire by Govt to transfer the Herbarium and science staff to a new site was not implemented, following strong representations from SBG Director, Humphrey Burkill.	A tree planting campaign had begun on 16 <sup>th</sup> June 1963, followed by a national Tree Planting Day from November 1971. SBG set up additional nurseries on nearby sites, including sales to private customers.
1969	Marsh Garden, Lawn A (adjacent to Holland Road) created.	Part of this area had been dug out as a rhinoceros wallow and alligator pond in 1877.
1970	A G Alphonso appointed Asst Director; he had been sent to Kew for two year's training in horticulture, returning in 1956. The role of Director ceased upon the resignation of Chew and was not re-established until 1988.	Alphonso was in post until 1976 and fulfilled the role of chief administrator upon the departure of Director Chew Wee Lek in that year.
1971	An image of the Sundial Garden in the annual report shows tanks and fountains.	
1972	School of Ornamental Horticulture opened, utilizing Burkill Hall and offering a 'Diploma in Ornamental Horticulture and Garden Design', the first of its kind in SE Asia. HM Queen Elizabeth II visited SBG for an orchid naming in her honour.	Diploma included both theoretical and practical training. [The history of the School is summarized in Gardenwise 13: 12–13 (1999)].

Date	Historical event/action [data source] <sup>1</sup>	Notes
1974	Map of SBG published as part of visitor guide ("A Pictorial Guide to the SBG"). The map shows that the small remaining area of the former Economic Gardens, where staff accommodation had existed, was no longer open for public visitation. According Mrs Ng it included a nursery area. Second lake, now called Symphony Lake, excavated to include part of site of former Cluny Lake [Ann. Report], completed 1976, whose island was thereafter used for the Gardens' concerts programme. Annual reports for the Gardens ceased after this year and information on its development remained scarce until the launch of Gardenwise in 1989.	Map and Guide marks and illustrates various features that were subsequently lost during the 1990s redevelopments, including two sun rockeries, temperate and cactus houses, topiary garden, Japanese bridge and miniature waterfalls in The Dell and the large tea kiosk beside Swan Lake (cf. 1965). The nursery produced stock for the Singapore greening movement.
1976	SBG referred to Ministry of National Development (MND) and made formally responsible for the greening of Singapore, including the development of new parks and open spaces; Ng Siew Yin appointed chief administrator and maintained the growth of scientific collections (exchanges with other institutions), herbarium, library, horticultural training and standards.	In the 1970s Wong Yew Kwan, Commissioner of Parks, reinstated research at SBG and this included the development of new facilities for plant introduction, pathology, tissue culture propagation of orchids and new Gardens features.
1977	Centennial memorial to the introduction of rubber erected in area where the first Economic Garden was made in 1877.	A slightly tacky concrete structure made to resemble a tree trunk with a score line for tapping of latex.
1979	120 <sup>th</sup> anniversary of SBG celebrated by a long article in the Straits Times by Mazlan Badron & Jane Perkins.	[ST 31 Dec 1979].
1980	Prime Minister Lee Kuan Yew plants an African mahogany tree beside Main Gate Road on Tree Planting Day (Nov.).	The Khaya senegalensis is located on Lawn A and is already a large tree.
1983	The return 13 ha of former SBG land at Bukit Timah Core announced [Chin in Gardenwise 24: 2 (2005) says the transfer of land was (legalised) in 1986], which had been occupied by various Singaporean university interests since 1920s; work begun on planting arboretum collections, a pond, jogging tracks and footpaths. Tinsley, B., Singapore Green, the first modern history of the Gardens, published.	Land was part of the old Economic Gardens. The newly developed area remained separated from the established Gardens by part of Cluny Road and was connected by an underpass.
1984– 1987	3 sculptures by British artist Sydney Harpley were gifted by the first Chief Minister, David Marshall (1908–1995).	These are Girl on a Swing, Girl on a Bicycle and Girl on a Hammock, located along the Upper Ring Road.
1986/87	SBG hosted Orchid Shows, winning awards for new hybrids.	Dendrobium (Temasek) 'Botanic Gardens' (1986) and D. 'Margaret Thatcher' (1987).
1988	Orchid specialist, Dr Kiat Tan, appointed Director of SBG and awarded grant to commission the Gardens' redevelopment master plan, with SBG as a newly designated division of MND, comprising its Research & Advisory and Botanic Gardens branches.	This may be regarded as the beginning of the modern era in SBG's history in terms of its regaining autonomy, influence, relevance and scientific intent.

Date	Historical event/action [data source] <sup>1</sup>	Notes
1989	Master Plan completed by landscape consultants, to be implemented in 3 phases and described in the book 'Visions of Delight', published as part of SBG's 130 <sup>th</sup> anniversary celebrations; Gardenwise, SBG's scientific and horticultural outreach magazine, launched (Vol. 38 publ., April 2012). A Japanese Garden was installed for the anniversary; this was later converted into the current Aroid Garden during the 1990s.	Cluny and Dalvey Roads bisecting the Gardens closed and removed; overall SBG area now 52 ha. Staff landscape architect, Junichi Inada, played major role in design of new Gardens' features hereafter.
1990	National Parks Board established, with Dr Kiat Tan as its Executive Director and concurrently SBG Director. SBG designated as a National Park.	Board responsible for 1,000s of ha of parks and natural reserves.
1991– 1992	The concept of SBG as comprising 3 core areas – Tanglin, Central and Bukit Timah Cores – was established in the revised Master Plan; Swiss fountain presented; restoration of Burkill Hall; restoration of SBG Rainforest [Gardenwise 4: 2, 15–16 (1992); 23: 17 (2004)].	The Master Plan secured \$120M of Govt funding, plus a further \$48M for Bukit Timah Core in 2006. The Swiss fountain is a large granite ball that turns upon a bed of water.
1993	Bukit Timah Core pond (1983) expanded into Eco-Lake. Dr Chin See Chung appointed Keeper of SING Herbarium.	"Eco" refers to Economic, not ecological.
1994	Sun Rockery, for cacti & succulents, constructed and later refurbished as Sun Garden, partly protected from rain by a glass roof [Gardenwise 6: 3 (1994); 11: 12–13 (1998)]; two previous sun rockeries existed as marked on the 1974 map; nearby 1930s Bandstand restored.	A garden for succulents existed at SBG since the early 1920s. SBG visitor survey indicated 2.3M annual visits, of which 66% tourists.
1995	3 ha National Orchid Garden (NOG) opened by Lee Kuan Yew in area around the recently restored Burkill Hall, including Lady McNeice Bromeliad Collection enclosure and Tan Hoon Siang Mist House (former Asst Director's house was demolished during NOG's development). Plant Resource Centre constructed. Dr Chin See Chung appointed Director SBG; Bougainvillea	This attraction is charged for, whereas the remainder of SBG is free access; Yam, T., Orchids of the Singapore Botanic Gardens published. (Gardenwise was not published in 1995–1996). [Gardenwise 12: 10–11 (1999)].
1997	collection in Bukit Timah Core established. Detailed aerial survey of SBG made in colour.	This shows various areas of the
1998	New Visitor Centre at Nassim Gate and NParks HQ complex opened on 10 Dec.; E J H Corner house restored and used as gourmet restaurant; Heliconia Walk laid out (Palm Valley). SBG becomes partner in 3-year Polytechnic Diploma in Horticulture & Landscape Management, training 40 students/year, replacing that established in 1972.	Gardens under redevelopment. Centre includes clock tower, café- restaurant, info desk, shop, toilets and other visitor facilities, besides coach and car parks, drop-off/ pick-up points etc. The Central Core design expanded SBG's land eastwards on ground previously sandwiched between Cluny and Dalvey Roads, including an historic rain tree.
1999	Facilities for School of Horticulture opened in Potting Yard. Temporary sculpture exhibition held (diverse artists).	[Gardenwise 14: 18–19 (2000)].

Date	Historical event/action [data source] <sup>1</sup>	Notes
2001	Volunteer programme established, initially with Volunteer Guides offering public tours in various languages. Old Herbarium buildings demolished.	Volunteers have subsequently supported diverse activities in SBG. Dipterocarpus timber from the old herbarium is incorporated in the Botany Centre's Green Pavilion.
2002	Botany Centre construction begun.	Completed 2005, for 2006 opening
2003	Announced that 12.3 ha of land to be added to Bukit Timah Core from S'pore Management Univ., which apparently was legalised formally in two parcels in 2004 & 2005; Ginger Garden opened in Central Core including a new walk-behind waterfall feature, the Waterfall Hill, and Halia restaurant [Gardenwise 21: 8–11 (2003)]. Singapore Orchid Festival co-hosted at SBG with OSSEA (Sept.) [Gardenwise 22: 20–21 (2004)]. Lightning conductors installation programme begun for vulnerable trees in the Rainforest and elsewhere (SBG is reported to be a hotspot for lightning strikes in Singapore). On 22 July a significant gathering of senior Govt figures observed the planting to a tembusu below Palm Court to commemorate those who died in the SARS epidemic during the year.	Coach drop off zone at Tyersall Gate entrance created for NOG and Ginger Garden; 11 infra- red counters to enable accurate recording of visit numbers installed; these have shown that SBG is Singapore's most popular park on a visits per hectare basis†. More lightning conductors were installed in 2005 and subsequently but theft of the copper cables soon emerged as an issue. SBG's Rainforest officially designated as a 'Nature Area' in URA Master Plan.
2004	Refrigerated Cool House conservatory within NOG opened in January; SBG hosts first meeting of the Southeast Asia Botanic Gardens forum and established Botanical Fellowship programme. Native orchid reintroduction programme successful with two species of Bulbophyllum [Gardenwise 23: 8 (2004)]. Two 79-year-old talipot palms flowered in December.	The Cool House is for tropical montane orchids and other flora [Gardenwise 22: 14 –15 (2004)]. [Gardenwise 22: 16–18 (2004)]. Corypha umbraculifera [Gardenwise 24: 22–23 & front cover (2005)].
2005	Evolution Garden opened in southern part of Bukit Timah Core (Feb.), occupying 1.5 ha and tracing development of plant life on Earth over the past 3.5 billion years; Shaw Symphony Stage rebuilt and launched on 1 May. Structures to protect collections in Sun Rockery and Bonsai Garden built. Kiew, R., Begonias of Peninsula Malaysia, published.	An Evolution House display had been opened at RBG Kew in 1995 and pioneered the use of models of extinct plant forms as at SBG. Both Kew and SBG projects benefited from advice from palaeobotanist, Prof. Peter Crane.

Date	Historical event/action [data source] <sup>1</sup>	Notes
2006	Opening (Sept.) of completed Tanglin Core including the Botany Centre, new Herbarium & Library facilities (with public access and enquiries desk), expanded orchid micro-propagation facilities, visitor reception/information desk, car park, restaurant, classrooms, exhibition and meeting halls/rooms and Gardens Directorate offices. This required the diversion of Cluny Road to gain an additional 0.6 ha. Replacement Tanglin Gate designed by local artist, Eng Siak Loy and based on the Malayan climber Bauhinia kockiana, installed on 6 <sup>th</sup> September. Swans sculpture in Swan Lake installed. Saraca Stream Walk completed. Total capital expenditure on improvements to this date from 1990 was c. \$201 million.	The visitor reception hall or "Green Pavilion" has a roof covered by self-sustaining vegetation, claimed to be the first "green" roof in Singapore. First Singapore Garden Festival (SGF) mounted by SBG at Suntec Convention Centre. Spacing of the 4 new gate posts is aligned to match the spacing of those of the original Main Gate at this site, but the gateway is not in the exact position as the original, since Cluny Road had been re-aligned. Eng Siak Loy was an NParks staff designer from 1989.
2007	2 ha Jacob Ballas Children's Garden opened with external access via Kheam Hock Road at NE corner of SBG (Oct.).	By 2011 this facility, the first of its kind in Asia, was judged to have received 1 million children.
2008	Time magazine votes SBG as "Asia's Best Urban Jungle". A list of the 137 kinds of birds recorded for SBG published.	2 <sup>nd</sup> SGF mounted at Suntec. [Birds list in Gardenwise 30: 14–19].
2009	SBG celebrates 150 <sup>th</sup> anniversary in a live video link-up tree planting event with the Royal Botanic Gardens, Kew, which was celebrating its 250 <sup>th</sup> and with the publication by B Tinsley of Gardens of Perpetual Summer; anniversary set of postage stamps issued. An 8.6 ha strip of land west of Tyersall Avenue added, bringing total area of SBG to 74 ha; this extension is earmarked for the development of the "Learning Forest" during 2013–16. Some of the trees on the site are believed to be as much as 100 years old and there are younger specimens of very rare species that have regenerated. The Tyersall area is intended as part of the Buffer Zone if SBG is inscribed as a UNESCO World Heritage Site.	SBG planted a pair of Pará Rubber trees (third generation from the 1877 originals), whilst Kew planted a pair of Trachycarpus palms. The Tyersall Palace and its surroundings were completed in 1892, but the building burnt down in 1905 and the site was subsequently abandoned, reverting to a forested state. During WW2, parts of Tyersall (beyond SBG's proposed Learning Forest) were used as a military encampment from 1939 by the 2 <sup>nd</sup> Argyll Battalion and the encampment reverted to forested state after the war.
2010	Dr Wong Khoon Meng appointed Keeper, SING Herbarium.	3 <sup>rd</sup> SGF mounted at Suntec.

Date	Historical event/action [data source] <sup>1</sup>	Notes
2011	Dr Nigel Taylor (b. 1956) took up appointment as Director, SBG on 19 September [see ST, Monday 6 Dec. 2011]; new MRT Circle Line station serving SBG opened on 8 <sup>th</sup> October at NW corner of Bukit Timah Core, public access from the station being facilitated through cast-iron gates that formerly hung at Tanglin (Main) Gate from 1988– 2006, their design inspired by S'pore's national flower, Vanda 'Miss Joaquim'; Healing Garden of 2.5 ha opened by President of Singapore on 21 October, displaying c. 500 species used in SE Asia; Fragrant Garden begun.	Taylor had previously served at Kew for 34 years, the last 16 as Curator of the Royal Botanic Gardens. Climbers Garden part planted at new MRT gate; visitation increased by 18% in first month of the station opening. The Healing Garden is partly interpreted via an iPhone app.
2012	At end of March, SBG records a record annual visitor-ship of 4.13 million, thought to be the highest verifiable figure for any botanic garden worldwide; at same time notified that International Garden Tourism Awards (Canada) accord SBG status of "2012 Garden of the Year" (D/ SBG received award on 13 <sup>th</sup> April in Vancouver). Pied Hornbills successfully raised offspring and displayed to staff near Botany Centre in April/May. Duke & Duchess of Cambridge (Prince William & Catherine) attended orchid naming on 11 September and created great media interest. At close of calendar year SBG records 4.4 million visits.	Kings Park, Perth, Australia has claimed a figure of 5.8 million, but this is believed to be an estimate and counts many visits to the whole park, not the actual botanic garden therein. 100 <sup>th</sup> anniversary of Gardens Bulletin celebrated by an article on its history by Editor, K M Wong [vol. 64(1)]. 4 <sup>th</sup> SGF at Suntec (July). Gardenwise 39 published July, including article on the heritage of the Bandstand by Thereis Choo.
2013	On 25 June named Asia's top park in TripAdvisor's inaugural Traveller's Choice Award 2013. Fragrant and Foliage Gardens opened. SBG Heritage Museum (Holttum Hall) and CDL Green Gallery open 30 Nov. by PM Lee.	Award reported in ST 26 June.

#### Summary of key events & periods in SBG's history

- 1859 Founding of SBG at Tanglin site on land acquired by Agri-Horticultural Society.
- 1860–68 Design, build and layout of Tanglin (Heritage) Core by Niven, including Bandstand Hill, Swan Lake, Ring roads, Manager's/Superintendent's house, extension to the site.
- 1875–79 Founding of Herbarium & Library; introduction of Oil Palm, Rubber and Coffee to SBG; site extended northwards (Economic Gardens).
- 1880s SBG's nurseries producing 100s of 1000s of trees for planting along Singapore streets and in parks; Superintendant/Director of SBG responsible for documenting and protecting the straits settlement's forests; Herbarium, Library and scientific research expanded.
- 1891–95 First Malaysian scientific/botanical periodical established at SBG; Ridley promoting the planting of rubber in Malaya.
- 1920s Loss of most of the Economic Gardens; establishment of orchid breeding programme and in vitro propagation, leading to new local industry.
- 1930s Botanical research team and scientific outputs further expanded until late 1950s.
- 1942–45 SBG under Japanese control during WW2, but scientific research continued and Gardens etc. saved from destruction.
- 1956– VIP Orchid Naming programme begun.
- 1967–87 SBG role changed to support the Singapore Garden City movement; botanical research declined.
- 1988 Modern era of SBG begun with appointment of Tan W K (Director); new Master Plan (1990); taxonomic research focus re-established; major expansion of public attraction elements ongoing with visitation rising from 1 to 3+ million annually.
- 2006 Biennial Singapore Garden Festivals begun, organised by SBG, attracting 300,000 visitors over 9 days to the Suntec Convention Centre.
- 2011–12 4.13 million visits to SBG recorded by close of March 2012, making it the world's most visited botanic garden (discounting King's Park, Perth, WA); SBG awarded "2012 Garden of the Year" by International Garden Tourism Awards panel (Canada).
- 2012–13 4.4 million visits to SBG.





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# APPENDIX C LIST OF HERITAGE TREES

# APPENDIX C LIST OF HERITAGE TREES

NAME	LOCATION	ACC_NUM
Adenanthera pavonina	LJ	00/6509*A
Albizia lebbekoides	LE	00/6003*A
Alstonia pneumatophora	LH	00/7046*A
Callerya atropurpurea	LF	00/6102*A
Calophyllum inophyllum	LC	00/5323*A
Carapa guineensis	LE	00/6007*A
Ceiba pentandra	LD	112/33/1*A
Ceiba pentandra	LO	67/32/5*A
Dacrycarpus imbricatus	LH	6/56/1*A
Dryobalanops aromatic	LE	94/40/1*B
Dryobalanops aromatic	LH	94/40/1*C
Dryobalanops aromatic	LO	196/39/1*A
Fagraea fragrans	LE	00/5963*A
Ficus kurzii	LA	00/4233*A
Hertiera alata	LO	00/9332*A
Hevea brasiliensis	LC	00/5305*A
Lecythis ollaris	LE	166/26/1*A
Podocarpus neeriifolius	LE	88/38/2*A
Terminalia subspathulata	LN	20021468*A
Alstonia angustiloba	LT (Burkill Drive)	19970801*A
Alstonia angustiloba	LZ (NOG nursery)	00/9263*B
Barringonia asiatica	HG	59/29/2*A
Fagraea fragrans	LW	00/2058*A
Ficus kerkhovenii	Gardens Jungle	20112418*A
Horsfieldia irya	LXG	19970822*A
Palaquium obovatum	Evo Garden / RB	20092126*A
Parkia speciosa	LT	Not in record
Parkia timoriana	LY	00/8724*B
Pentadesma butyracea	HG	20091945*A
Samanea saman	GATEWAY	20000087*A
Shorea gratissima	Gardens Jungle	20094403*A
Sindora wallichii (supa?)	LT	60/31/6*A
Sindora wallichii (supa?)	LT	60/31/6*B
Inocarpus fagifer	EG7	20050851*A

NAME	LOCATION	ACC_NUM
Antidesma bunius	LH	00/7059*A
Khaya senegalensis	LB	00/4224*A
Stereospermum fimbriatum	LB	00/5075*A
Shorea roxburghii	LB	00/10146*A
Phyllanthus pectinatus	LE	00/5986*A
Alangium ridleyi	LH	00/7051*A
Lecythis ollaria #1	LH	00/7040*A
Lecythis ollaria	LH	00/7040*B
Kigelia Africana	LH	58/31/2*A
Palaquium obovatum	LXH	19970860*B

# APPENDIX D ADDITIONAL BUILT HERITAGE INFORMATION

### APPENDIX D

# ADDITIONAL BUILT HERITAGE INFORMATION

Information regarding the interior of the following buildings is provided in this appendix:

- Houses 1-5
- House 6
- E.J.H. Corner House
- Burkill Hall
- Holttum Hall
- Ridley Hall

This Appendix was informed by ICOMOS Singapore Ltd's *Research Report* (2013).

#### Houses 1-5

As a precedent, the porte-cochere or porch is of particular interest. Apparently, Coleman was 'obsessed' with providing a covered porch for his villas in Singapore. Back in India, the design of carriage porches has been institutionalised, such as included in the 'Military Engineer Services Handbook' since the First Edition in 1877. It is in this context that Cyril and Dawbarn seem to have drawn the arcaded design, toped by a flat roof for all five houses.

#### House 1 (originally named Kedah House)

Inside this house, an entry hall at the centre (with stucco moulded pilasters with fluted capitals) leads to the staircase opposite and a wing to either side. The floors are tiled and the interior is subdivided with modern partitions and suspended ceilings as offices. The open-well staircase with a hexagonallyformed landing is lit by high level windows up to the roofline. The staircase is timber on a stone first step, with timber balustrade and lattice pattern balusters. This is the only one of the five houses with the panelling surviving under the staircase, the triangular part under the first flight of steps having a typical Art Deco motif of the rays of sunshine. The upper floor landing leads to a room with a balcony over the porch opposite and the two wings to either side along what may have originally been an open verandah to the back garden with a service staircase on one end and a toilet on the other, both of which survive. The spaces, including the verandah have been combined into an office.

The two side portals of the entrance hall are sealed up and a false ceiling has been added. The original ventilated parapet above the porte-cochere is intact. Some of the original timber lattice doors, windows and ironmongery such as butterfly hinges and window handles are intact. In the interior, the granite starting step and lattice balustrade of the original timber staircase do not appear to have been modified. Otherwise, the façade fenestration has been modified and replaced with timber-framed windows with low-emissivity glazing.

The first-storey verandah has been enclosed and is currently being used for storage. An intact original timber privacy screen has been retained on the second floor.

#### House 2

An entry hall at the centre (with stucco moulded pilasters with fluted capitals) leads to the staircase opposite and a wing to either side. The interior is now subdivided with modern and glazed partitions and suspended ceilings and has been substantially refurbished as a restaurant and club house. The open-well staircase with hexagonally-formed landing is lit by high-level windows up to the roofline. The staircase is timber on a stone first step, with timber balustrade and lattice pattern balusters. The upper floor landing leads to a room with the balcony over the porch opposite and the two wings to either side with an open verandah to the back garden. The rooms onto the verandah have now been divided by new partitions and suspended ceilings. A new fire escape has been added to one end of the verandah. The ancillary building continues to be used as a kitchen, and has been completely fitted out to

accommodate modern restaurant standard usage. House 2 now faces a number of modern college buildings.

Key spaces reinstated as a part of the restoration works include the first and second storey rear verandahs, as well as the main entrance hall (where partitions may have been removed to reinstate the portal of ornamented columns).

A number of modifications to the building have been carried out including the addition of a new timber deck at the rear (as alfresco dining area); instead of original timber louvre windows, only the window frames and louvred toplights at the second-storey verandah have been retained; to comply with current building codes, handrails were added to the low verandah window sill and similarly, handrails were added to the 2nd floor parapet. The staircase balustrades were also raised to comply with building codes.

The ground floor rooms on one side have been combined into a large restaurant dining space secondary internal windows with glazed panels have been added for acoustic and thermal performance while external timber louvred windows maintain the historic appearance of the building. Replicas of surviving lattice doors were fabricated to reinstate the original fenestration design. Overall, the restoration was sensitively carried out and received a URA Architectural Heritage Award in 2009.

#### House 3 (originally named Johore House)

An entry hall at the centre (with stucco moulded pilasters) leads to a staircase opposite and a wing to either side. The floors are concrete and tiled in places and the interior is now subdivided with modern partitions, doors and suspended ceilings. The open-well staircase with hexagonally-formed landing is lit by high-level windows up to the roofline. The staircase is timber on a stone first step, with timber balustrade and lattice pattern balusters. The upper floor landing leads to a room with the balcony over the porch opposite and the two wings to either side along what may have originally been an open verandah to the back garden. Any original internal walls have been removed creating large well-lit rooms used as offices. These rooms have timber floors.

House 3 has undergone renovation with a mostly utilitarian approach, obscuring/replacing many of the key heritage features, for example the main entrance hall columns are now hidden and 'embedded' in latter-day brick walls, verandah spaces have been enclosed as storage areas and some windows and doors have been replaced. Nonetheless, some historic elements such as coved ceiling cornices and granite heel stones of the timber door frames at the rear verandah can still be discerned.

#### House 4 (originally named Mansfield Lodge)

The entry hall here is larger than in the other houses, with a coffered plaster ceiling. There is an imperial style staircase opposite the entrance, which has been partly boarded in. The floors are concrete and stone in places. The staircase with a hexagonallyformed landing is lit by high-level windows up to the roofline. The staircase is timber on a stone first step, boarded in at the sides, but with the timber balustrade still evident. On the upper floor landing, thin timber pilasters and lattice above separate the glazed verandah over the porch. A new partition has been inserted behind it. On the north-east side, all partitions have been removed creating a single open space with the roof trusses also exposed. On the north-west side the corridor/former verandah looking onto the garden has been retained with rooms off it, and the second (service) staircase at the end of it. A number of temporary structures are present in the garden.

Much of the original ornamentation is visible throughout the ground floor of the house, such as coffered ceilings with cornices in the entrance hall and main dining area on the first-storey. On both floors the verandah spaces are no longer apparent due to demolished walls and a new interior layout. Architectural features such as the parabolic arches along the rear verandah have been retained, together with historic green tinted glazing. Of note is the floor tiling arranged in staggered layout, possibly Indian Patent Tiles.

#### House 5

An entry hall at the centre (with stucco moulded pilasters with fluted capitals) leads to a staircase opposite and a wing to either side. The floors are mostly carpeted. The interior is now subdivided with modern partitions and suspended ceilings. Two original interior doors survive with the lattice pattern over the lower panels. The open-well staircase with hexagonally-formed landing is lit by high-level windows up to the roofline. The staircase is timber on a stone first step, with timber balustrade and lattice pattern balusters. The upper floor landing leads to a room with the balcony over the porch opposite and the two wings to either side along what may have originally been an open verandah to the back garden. The spaces have now been divided by new partitions and suspended ceilings. The second (service) staircase at the end of the verandah survives.

Externally, all the original fenestration has been modified on the front facade, the timber louvered panels having been replaced with timber casements with glazed panels. The original ventilated parapet above the porte-cochere is intact. On both sides of the main entrance hall, the portals in between the pairs of ornamental pillars have been sealed up.

Most of the internal historic timber lattice doors and screens have been retained. Timber louvres on the second-storey verandahs have also been kept, while adding a secondary layer of glazed windows. The original spatial quality is respected in the current planning and furnishing layout. To comply with building codes, handrails were added to some second-storey timber window frames.

#### House 6 (The Former Field Assistant's House)

The interior has been much altered to accommodate a modern office function. The central staircase opposite the entrance is concrete with an iron railing. Internal doors are modern replacements and the interior is subdivided with modern partitions and suspended ceilings. The glazed-in balcony over the porch is several steps lower than the first floor.

It appears that some ad-hoc interventions have been carried out that have obscured elements of the original house design and details, e.g. the façade fenestration design. The lean-to roof appears to be at odds with the design and profile of the main roof.

#### **E.J.H. Corner House**

The windows are casements with louvered shutters and louvered vents above them. There are French doors onto the verandahs with glazing bar overlights. Several of the first floor windows are casements with glazing bar overlights. The first floor verandah has been partly glazed-in. A covered walkway leads to a single-storey ancillary building to the rear that is currently used as the kitchen for the restaurant, and has been refitted accordingly.

The main element of the front is a 'sitting-verandah', supported on two Tuscan piers, stuccoed in white on both sides of the portico. The verandah bears bamboo-chicks, while wooden lattices are a common idiom used for the balusters of staircases and top-vents of windows.

#### **Burkill Hall**

The ground floor is an open space with the masonry pilasters supporting the timber structure above, the beams and joists remaining visible. The corners have been built in; the timber lattices are later additions. A timber staircase to the side of the entrance with a roughly executed coiled balustrade, stick balusters and octagonal newel post leads to the first floor. The defining feature of the first floor is the central-projecting verandah and open living space. The main rooms and the staircase are accessed from this main space with panelled double doors. The rooms also have access to a private verandah. A service staircase from the rear end of the verandah leads down to the link to the ancillary building.

In general, Burkill Hall can be considered as a 'distant cousin' of the Sri Temasik (1867), a colonial secretary bungalow in the Istana (Government House). Together, both bungalows constitute a vital heritage of Singapore from the 19th century. The architecture stands in spirit of the Regency style, such as established by G.D. Coleman, the first government architect (1822-1844) of Singapore.

#### **Holttum Hall**

Access into the building is via a double door panelled at the base and glazed above with glazed sidelight. The ground floor windows are casements with louvered vents above them; while the first floor windows are casements with glazing bars and overlights with a curved head. The hipped roof incorporates gablets at the apex with louvered vents. The five-bay sides and rear elevation follow the same pattern of render and fenestration as the front.

The doorway at the centre leads into a small lobby area with a timber staircase to one side. Double doors opposite the entrance lead to the ground floor space with a column in the centre, concrete floor and modern suspended ceiling incorporating light fixtures. The partitions and toilets are later additions. The upper floor consists of rooms leading off from a central hallway. These rooms and the hallway have a timber floor and modern suspended ceilings incorporating light fixtures. The timber staircase has a half-round shaped handrail, stick balusters and turned newel posts with ball finials, very typical of the English Victorian style.

The casement windows are shaped by narrow transoms and mullions in an Early English Renaissance style. The fanlights are square-heads in the first storey, followed by a lightly-curved valence in the second storey.

#### **Ridley Hall**

The building, originally intended to be used for two different functions, is organised in two sections with an open linkway between them. The main long and narrow five-bay section faces a wider two-bay section with a shared verandah where the entrances are located (used as accommodation for visiting scientists). Steps lead up to the verandah/porch on both sides with stucco balustrades. The buildings are raised on a low plinth with masonry arches and are rendered with a tiled hip roof, currently with machine tiles. The windows are casements, with louvered vents to the upper half and the doors panelled and glazed double doors with louvered vents above. The interior has been modernised to accommodate a lecture hall, with modern tiled floors and suspended ceiling incorporating air conditioning units and lighting fixtures.

## APPENDIX E

F

## SOCIO-CULTURAL AND POLITICAL EVENTS OF IMPORTANCE

### APPENDIX E

# SOCIO-CULTURAL AND POLITICAL EVENTS OF IMPORTANCE

Extract from:

ICOMOS Singapore Ltd (2013) 'Research Report; Singapore Botanic Gardens: UNESCO World Heritage Site Nomination', ICOMOS Singapore Ltd

#### **1. Band Performances**

The Botanic Gardens was the venue for one of the earliest forms of free public entertainment in Singapore. The earliest report of band performances at the Gardens was in August 1861, just two years after the Gardens were established. According to this report, the band played twice a week and performances started at 5.30 pm.

This tradition has carried on almost without a break till the present day. There was some doubt as to whether band performances took place during the Japanese Occupation. Research into the Syonan Shimbun (Syonan Times) shows that band performances took place at the Botanic Gardens from May 1942 through to 5 September 1944. There are no newspaper records of any other performances from that date onwards. The performances were almost all given by the Police Band – the Synonan Police Band. Dates of the performances are as follows:

#### 1943

- January: 5, 13
- February: 20
- March: 13, 31
- April: 14
- May: 5, 23
- June, 13, 30
- July: 18
- August: 15, 25
- September: 12, 29
- October: 20
- November: 10, 28
- December: 22

#### 1944

- January: 13, 31
- March: 8, 26
- April: 1
- May: 7, 24
- July: 23
- August: 13
- September: 24

In 1942, most of the band performances were given on Wednesdays and Sundays from 7.00 pm to 8.00 pm and the venues rotated between Waterloo

#### 1942

- May: 15, 29
- June: 10, 19
- July: 3, 15, 24
- August: 26
- September: 11, 25
- October: 14, 28
- November: 15, 29
- December: 16

Street, Jalan Besar, the Police Club, Farrer Park and the Botanic Gardens. Pieces played were a mixture of European light classics and Japanese works (eg Watanabe's *Gunka Shyu*). European pieces included Suppe's *Light Cavalry Overture*, Dvorak's *Slavonic Dances*, and Caryll's *Waltz: Oh Oh Delphine*. Whatever the programme, the Police Band would always close with their rendition of the Japanese national anthem, *Kimigayo*. At the Botanic Gardens, the performances took place at the Bandstand. The conductor was Ganda Singh.

#### **2. Musical Performances**

Musical performances at the Singapore Botanic Gardens were not limited to those of military bands but also by other groups playing music of other genre. Of particular note is the Singapore Symphony Orchestra (SSO), which was established in 1979 and which gave its first outdoor concert at the Istana in 1983. The success of this outing led the orchestra to explore giving more mass classical concerts in outdoor venues, including the SBG.

The occasion chosen for the SSO's first SBG performance was Labour Day or May Day (1st May), 1984. The orchestra played at a spot 'on an island on the second lake of the Palm Valley' which was described as a 'natural amphitheatre'. The hour-long concert was sponsored by the Post Office Saving Bank (POSB) and lasted an hour. Highlights included popular and Chinese classical pieces: Jerome Kern's *Showboat, Colourful Clouds Chasing the Moon*, Verdi's *Alzira Overture*, Sibelius' *Finlandia* and the theme from the movie, *The King and I*. The inaugural concert was extremely well attended and received and hailed as a great success by the media.

In July 1984, a reader of the Straits Times wrote in to suggest that for outdoor concerts to work, some kind of acoustic shell that would enhance the sonics and better focus the sound of the orchestra. In August 1985, the Singapore Tourist Promotion Board (STPB) announced plans to build a S\$350,000 'music centre' at the Botanic Gardens so that musical performances can be shielded from the elements. When first announced, the plan was to build the stage at Swan Lake (rather than what is now called Symphony Lake). A design competition with S\$6,000 as top prize was won by architect Cheang Kok Kheong of the Sentosa Development Corporation in October 1985. The stage was built in 1986 but there is no record of how the decision was made to locate it in Palm Valley (Symphony Lake) rather than at Swan Lake, as originally intended. That year, the Singapore Jazz Festival featured several performances at the SBG, including the Annie Whitehead Band, the NUS Stage Band and the Singapore Jazz Orchestra. Admission to these events were free. This stage was rebuilt in 1995 at the cost of \$2 million and renovated again in 2004 with a contribution of \$1.5 million from the Shaw Foundation. It is now known as the Shaw Foundation Symphony Stage.

#### 3. Aneka Ragam Ra'ayat (People's Variety Show)

Between 1959 and 1964, Singapore's Ministry of Culture organised a series of free, open-air cultural concerts with a strong multi-ethnic theme known as Aneka Ragam Ra'ayat or the 'People's Variety Show'. These concerts were held in various locations throughout Singapore including the steps of City Hall and the Singapore Botanic Gardens. The main object of these concerts was to foster a sense of unity among the people of different races in Singapore. The very first of these concerts was held at the Botanic Gardens on 2 August 1959 on a specially-constructed stage near the lake. It was officially opened by Prime Minister Lee Kuan Yew at 4.30 pm that afternoon with some 22,000 people in attendance. Between 1959 and 1964, the Ministry of Culture organised over 200 shows under the Aneka Ragam Ra'ayat banner. Concerts were staged weekly in the different venues.

A typical Aneka Ragam Ra'ayat production would feature Singapore's four major ethnic groups -Malay, Chinese, Indian and Western. Performances would feature Malay drama and ronggeng music, Tamil devotional songs and Indian classical dances, Chinese lion dance displays and Peking opera, and western classical music and folk performances were also included. At the opening of the first concert, Prime Minister Lee described the series of concerts as the 'cultural awakening of the people of Singapore' and that it was 'part and parcel of our search of a national identity.' He hoped that 'in the course of time, out of the interaction of our rich and varied cultures, we will be able to breed a new strain of culture - a Malayan culture.' 'Here, under open skies, Malays, Chinese, Indians will, I hope, discover the materials for a national art and national culture.'



A 'western performance' at the first 1959 concert at SBG



Prime Minister Lee Kuan Yew opening the first Aneka Ragam Ra'ayat concert at the Singapore Botanic Gardens on 2 Aug 1959.

APPENDIX F LEGISLATIVE ACTS

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## Planning Act (CHAPTER 232)

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# PLANNING ACT

# (CHAPTER 232)

(Original Enactment: 1998 REVISED EDITION)

#### **REVISED EDITION 1998**

(15th December 1998)

An Act to provide for the planning and improvement of Singapore and for the imposition of development charges on the development of land and for purposes connected therewith.

[1st April 1998]

# PART I

## PRELIMINARY

#### Short title

**1.** This Act may be cited as the Planning Act.

#### Interpretation

2. In this Act, unless the context otherwise requires —

"amendment", in relation to the Master Plan, includes any alteration or addition to or any repeal or replacement of the Master Plan in whole or in part;

"breach of planning control" means —

- (*a*) the carrying out of any development of land without the requisite planning permission;
- (*b*) the carrying out of works in a conservation area without the requisite conservation permission; or
- (*c*) any failure to comply with any condition subject to which planning permission or conservation permission was granted;
- "building" includes any house, hut, shed or roofed enclosure (whether used for the purpose of human habitation or otherwise) and also any wall, fence, platform, staging, gate, post, pillar, paling, frame, hoarding, slip, dock, wharf, pier, jetty, landing-stage or bridge, or any structure or foundation connected to the foregoing;

"certificate of statutory completion" has the same meaning as in the Building Control Act (Cap. 29);

"Certified Interpretation Plan" means a Certified Interpretation Plan prepared and certified by the competent authority under section 7;

"Collector" has the same meaning as in the Land Revenue Collection Act (Cap.155);

[<u>17/2001 wef 01/06/2001</u>]

"competent authority", in relation to this Act or any Part or provision of this Act, means any competent authority appointed under <u>section 5</u> to be responsible for the operation of this Act or that Part or provision, as the case may be; Singapore Statutes Online - 232 - Planning Act

- "conservation" means the preservation, enhancement or restoration of the character or appearance of, and the interior and exterior of any building in, a conservation area;
- "conservation area" means an area designated by the Minister in accordance with sections 8 and 9;
- "conservation guidelines" means the conservation guidelines issued under section 11;
- "conservation permission" means permission referred to in section 12(2);
- "development charge" means the tax payable under section 35;
- "enforcement notice" means a notice served under section 28;
- "functions" includes powers and duties;
- "holding" means any piece or parcel of land held or possessed under an instrument of title, capable of being registered under the <u>Registration of Deeds Act (Cap. 269)</u> or, where applicable, under the <u>Land</u> <u>Titles Act (Cap. 157)</u>, relating exclusively thereto;
- "information notice" has the meaning assigned to it in section 25;
- "land" includes buildings and any estate or interest in or right over land;
- "Master Plan" has the meaning assigned to it in section 6;
- "occupier" includes any person in actual occupation of land or premises or any person having the charge, management or control of the land or premises either on his own account or as an agent of another person, but does not include a lodger;
- "owner", in relation to land or premises, means the person for the time being receiving the rent of the land or premises whether on his own account or as trustee for any other person or as receiver (not being appointed by or on behalf of a mortgagee) or the person who would receive the rent if the land or premises were let to a tenant and includes
  - (a) a mortgagee in possession; and
  - (b) the purchaser of any newly constructed premises or part thereof in respect of which a temporary occupation permit or a certificate of statutory completion has been granted;

"planning permission" means permission referred to in section 12(1);

"prescribe" means prescribe by rules made under this Act;

"provisional permission" means provisional permission granted under section 17(1);

"purchase notice" means a notice served under section 24;

"qualified person" means a person specified in the First Schedule;

[<u>30/2003 wef 10/12/2003</u>]

"repealed Act" means the repealed Planning Act (Cap. 232, 1990 Ed.);

"street" includes any road, square, footway or passage, whether a thoroughfare or not, over which the public has a right of way, and also the way over any public bridge, and includes also any road, footway or passage, open court or open alley, used or intended to be used as a means of access to 2 or more holdings, whether the public has a right of way thereover or not; and all channels, drains and ditches at the side of any street shall be deemed to be part of that street;

"subdivision permission" means permission referred to in section 12(3);

"temporary occupation permit" has the same meaning as in the Building Control Act (Cap. 29);

"use", in relation to land, does not include the use of land by the carrying out of any building or other operations on the land;

"works within a conservation area" means —

- (a) any development of land within a conservation area; or
- (*b*) any decorative, painting, renovation or other works (whether external or internal) to any building within a conservation area which may affect its character or appearance;
- "written permission" means a planning permission, conservation permission or subdivision permission, as the case may be, granted by a competent authority and includes any such permission granted or issued by electronic transmission or in a medium other than paper and authenticated in such manner as the competent authority may determine;
- "written statement", in relation to the Master Plan, means that part of the Master Plan which includes a summary of the main proposals of the Master Plan with such descriptive matter as the competent authority considers necessary to illustrate the proposals of the Master Plan or as the Minister may, from time to time, direct for that purpose.

# Meaning of "development"

**3.**—(1) Subject to <u>subsections (2)</u> and (<u>3</u>), in this Act, except where the context otherwise requires, "development" means the carrying out of any building, engineering, mining, earthworks or other operations in, on, over or under land, or the making of any material change in the use of any building or land, and "develop" and "developing" shall be construed accordingly.

(2) The following operations or uses of land shall not be deemed for the purposes of this Act to involve development of land:

- (*a*) the carrying out of works for the maintenance, improvement or other alteration of a building which do not materially affect the external appearance or the floor area of the building;
- (b) the carrying out of such minor or preliminary works and such temporary use of land as may be declared by the competent authority for the purpose of this subsection;
- (c) the carrying out by any statutory authority of any works on land within the boundaries of a street, being works which are necessary for the maintenance or improvement of the street;
- (d) the carrying out by any statutory authority of any works for the purpose of laying, inspecting, repairing or renewing any sewers, mains, pipes, cables or other apparatus, including the breaking open of any street or other land for that purpose;
- (e) the carrying out of any act authorised or required by the <u>Control of Vectors and Pesticides Act 1998</u> (Act 24 of 1998);
- (*f*) the use of any existing building or land within the curtilage of a dwelling-house for any purpose incidental to the enjoyment of the dwelling-house as such;
- (g) the use of any land for the purposes of agriculture or forestry (including afforestation) and the use for any of those purposes of any building occupied together with land so used;
- (*h*) in the case of buildings or land which are used for a purpose of any class specified in any rules made

under <u>section 61</u>, the use of the building or land or any part thereof for any other purpose within the same class.

- (3) For the avoidance of doubt, it is hereby declared that for the purposes of this section
  - (*a*) the use as 2 or more separate houses of any building previously used as a single house involves a material change in the use of the building and of each part thereof which is so used;
  - (*b*) the use as a dwelling-house of any building not originally constructed for human habitation involves a material change in the use of the building;
  - (c) the use for other purposes of a building or part of a building originally constructed as a dwellinghouse involves a material change in the use of the building;
  - (d) the demolition or reconstruction of or addition to a building constitutes development;
  - (e) the use for the display of advertisements of any external part of a building which is not normally used for that purpose involves a material change in the use of the building;
  - (f) the deposit of refuse or waste materials on land involves a material change in the use thereof notwithstanding that the land is comprised in a site already used for that purpose, if
    - (i) the superficial area of the deposit is extended; or
    - (ii) the height of the deposit is extended and exceeds the level of the land adjoining the site;
  - (g) subject to subsection (2)(h), the use of any building or part thereof for any purpose other than that for which the building was originally constructed involves a material change in the use of the building;
  - (h) any decorative, painting, renovation or building works, whether external or internal, to or on a monument in respect of which there is in force a preservation order under the <u>Preservation of Monuments Act 2009</u> shall constitute building operations; and

[<u>16/2009 wef 01/07/2009]</u>

(*i*) the use and operation as 2 or more separate entities of any building or buildings or part of a building which is or are approved or authorised to be used and operated as one single entity for any of the uses specified in <u>the Second Schedule</u> involves a material change in the use of the building or buildings or part of the building.

[<u>30/2003 wef 10/12/2003</u>]

# Meaning of "subdivide"

**4.**—(1) Subject to this section, a person shall, for the purposes of this Act, be said to subdivide land if, by any deed or instrument, he conveys, assigns, demises or otherwise disposes of any part of the land in such a manner that the part so disposed of becomes capable of being registered under the <u>Registration of Deeds Act</u> (Cap. 269) or, in the case of registered land, being included in a separate folio of the land-register under the <u>Land Titles Act (Cap. 157)</u>, and "subdivide" and "subdivision" shall be construed accordingly.

(2) Notwithstanding <u>subsection (1)</u>, the following leases granted on or after 1st April 1998 shall not be regarded as a disposal of the land or part thereof:

- (*a*) in the case of any development described in <u>Part I of the Third Schedule</u>, the grant of any lease for any unit in the development for a term not exceeding an aggregate of 14 years;
- (b) in the case of any development described in Part II of the Third Schedule, the grant of any lease for a

building or any part of a building comprised in the development for a term not exceeding an aggregate of 14 years; or

(c) in the case of any other land, the grant of any lease of the whole or part of the land for a term not exceeding an aggregate of 7 years.

[<u>30/2003 wef 10/12/2003</u>]

(3) The Minister may, at any time, by order published in the *Gazette* amend, delete or add to the list of leases in <u>subsection (2)</u> which shall not be regarded as a disposal of land or part thereof.

[30/2003 wef 10/12/2003]

- (4) For the purposes of this section
  - (*a*) the fact that the term of a lease may be extended in pursuance of an option shall be taken into consideration in determining whether the term of the lease exceeds any of the periods specified in <u>subsection (2)</u>; and
  - (b) the fact that a lease for a specified period of time is determinable on the happening of an event within that time shall not be taken into consideration in determining the term of the lease.

[<u>30/2003 wef 10/12/2003]</u>

## **Competent authority**

**5.**—(1) The Minister may, by notification in the *Gazette*, appoint such person or persons as he thinks fit to be the competent authority or authorities responsible for the operation of this Act, either generally or for any particular Part or provision of this Act or for any particular rules made under this Act, and may in the notification specify the extent of and manner in which that responsibility is to be exercised.

(2) The functions conferred on the competent authority by this Act may be performed by any officer referred to in <u>subsection (3)</u> who has been generally or specially authorised by name or office by the competent authority, and subject to his direction and control.

(3) The competent authority may authorise any of the following persons to perform all or any of his functions conferred by this Act:

- (*a*) any public officer; and
- (b) any officer in the employment of a statutory authority which has been approved by the Minister for the purpose.

(3A) Without prejudice to <u>subsections (2)</u> and (3), the competent authority may, with the approval of the Minister, authorise generally or specially any person to perform any or all of the functions conferred on the competent authority by <u>sections 27</u> and <u>31</u>, subject to the direction and control of the competent authority.

[<u>17/2005 wef 15/07/2005</u>]

(4) Any officer or person who is authorised (whether generally or specially) under <u>subsection (2)</u> or <u>(3A)</u> to perform the functions of the competent authority under this Act shall be deemed to be —

(a) a public officer for the purposes of this Act; and

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(b) a public servant within the meaning of the <u>Penal Code (Cap. 224)</u>.

[<u>17/2005 wef 15/07/2005</u>]

#### PART II

## MASTER PLAN AND CONSERVATION AREAS AND GUIDELINES

## **Master Plan**

**6.** The Master Plan means the Master Plan that was originally submitted to and approved by the Governor in Council on 5th August 1958 under the provisions of Part IV of the Singapore Improvement Ordinance (Cap. 259, 1955 Ed.) as subsequently amended under the repealed Act or this Act, and includes the approved maps and written statement.

## **Certified Interpretation Plans**

7.—(1) For the purpose of providing more detailed interpretation of the Master Plan, the competent authority may, from time to time, prepare and certify further maps on a scale larger than that of the maps contained in the Master Plan.

(2) Upon such certification the plan shall be known as a "Certified Interpretation Plan".

## **Amendments to Master Plan**

**8.**—(1) At least once in every 5 years after 1st April 1998, the competent authority shall review the Master Plan and submit to the Minister a report of his review together with proposals for amendment to the Master Plan which he may consider expedient.

(2) Without prejudice to subsection (1), the competent authority may at any time also submit to the Minister proposals for amendment to the Master Plan.

(3) Proposals for amendment to the Master Plan may provide for any of the following in relation to the whole of the area which is the subject of the Master Plan or any part thereof:

- (a) rezoning;
- (*b*) change of plot ratios;
- (c) change of the written statement in any respect;
- (d) designation of conservation areas; or
- (e) any other purpose therein stated.

(4) A proposal for any amendment to the Master Plan may include such maps, written statements and other matter as may be prescribed and such other information as the competent authority considers necessary.

(5) A proposal for any amendment to the Master Plan shall be submitted to the Minister for approval and shall be accompanied by a planning report.

(6) The Minister may approve the proposal with or without modifications or reject it.

(7) When the Minister approves of a proposed amendment to the Master Plan, the Master Plan shall have

effect as amended as from the date of the approval of the Minister.

(8) In the event of any conflict between provisions of the Master Plan, the most recently approved provision shall prevail.

## **Conservation areas**

**9.**—(1) Where in the opinion of the Minister any area is of special architectural, historic, traditional or aesthetic interest, the Minister may approve under section 8 a proposal to amend the Master Plan to designate the area as a conservation area.

- (2) A conservation area may comprise
  - (*a*) an area;
  - (b) a single building; or
  - (c) a group of buildings.

#### Rules relating to amendments to Master Plan

**10.**—(1) The Minister may make rules to provide for the form, content and procedure to be followed in connection with the preparation, submission and approval of an amendment to the Master Plan.

- (2) Without prejudice to the generality of subsection (1), such rules may, in particular, require
  - (*a*) the competent authority to publish in prescribed circumstances a notice of the submission of any proposal to amend the Master Plan, and of the place or places where copies of the Master Plan and of the proposal may be inspected;
  - (b) objections and representations made in accordance with the rules to be considered, and public inquiries or other hearings in such cases as may be prescribed to be held before the Master Plan is amended by the Minister; and
  - (c) copies of the Master Plan or parts thereof to be made available for free inspection by and for sale at a reasonable cost to the public.
- (3) [Deleted by Act 30/2003 wef 10/12/2003]

## **Conservation guidelines**

**11.**—(1) The competent authority may, from time to time, issue guidelines for the conservation of buildings or land within a conservation area and for the protection of their setting.

(2) The competent authority shall publish and make available copies of such guidelines for free inspection and for sale at a reasonable cost to the public.

#### PART III

## DEVELOPMENT AND SUBDIVISION OF LAND

#### Unauthorised subdivision, development and other works

**12.**—(1) No person shall without planning permission carry out any development of any land outside a conservation area.

- (2) No person shall without conservation permission carry out any works within a conservation area.
- (3) No person shall without subdivision permission subdivide any land.

(4) Any person who contravenes subsection (1), (2) or (3) shall be guilty of an offence and shall be liable on conviction —

- (a) to a fine not exceeding \$200,000; and
- (*b*) in the case of a continuing offence, to a further fine not exceeding \$10,000 for every day or part thereof during which the offence continues after conviction.

(5) Where a person is convicted of an offence under subsection (4) in respect of any works on or any development or subdivision of land without having been served previously with an enforcement notice in respect of the works, development or subdivision, the competent authority may serve an order on the person directing him to remove from the land, within 14 days of the date of service of the order, all such property or materials used in connection with the offence as may be specified in the order.

## **Application for permission**

**13.**—(1) An application for planning permission, conservation permission or subdivision permission shall be made to the competent authority in the prescribed form and manner.

(2) The competent authority shall seek to determine such an application within 3 months of receiving it but may, where unavoidable circumstances so require, defer his determination for such further period as he thinks fit.

# Applications determined with reference to Master Plan, etc.

**14.**—(1) Subject to subsection (2), in determining an application for written permission, the competent authority shall act in conformity with the provisions of the Master Plan and any Certified Interpretation Plan in so far as they may be relevant.

(2) Where the Minister approves, either in relation to a particular application or a class of applications, as the case may be, the competent authority need not act in accordance with subsection (1) in any of the following circumstances:

- (*a*) the land to which the application relates (referred to in this subsection as the relevant land) is or will be required for any public purpose or for the provision of any utility services or infrastructural, social or transportation facility;
- (b) the relevant land, or its locality, is the subject of a planning, transportation, conservation or

preservation study being carried out by the competent authority or any other public authority;

- (c) the provisions of the Master Plan in so far as it relates to the relevant land, or its locality, is being reviewed by the competent authority;
- (*d*) a proposal to amend the provisions of the Master Plan in so far as it relates to the relevant land, or its locality, has been submitted to the Minister for approval under section 8;

[30/2003 wef 24/12/1998]

(e) the competent authority is of the view that the development proposed in the application is incongruent with the developments on land adjoining the relevant land or other land in the locality; or

#### [30/2003 wef 24/12/1998]

(*f*) the planning permission or conservation permission to be granted for the development proposed in the application is for a specified period not exceeding 10 years.

[30/2003 wef 24/12/1998]

(3) Where subsection (2) applies, the competent authority may determine the application in the manner as the Minister may approve.

- (4) Subject to any rules, the competent authority may
  - (*a*) grant written permission, either unconditionally or subject to such conditions as he considers fit, including those referred to in section 15; or
  - (b) refuse written permission.

(5) Where written permission is granted subject to conditions or is refused, the competent authority shall provide reasons in writing for imposing the conditions or refusing the application, as the case may be.

(6) When an application for planning permission or conservation permission is made to the competent authority in relation to any land, the application shall supersede any previous application for planning permission or conservation permission relating to the same land which remains undetermined.

(7) Unless otherwise approved by the Minister in writing, the planning permission or conservation permission of the competent authority shall be a condition precedent to the consideration by a licensing authority of any application for the issue of a licence for any purpose involving the development of land.

# Applications determined in reliance of certificate or declaration of qualified person

**14A.**—(1) Where, in accordance with rules made under section 61, an application for written permission is required to be accompanied by any certificate or declaration by an appropriate qualified person that to the best of his knowledge and belief —

- (*a*) the information contained in any specified document, form and plan submitted for the application is true and correct in all material particulars; and
- (*b*) every such document, form and plan submitted for the application has been completed or prepared in accordance with the provisions of this Act and all requirements as may be specified by the competent

## authority in respect of the application,

the competent authority may, without checking the information, documents, forms or plans, determine the application on the basis of the certificate or declaration of the qualified person.

[30/2003 wef 10/12/2003]

(2) Notwithstanding subsection (1), the competent authority may, in his discretion, carry out random checks on any information, document, form or plan relating to any application for written permission before or after determining the application.

[30/2003 wef 10/12/2003]

(3) The competent authority may at any time revoke any written permission granted under subsection (1) if he is satisfied that -

- (*a*) any information contained in any document, form or plan submitted for the application is false or misleading in any material particular; or
- (*b*) any document, form or plan submitted for the application is not in compliance in any material particular with the provisions of this Act and the requirements as may be specified by the competent authority in respect of the application.

#### [30/2003 wef 10/12/2003]

(4) Where the competent authority revokes a written permission under subsection (3), any development of land, works within a conservation area or subdivision of land (as the case may be) carried out pursuant to that written permission shall be deemed to have been carried out without the requisite written permission.

[30/2003 wef 10/12/2003]

(5) Any qualified person who —

- (*a*) makes a certificate or declaration referred to in subsection (1) which is false or misleading in any material particular; or
- (b) recklessly makes such certificate or declaration which is false or misleading in any material particular,

shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$30,000 or to imprisonment for a term not exceeding 6 months or to both.

[30/2003 wef 10/12/2003]

## **Conditional permission**

**15.**—(1) All or any of the following conditions may be imposed on the grant under section 14(4) of any planning permission or conservation permission in respect of any land:

- (*a*) that the permission is granted for a specified period;
- (b) that any work shall be commenced by a specified time;
- (c) restrictions as to the height, design, appearance and siting of buildings;
- (*d*) that subdivision of the land is prohibited;
- (e) that deposits shall be placed with such statutory authority as the competent authority may specify to

secure compliance with the requirements of that statutory authority;

- (*f*) that the title of any part of the land shall be transferred free from encumbrances to the State or any public authority;
- (g) [Deleted by Act 30/2003 wef 10/12/2003]
- (*h*) that such connecting structures (whether or not within the land) as the competent authority considers necessary are to be provided, maintained, kept open and accessible for use by the public or any occupier or other user of the land and any other land adjoining or in the locality; and
- (*i*) that the permission shall supersede any previous permission given by the competent authority to the applicant notwithstanding anything in section 20.

(2) The following conditions may also be imposed on the grant of any conservation permission under section 14(4):

- (*a*) requirements for compliance with any conservation guidelines or any other requirements relating to conservation;
- (*b*) requirements for making good any damage caused to the building by any works after the works are completed; and
- (c) where the approval of the Commissioner of Building Control under the Building Control Act (Cap. 29) is required to be obtained for the plans of the building works with regard to any works within a conservation area, requirements for the submission to the competent authority, within 7 days of the application for approval made to the Commissioner of Building Control, of a declaration by a qualified person that the plans submitted to the Commissioner of Building Control for the application with regard to such works are in accordance with the plans approved by the competent authority in the grant of the conservation permission.

[30/2003 wef 10/12/2003]

(3) Any person who fails to comply with any condition imposed on any planning permission or conservation permission shall be guilty of an offence and shall be liable on conviction —

- (a) to a fine not exceeding \$200,000; and
- (*b*) in the case of a continuing offence, to a further fine not exceeding \$10,000 for every day or part thereof during which the offence continues after conviction.

(3A) Any qualified person who —

- (a) makes a declaration referred to in subsection (2)(c) which is false or misleading in any material particular; or
- (b) recklessly makes such declaration which is false or misleading in any material particular,

shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$30,000 or to imprisonment for a term not exceeding 6 months or to both.

[30/2003 wef 10/12/2003]

(3B) In subsection (2)(c), "qualified person" means a person who is registered as an architect under the

Architects Act (Cap. 12) and who has in force a practising certificate issued under that Act.

[30/2003 wef 10/12/2003]

(4) Where any person fails to comply with any condition imposed on any planning permission or conservation permission, the competent authority may cancel the relevant permission.

(5) In this section, "connecting structure" means any underpass, subway, bridge or other structure, whether under, above or on the ground and whether for pedestrians or vehicles, linking or connecting a building with another or a building with any public facility or street, and includes escalators, travelators and other facilities.

## Subdivision permission: supplementary provisions

**16.**—(1) A planning permission or conservation permission may also, where it expressly so provides, contain subdivision permission.

(2) A copy of every document containing subdivision permission shall be forwarded by the competent authority to the Collector together with a plan of the subdivision so authorised on which the dimensions of all lots, widths of streets and backlanes and such other particulars as the competent authority may consider necessary are shown.

#### **Provisional permission**

**17.**—(1) Where the competent authority so determines, he may grant any written permission as a provisional permission in the first instance.

(2) The competent authority may authorise (generally or specially) the carrying out of specified preliminary works following the grant of provisional permission.

(3) Any grant of provisional permission shall lapse 6 months following the date of its granting unless a longer period is specified in the provisional permission or the competent authority otherwise directs in writing.

(4) Where the competent authority is satisfied that all the conditions contained in a provisional permission have been complied with during the validity period of the provisional permission, the competent authority shall grant final permission subject to such further conditions as he thinks fit.

(5) A final permission granted under subsection (4) shall be deemed to be a written permission granted under section 14.

#### **Outline permission**

**18.**—(1) An applicant for planning permission or conservation permission may if he so desires apply in the first instance for outline permission in the manner prescribed.

(2) An application for outline permission shall be determined on the same basis as an application for planning permission or conservation permission except that the competent authority shall have regard only to matters relating to land use, intensity, type, form and height of the proposed development or works.

(3) Outline permission shall constitute approval in principle for the proposed development or works, but shall not authorise the carrying out of that development or works or any other development or works.

(4) Any grant of outline permission shall lapse 6 months following the date of its granting unless a longer period is specified in the outline permission or the competent authority otherwise directs in writing.

(5) Where subsequent to the grant of outline permission an application for planning permission or conservation permission is made during the validity period of the outline permission, the application shall be determined on the basis of the further details supplied on that subsequent application.

(6) Section 22 shall apply, with the necessary modifications, to applications made under this section as it applies to applications made under section 13.

# **Rectification of errors and omissions**

**19.**—(1) The validity of any written permission granted under this Part shall not be affected by any error in or omission of any particulars relating to the description of any land or boundary if the location and identity of the land are not in question.

(2) The competent authority may at any time rectify any such error or omission by —

- (a) notification in the *Gazette*; or
- (b) amending or adding to the written permission to correct any matter erroneously entered or omitted.

# **Expiry of permissions**

**20.**—(1) Except where the competent authority imposes a condition to the contrary, every planning permission and every conservation permission shall lapse if the development or works authorised by it are not completed or effected within 2 years of —

- (*a*) the date of the grant of the planning permission or conservation permission, as the case may be;
- (b) the date of the final permission granted under section 17(4); or
- (c) if an appeal is made under section 22, the date the appeal is determined or withdrawn.

(2) The competent authority may, in his discretion, extend any planning permission or conservation permission on such terms and for such further period as he thinks fit.

# **Applications referred to Minister**

**21.**—(1) The Minister may give directions to the competent authority requiring that all or any applications under section 13 or any class of applications specified in the direction shall be referred to him for determination instead of the competent authority, and every such application shall then be so referred to the Minister.

(2) The decision of the Minister on such an application shall be communicated to the competent authority, who shall grant or refuse written permission in accordance with the decision, and, if written permission is granted, impose such conditions as the Minister may direct and such other conditions as the competent authority thinks fit.

(3) The Minister shall, in determining any such application, have all the functions of the competent authority under this Act, and references to the competent authority shall accordingly be construed as references to the Minister.

(4) Any decision by the Minister under this section shall be final, and shall not be subject to appeal under section 22 or challenged or questioned in any court; but any decision by the competent authority to impose conditions other than as directed by the Minister shall be subject to appeal under section 22 as if the conditions had been imposed by the competent authority under section 14(4).

(5) Where the competent authority intends to develop or to carry out works within a conservation area on any land belonging to him, he may be directed by the Minister to furnish to the Minister particulars relating to the development or works and the Minister may give such further directions as he considers fit in relation thereto.

(6) The Minister may authorise, by notification in the *Gazette*, either generally or in relation to any specified area —

- (a) any development of land;
- (b) any works within a conservation area; or
- (c) any subdivision of land,

subject to such conditions as may be specified in the notification.

[30/2003 wef 10/12/2003]

# **Appeals to Minister**

22.—(1) Where an application for written permission under section 13 is —

- (*a*) refused by the competent authority;
- (b) granted by the competent authority subject to conditions; or
- (c) granted provisional permission under section 17 by the competent authority subject to conditions,

the applicant who is aggrieved by that decision may appeal to the Minister against that decision.

(2) An appeal shall be made in the form and manner prescribed and within 60 days of the date of the notification of the decision.

(3) Where an appeal is brought under this section against a decision of the competent authority, the Minister may dismiss or allow the appeal unconditionally or subject to such conditions as he considers fit.

(4) The decision of the Minister on an appeal shall be communicated to the competent authority and the applicant.

(5) Where the competent authority grants written permission in accordance with the decision of the Minister

on appeal, the competent authority may, in addition to the conditions allowed by the Minister, impose such additional conditions as the competent authority thinks fit which shall not be inconsistent with the decision of the Minister on appeal.

(6) Any decision by the competent authority to impose additional conditions under subsection (5) may be appealed against under subsection (1) as if the conditions were imposed under section 14(4).

(7) The decision of the Minister shall be final and shall not be challenged or questioned in any court.

## **Registers and records**

23.—(1) The competent authority shall keep a record of —

- (a) all written permissions granted or refused by him and by the Minister under this Part; and
- (b) all decisions made by the Minister on appeal under section 22.

(2) The record shall include all relevant plans.

(3) The record shall be made available for inspection to any member of the public on payment of such fees as may be prescribed.

(4) The record may be kept in electronic form.

## Obligation to purchase land in certain cases

**24.**—(1) Without prejudice to the operation of any other written law relating to the acquisition of land for a public purpose, any owner of land which is allocated in the Master Plan for development for a public purpose may serve on the competent authority a purchase notice requiring his interest in the land so required for that public purpose to be purchased in accordance with this section, if he —

- (a) is refused permission under section 14 to develop that land; or
- (*b*) has completed the development of any contiguous land belonging to him in accordance with any permission granted by the competent authority under section 14.

(2) The person serving the notice shall certify that he has the consent of every person known to him to have an interest in the land.

(3) The competent authority shall investigate every purchase notice so served and, when he is satisfied with the correctness thereof, he shall transmit the purchase notice to the Minister together with the following information:

- (a) the specific public purpose for which the land is allocated; and
- (b) any written permission granted to the owner of the land to develop it notwithstanding the allocation of the land for a public purpose.

(4) The Minister may reject a purchase notice in whole or in part where, in his opinion, the land or part thereof -

- (a) is capable of reasonably beneficial use in its existing state; or
- (*b*) will not be required for development for a public purpose within 5 years from the date of service of the purchase notice.

(5) Where, and to the extent that, he does not reject a purchase notice, the Minister shall declare that the land referred to in the purchase notice or any part thereof is needed for a public purpose and may order proceedings to be taken for —

- (*a*) obtaining possession of the land or part thereof for the State, the competent authority or any public authority; and
- (b) determining compensation to be paid to any person or persons interested therein.

(6) Such compensation shall be assessed in the manner and according to the principles laid down in any written law for the time being in force relating to the acquisition of land for a public purpose, but account shall be taken of any such written permission for development granted as referred to in subsection (3)(b).

(7) For the purposes of this section, the allocation of land in the Master Plan as being within —

- (*a*) a green belt; or
- (b) a conservation area,

shall not constitute an allocation for development for a public purpose.

## PART IV

#### **ENFORCEMENT**

# Power to require information about activities on land

**25.**—(1) Where it appears to the competent authority that there may have been a breach of planning control in respect of any land, he may serve an information notice on any person who —

- (a) is an owner or occupier of the land or has any other interest in the land; or
- (b) is carrying out operations on the land or is using the land for any purpose.

(2) An information notice may require the person on whom it is served to give such information as may be specified in the notice relating to -

- (*a*) any operations being carried out on the land, any use of the land and any other activities being carried out on the land; and
- (b) any matter relating to the conditions subject to which any planning permission or conservation permission in respect of the land has been granted.

(3) In particular, an information notice may require the person on whom it is served —

- (*a*) to state whether or not the land is being used for any purpose specified in the notice or any operations or activities specified in the notice are being or have been carried out on the land;
- (b) to state when any use, operations or activities began;
- (c) to give the name and address of any person known to him to use or have used the land for any purpose, or to be carrying out or have carried out any operations or activities on the land;
- (d) to give any information he holds as to any planning permission or conservation permission for any use or operations or any reason for planning permission or conservation permission not being required for any use or operations;
- (e) to state the nature of his interest (if any) in the land and the name and address of any other person known to him to have an interest in the land.

(4) An information notice shall be complied with by giving the required information in writing to the competent authority.

(5) The service of an information notice does not affect any other power exercisable in respect of any breach of planning control.

(6) In this section, any reference to operations or activities on land shall include a reference to operations or activities in, under or over the land, and includes works in a conservation area.

# Penalties for non-compliance with information notice

**26.**—(1) If the person on whom an information notice is served does not comply with the notice at the end of 21 days from the day the notice was served on him, he shall be guilty of an offence.

(2) It shall be a defence for a person charged with an offence under subsection (1) to prove that he did not know, and could not with reasonable diligence have ascertained, the information required in the information notice.

- (3) If any person
  - (*a*) makes any statement purporting to comply with a requirement of an information notice which he knows to be false or misleading in a material particular; or
  - (b) recklessly makes such a statement which is false or misleading in a material particular,

he shall be guilty of an offence.

(4) Any person who is guilty of an offence under this section shall be liable on conviction to a fine not exceeding \$5,000 or to imprisonment for a term not exceeding 6 months or to both.

## Authority to enter upon land

27.—(1) The competent authority may, with such assistants and workmen as are necessary, at any reasonable time, enter any land for the purpose of -

- (a) ascertaining whether there is, or has been, a contravention of this Act;
- (*b*) ascertaining whether any of the functions conferred by this Act on the competent authority or the Minister should or may be exercised; or
- (c) taking any action or carrying out any work authorised or required by or under this Act.

[17/2005 wef 15/07/2005]

(2) The competent authority may take photographs of the land and any property or material found thereon and such other steps as he may consider necessary without involving any search or seizure of any premises, thing or person.

(3) The occupier of any premises shall, if required by the competent authority —

- (a) give his name and address;
- (b) provide proof of his identity; and
- (c) give the name and address of the owner of the premises, if known.

(4) Any person who wilfully obstructs the competent authority in the performance of any matter or thing which he is authorised to do by this section or fails to comply with the requirement under subsection (3) shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$5,000 or to imprisonment for a term not exceeding 6 months or to both.

(5) A police officer may arrest without warrant any person who has committed or whom he reasonably

suspects to have committed an offence under subsection (4) if -

- (a) the person declines to give his name and address; or
- (b) there is reason to doubt the accuracy of the name and address, if given.

(6) A person arrested under this section may be detained until his name and address are correctly ascertained except that no person so arrested shall be detained longer than is permitted by written law and is necessary for bringing him before a court unless the order of a court for his detention is obtained.

#### **Enforcement notices**

**28.**—(1) The competent authority may issue an enforcement notice where it appears to him that there has been a breach of planning control.

(2) An enforcement notice shall specify the steps the competent authority requires to be taken, or the activities on or the use of the land he requires to cease, in order to remedy (wholly or partly) the breach of planning control or to remedy any injury to any amenities caused by the breach.

- (3) An enforcement notice may, in particular, require
  - (a) the alteration, demolition or removal of any building or works;
  - (b) the carrying out of any building or other operations;
  - (c) the cessation, either wholly or to the extent specified in the notice, of any activity on or use of the land; or
  - (*d*) the removal from the land of all property and materials used in connection with the breach of planning control.

(4) Where the enforcement notice relates to unauthorised works in a conservation area, the notice may also include -

- (a) a requirement to restore any building on the land to its former state;
- (b) if the competent authority considers that such restoration is not reasonably practicable or undesirable, a requirement to execute such works as he may specify in the notice to alleviate the effect of the unauthorised works; or
- (c) a requirement to bring any building to the state in which it would have been if the terms and conditions of any conservation permission granted in respect of the building had been complied with.
- (5) An enforcement notice shall specify
  - (*a*) the date on which it is to take effect, which shall not be less than 14 days from the date of service of the notice; and
  - (*b*) the period (which shall run from the date the enforcement notice takes effect) within which any step required by the notice shall be taken or any activity on or the use of the land required by the notice to cease shall cease.

- (6) A copy of an enforcement notice may be served on any one or more of the following:
  - (a) any owner of the land to which it relates;
  - (b) any occupier of that land; or
  - (c) any other person who appears to the competent authority to have been responsible for or participated in the breach of planning control.
- (7) An enforcement notice shall continue to have effect until and to the extent that the notice is
  - (a) superseded by a grant of planning permission or conservation permission under section 14;
  - (b) superseded by a notification under section 21(6); or
  - (c) withdrawn by the competent authority.

(8) Compliance with the requirements of an enforcement notice, whether in respect of —

- (a) the completion, demolition, removal or alteration of any building or works;
- (b) the discontinuance of any activity on or use of the land; or
- (c) in any other manner,

shall not discharge the notice.

(9) Except by way of an appeal to the Minister under section 29, the validity of an enforcement notice shall not be questioned in any court or proceedings whatsoever.

#### Appeal to Minister against enforcement notice

**29.**—(1) Any person aggrieved by any requirement of an enforcement notice may, at any time before the notice takes effect, appeal to the Minister in the form and manner prescribed.

(2) Where an appeal is made under this section, the Minister may —

- (a) correct any defect, error or misdescription in the enforcement notice or vary its requirements;
- (*b*) extend, subject to such conditions as he considers fit, the period specified in the enforcement notice within which any requirement therein is to be complied;
- (c) dismiss the appeal;
- (d) allow the appeal unconditionally; or
- (e) allow the appeal in whole or in part, and subject to such conditions as he considers fit,

and the Minister may give such directions as he thinks necessary to give effect to his decision on the appeal.

(3) Without prejudice to the general power of the Minister to impose conditions or give directions under subsection (2), the Minister may require that such security as he may think necessary be furnished to the competent authority and specify the circumstances in which the security may be forfeited by the competent authority.

(4) The decision of the Minister under subsections (2) and (3) shall be final.

(5) When an appeal is made to the Minister under this section, the enforcement notice shall, unless the Minister at any time otherwise directs, be of no effect pending the determination or withdrawal of the appeal.

(6) Except where the Minister decides to allow an appeal unconditionally, the enforcement notice shall take effect from the date the appellant is given notice of the decision of the Minister.

(7) Any forfeiture by the competent authority of any security furnished under this section shall not prejudice the institution of proceedings against any person for any offence under this Act.

## Offences of non-compliance with enforcement notice

**30.**—(1) Where there has been a failure to comply with any requirement of an enforcement notice in relation to any land, the person who is served with the enforcement notice shall be guilty of an offence.

- (2) Any person who
  - (*a*) uses land in contravention of the enforcement notice after the requirements in the notice have been complied with; or
  - (b) carries out any works by way of reinstating or restoring buildings or works which have been demolished or altered in compliance with the requirements in an enforcement notice,

shall, notwithstanding the earlier compliance with the notice, be guilty of an offence.

(3) A person guilty of an offence under this section shall be liable on conviction —

- (*a*) to a fine not exceeding \$200,000 or to imprisonment for a term not exceeding 12 months or to both; and
- (b) in the case of a continuing offence, to a further fine not exceeding \$10,000 for every day or part thereof during which the offence continues after conviction.

## Execution and costs of works required by enforcement notice, etc.

**31.**—(1) Where —

- (a) any requirement of an enforcement notice or an order under section 12(5) is not complied with within the period allowed by the notice or order, as the case may be;
- (*b*) any land is used in contravention of an enforcement notice after the requirements in the notice have been complied with; or
- (c) any works have been carried out by way of reinstating or restoring buildings or works which have been demolished or altered in compliance with the requirements of an enforcement notice,

the competent authority may, with such assistants and workmen as are necessary, at any time enter the land and take any steps which are in his opinion necessary to secure compliance with the notice or order, as the case may be, including removing, detaining and disposing of any property or materials on the land.

[17/2005 wef 15/07/2005]

(2) The costs or expenses incurred, directly or indirectly, by the competent authority in exercise of the powers conferred by subsection (1) shall be recoverable as a civil debt from any person served with the enforcement notice or order under section 12(5), as the case may be, less such sums which are recoverable under section 32.

(3) The certificate of the competent authority stating the amounts of costs and expenses recoverable under subsection (2) shall be conclusive evidence of such amounts.

(4) The sums stated in the certificate of the competent authority under subsection (3) shall be secured as a first charge against the land and shall, subject and without prejudice to any other rights of the Government, prevail over all other estates and interests whenever created notwithstanding the provisions of any other written law relating to the registration of any interest or encumbrance over land.

#### Removal and sale of property and materials

**32.**—(1) Any property or materials removed and detained by the competent authority in the exercise of his powers under section 31 may be sold or otherwise disposed of unless a claim is made by the person to whom the property or materials belong within 2 weeks of the removal, in which case the property or materials may, subject to subsection (2), be returned to the person to whom they belong on such terms and conditions as the competent authority may impose.

(2) Any property or materials which have been removed and detained by the competent authority under section 31 shall not be returned to the person to whom they belong except upon the person having paid all the expenses incurred, directly or indirectly, by the competent authority in removing and detaining the property or materials or such part of those expenses as the competent authority determines.

(3) Where the competent authority sells any property or materials under subsection (1), the competent authority shall be entitled to deduct from the proceeds of the sale all or any of the costs and expenses incurred, directly or indirectly, by the competent authority in respect of the removal, detention and sale of the property or materials and the balance, if any, shall be paid on demand to the person to whom the property or materials belong.

(4) Any proceeds of sale of property or materials under this section not claimed within 2 years of the sale shall be paid into the Consolidated Fund.

#### Injunctions

**33.**—(1) Where the competent authority considers it necessary or expedient for any actual or apprehended breach of this Act to be restrained by injunction, the competent authority may apply to the High Court for an injunction, whether or not he has exercised or is proposing to exercise any of his other powers under this Part.

(2) On an application under subsection (1), the High Court need not require from the competent authority any undertaking in damages.

(3) On an application under subsection (1), the High Court may grant such an injunction as the Court thinks

appropriate for the purpose of restraining the breach.

# **Civil penalties**

**34.**—(1) The competent authority may require a person to pay a penalty for the grant of any written permission for —

- (*a*) any development of land;
- (b) any works within a conservation area; or
- (c) any subdivision of land,

in respect of which there appears to the competent authority that an offence has been committed, whether or not proceedings have been instituted against any person for an offence under section 12.

(2) Such a penalty shall not exceed —

- (*a*) 50 times the fee prescribed for an application for planning permission, conservation permission or subdivision permission, as the case may be; or
- (*b*) \$150,000,

whichever is the lesser amount.

(3) The certificate of the competent authority as to the penalty to be imposed under this section shall be conclusive of the amount.

(4) No further proceedings shall be instituted or taken against any person for an offence under section 12 once the penalty has been paid.

#### PART V

## DEVELOPMENT CHARGES

## **Principles of development charge**

**35.**—(1) Subject to the provisions of this Act, there shall be paid to the competent authority a tax known as a development charge in respect of every development of land authorised by any planning or conservation permission, except where the planning permission or conservation permission is granted for a specified period of 10 years or less.

[30/2003 wef 10/12/2003]

(2) Subject to section 39, any development charge payable in respect of any development of land shall be the difference between the Development Baseline and the Development Ceiling for that land.

(3) Development Baseline and Development Ceiling have the meanings assigned to them in section 36 and shall be calculated in accordance with the prescribed method and rates.

## **Development Baseline and Development Ceiling**

**36.**—(1) Subject to this section, the Development Baseline for any land shall be the value of any authorised development of that land which satisfies any one or more of the following criteria:

- (a) development charge, where payable in respect of the authorised development, has been paid;
- (b) no development charge is payable in respect of the authorised development by reason of any exemption or remission under this Act or the repealed Act; or
- (c) development charge is not payable in respect of the authorised development under the written law in force when the development was authorised.

[30/2003 wef 01/01/2008]

(2) The value of any development of land referred to in subsection (1) shall be calculated in accordance with the prescribed methods and rates.

#### [30/2003 wef 01/01/2008]

(3) Notwithstanding subsection (1), any development of land, being a development in respect of which no development charge is payable by reason of any exemption or remission under this Act or the repealed Act, shall be disregarded for the purpose of determining the Development Baseline for the land if —

- (*a*) any term of the exemption or remission provides that the development shall be disregarded for that purpose; or
- (b) any term of the exemption or remission has ceased to be or is not complied with.

[30/2003 wef 01/01/2008]

(4) Notwithstanding subsection (1), any development of land for use as a hotel or part of a hotel authorised by the grant of written permission by the competent authority under the repealed Act between 18th April 1968 and 31st December 1969 (both dates inclusive) on any prescribed land shall be disregarded for the purpose of

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determining the Development Baseline for the land if —

- (a) the use of the development as a hotel or part of a hotel has ceased; or
- (*b*) the application for planning permission or conservation permission being considered by the competent authority for the land is for development of the land for a use other than as a hotel.

[30/2003 wef 01/01/2008]

(5) Notwithstanding subsections (1) to (4), where the Development Baseline for any land cannot be ascertained in accordance with those subsections, the Development Baseline for the land shall be deemed to be the value of the last authorised development of the land before the material date.

[30/2003 wef 01/01/2008]

(6) Notwithstanding subsections (1) to (5), where the Development Baseline for any land cannot be ascertained in accordance with those subsections, the competent authority may, with the prior approval of the Minister, assign the Development Baseline for that land.

[30/2003 wef 01/01/2008]

(7) The Development Ceiling for any land shall be the total of the following when calculated in accordance with the prescribed method and rates:

- (a) the value of the authorised development of the land to be retained; and
- (b) the value of the development of the land to be authorised by the written permission.

[30/2003 wef 01/01/2008]

(8) Notwithstanding anything in this Act, in determining both the Development Baseline and Development Ceiling for any land, any development of that land authorised by a written permission granted for a specified period not exceeding 10 years shall be disregarded.

- (9) For the purposes of subsection (8)
  - (*a*) the fact that the period specified for a written permission granted for a development may be extended by the competent authority shall not be taken into consideration in determining whether the written permission is granted for a specified period not exceeding 10 years; and
  - (*b*) where the competent authority extends the period for which a written permission is granted for a development, the extension shall be deemed to be a separate written permission granted for the period of the extension specified by the competent authority.

[30/2003 wef 01/01/2008]

(10) In this section, unless the context otherwise requires —

"authorised", in relation to any development of land, means any development of that land —

- (a) authorised under this Act or the repealed Act; or
- (*b*) effected or carried out pursuant to any written approval granted under any written law before 1st February 1960;

"material date" means the date on which an application for planning permission or conservation

permission is made.

## Liability to pay development charge

**37.**—(1) Subject to subsection (4), the development charge (whether under an interim or final order) may, in the discretion of the competent authority, be levied on —

- (*a*) the owner of the land with respect to which the planning permission or conservation permission is granted; or
- (b) the person who applied for the relevant planning permission or conservation permission.

(2) That liability of the person on whom the development charge is levied shall continue notwithstanding any change in ownership of the land.

(3) Notwithstanding section 13(2), the competent authority shall not grant any planning permission or conservation permission until the estimated amount of development charge payable under an interim order under section 38(2) is either paid or secured to the satisfaction of the competent authority.

(4) Any outstanding amount of development charge shall be secured as a first charge against the land to which the relevant permission relates, and shall, subject to any other rights of the Government, prevail over all other estates and interests whenever created notwithstanding the provisions of any other written law relating to the registration of any interest or encumbrance over land.

## Procedure for determination and payment of development charge

**38.**—(1) The competent authority shall determine whether a development charge is payable in respect of any proposed development of land and, if payable, the amount thereof.

(2) The competent authority may in the first instance estimate the amount of development charge payable in respect of any proposed development of land and issue an interim order requiring the payment of such estimated amount.

(3) The competent authority shall serve a copy of the interim order on the person liable for the payment of the development charge in accordance with section 37.

(4) Where an interim order is issued under subsection (2) in respect of any proposed development of land, the competent authority shall, within 12 months from the date of the grant of the planning permission or conservation permission for that proposed development, determine the actual amount of development charge payable and make a final order.

(5) If no final order is made at the end of the period allowed under subsection (4), the estimated amount shall be deemed to be the actual amount of development charge payable in respect of the proposed development and the interim order shall be deemed to be a final order.

(6) Any additional development charge payable under a final order issued under subsection (4) shall be paid within such time as the competent authority may specify in the final order.

(7) Where a final order issued under subsection (4) is for an amount lower than the amount in the interim order relating to the same proposed development, the competent authority shall refund the excess without interest to the person who paid the estimated amount under the interim order.

# Alternative basis for determination of development charge

**39.**—(1) The Minister may limit the application of this section to proposed developments in respect of which the estimated amount of development charge payable under an interim order issued under section 38(2) exceeds a prescribed sum.

(2) Any person who is dissatisfied with the estimated amount of any development charge specified in an interim order issued under section 38(2) may, within 14 days of the interim order being served on him in accordance with section 38(3), in writing request the competent authority to determine the development charge in accordance with this section.

(3) Where any person makes such a request under subsection (2) in respect of any proposed development of any land, the development charge payable for any planning permission or conservation permission in respect of the proposed development shall be a prescribed percentage of any appreciation in the value of the land arising from the grant of the relevant permission to develop the land.

(4) For the purposes of this section, the Chief Valuer or such other person as the Minister may appoint shall determine the amount of appreciation, if any, in the value of the land.

(5) The competent authority may by an interim order require the payment of an estimated amount of development charge to be determined in accordance with this section and the provisions of section 38(2) and (3) shall apply, with the necessary modifications, to an interim order under this subsection.

(6) Where an interim order is issued under subsection (5) in respect of any proposed development of land, the competent authority shall, within 12 months from the date of the grant of planning permission or conservation permission for that proposed development, determine the actual amount of development charge payable in accordance with this section and make a final order; and the provisions of section 38(5) to (7) shall apply, with the necessary modifications, to such interim order and final order.

(7) Where a person liable to pay any development charge under this section is dissatisfied with —

- (a) the interim order under subsection (5);
- (b) the final order under subsection (6); or
- (c) the interim order deemed final pursuant to subsection (6),

he may, within 30 days of the interim order or the final order under this section, or if no final order is made, after the expiry of the time allowed under subsection (6) for a final order to be made, appeal to the Minister whose decision shall be final.

(8) A person who appeals to the Minister against an interim order under this section may nevertheless pay the estimated development charge under the interim order pending the outcome of his appeal and, upon the grant of the relevant written permission, may proceed with the development or works, but such payment shall be without prejudice to his appeal.

(9) No person may appeal under subsection (7) unless he has paid the prescribed fee for the appeal.

#### **Remission of development charge**

**39A.** The Minister may, in his discretion and subject to such terms and conditions as he may determine, remit, wholly or in part, the development charge payable by any person if he is satisfied that it is just and equitable to do so.

[30/2003 wef 10/12/2003]

## Power to make rules relating to development charge

**40.**—(1) The Minister may make rules for giving effect to this Part and for any matter which is required under this Part to be prescribed and, in particular, for or with respect to all or any of the following matters:

- (a) the different rates and methods of calculation of development charge;
- (b) exempting any particular development or class of developments from being the subject of any development charge;
- (c) the procedure for an application to the competent authority to determine the amount of any development charge;
- (d) the deferment of liability to pay development charge; and
- (e) the refund, wholly or in part, of the development charge paid by any person.

## (2) [Deleted by Act 30/2003 wef 10/12/2003]

# PART VA

# TEMPORARY DEVELOPMENT LEVY

[30/2003 wef 10/12/2003]

# **Temporary development levy**

**40A.**—(1) Subject to the provisions of this Part, there shall be paid to the competent authority a tax known as a temporary development levy in respect of every development of land authorised by any planning permission or conservation permission granted for a specified period of 10 years or less.

[30/2003 wef 10/12/2003]

(2) Subject to subsection (3), the temporary development levy shall only be payable if the Development Ceiling for the land exceeds the Development Baseline.

[30/2003 wef 10/12/2003]

(3) The temporary development levy payable shall be calculated in accordance with the prescribed methods and rates.

[30/2003 wef 10/12/2003]

(4) For the purposes of this section, where the competent authority extends the period for which a planning permission or conservation permission referred to in subsection (1) is granted, the extension shall be deemed to be a separate planning permission or conservation permission for the period of the extension specified by the competent authority.

[30/2003 wef 10/12/2003]

(5) In this Part —

"Development Baseline" shall have the same meaning as in Part V;

- "Development Ceiling" shall have the same meaning as in Part V except that the development referred to in section 36(7)(b) shall, notwithstanding any provision to the contrary in section 36, be deemed to refer to the development of the land to be authorised by a temporary permission;
- "temporary permission" means a planning permission or conservation permission granted for a specified period of 10 years or less.

[30/2003 wef 10/12/2003]

## Liability to pay temporary development levy

**40B.**—(1) The competent authority shall determine whether a temporary development levy is payable in respect of any proposed development of land to be authorised by a temporary permission and, if payable, the amount thereof.

[30/2003 wef 10/12/2003]

(2) The competent authority shall issue and serve a notice requiring the payment of the amount of temporary development levy on the person liable for the payment in accordance with subsection (3).

[30/2003 wef 10/12/2003]

(3) The competent authority may, in his discretion, impose the temporary development levy on —

- (a) the owner of the land with respect to which a temporary permission is to be granted; or
- (b) the person who applied for the temporary permission.

[30/2003 wef 10/12/2003]

(4) The liability of the person on whom the temporary development levy is imposed shall continue notwithstanding any change in ownership of the land.

[30/2003 wef 10/12/2003]

(5) Notwithstanding section 13(2), the competent authority shall not grant any temporary permission until the temporary development levy payable under a notice under subsection (2) is paid to the competent authority. [30/2003 wef 10/12/2003]

(6) Notwithstanding the provisions of any other written law relating to the registration of any interest or encumbrance over land, any outstanding amount of temporary development levy shall be secured as a first charge against the land to which the temporary permission relates and shall, subject to any other rights of the Government, prevail over all other estates and interests whenever created.

#### **Remission of temporary development levy**

**40C.** The Minister may, in his discretion and subject to such terms and conditions as he may determine, remit, wholly or in part, the temporary development levy payable by any person if he is satisfied that it is just and equitable to do so.

[30/2003 wef 10/12/2003]

## Power to make rules relating to temporary development levy

**40D.** The Minister may make rules to give effect to this Part and for any matter which is required under this Part to be prescribed and, in particular, for or with respect to all or any of the following matters:

- (a) the different rates and methods of calculation of the temporary development levy;
- (b) exempting any particular development or class of developments from being the subject of any temporary development levy;
- (c) the deferment of liability to pay any temporary development levy; and
- (*d*) the refund, wholly or in part, of the temporary development levy paid by any person.

[30/2003 wef 10/12/2003]

#### PART VI

## RECOVERY OF MONEYS

## **Recovery of money**

**41.**—(1) Any sum payable to the competent authority under this Act may be recoverable by him by action as a civil debt.

(2) No proceedings for the recovery of any money payable under this Act shall be quashed or set aside in any court for want of form or procedure.

#### Proceedings for recovery of money due

**42.**—(1) Unless otherwise expressly provided in this Act, the competent authority has and may exercise the following additional powers for the purpose of recovering any money due under this Act:

- (*a*) the competent authority may issue a warrant of attachment and may seize by virtue thereof any movable property and crops of any person liable to pay any sum due, and may, after service of the prescribed notice, sell the same by public auction or in such manner as may be prescribed; and
- (*b*) the competent authority may, by notice of sale to be served or published in the prescribed manner, declare his intention of selling, at the expiration of 3 months from the date of the notice of sale, any land belonging to the person from whom any sum is due and, if at the expiration of that period, that sum has not been paid or satisfied, the competent authority may sell, by public auction or otherwise, the whole of that land or such portion thereof or such interest therein as he considers sufficient for the recovery of that sum and costs.

(2) Notwithstanding subsection (1), the competent authority shall not proceed under subsection (1)(b) and sell the land of any person from whom any sum is due, or any portion thereof or interest therein, where there is upon the land and liable to be seized and sold under subsection (1)(a) movable property or crops belonging to that person of a value estimated by the competent authority to be sufficient to realise the sum required to satisfy the money due and costs.

(3) Any tenant, sub-tenant or occupier who, in order to avoid the seizure or sale of the land for non-payment of any sum due from the owner of the land, pays that sum and costs may thereafter, in the absence of any written agreement to the contrary, deduct the amount so paid by him from the rent due or to become due by him to his immediate landlord on account of the land or such part thereof as is held or occupied by him, and may retain possession thereof until that amount has been fully reimbursed to him whether by deduction from the rent or otherwise.

(4) Any tenant or sub-tenant who has reimbursed, whether by allowing a deduction from his rent or otherwise, any sub-tenant or occupier holding or occupying under him the amount so paid by the sub-tenant or occupier has a similar right to retain possession until similarly reimbursed.

(5) The receipt of the competent authority or of any duly authorised officer for any amount so paid by any such tenant, sub-tenant or occupier shall be deemed to be an acquittance in full for the like amount of the rent.

(6) If any land belonging to a person from whom any sum is due, or any movable property or crops that are mentioned in subsection (1)(a) or the proceeds of sale of that movable property or crops, is or are already in the custody of the law under any process of execution whereby the competent authority is unable to exercise the powers vested in him by this section, the competent authority may notify the sheriff or the bailiff of the court concerned of the amount due, and he shall be entitled, without obtaining judgment, to be paid that amount out of the proceeds of sale of the land, movable property or crops in priority to the judgment debtor and to the judgment creditor and to any other creditor, except the Government.

(7) A certificate from the competent authority shall be conclusive evidence of the amount of any sum that may be due.

## Attachment

**43.**—(1) The attachment mentioned in section 42(1)(a) may be made by a person appointed for the purpose by the competent authority and that person shall publicly notify the attachment in the prescribed manner and shall take an inventory of the property attached.

(2) For the purpose of effecting the attachment, the person appointed under subsection (1) may break into any house or building in the day time.

(3) The person appointed under subsection (1) shall be deemed to be a public servant within the meaning of the Penal Code (Cap. 224).

## **Application of proceeds**

**44.**—(1) The proceeds of a sale under section 42(1) shall be applied in the first place in satisfaction of the sum due together with interest thereon at the rate of 9% per annum and costs.

(2) In the event of there being any surplus remaining, the competent authority shall, if satisfied as to the right of any person claiming the surplus, pay the surplus to that person or, if not so satisfied, shall hold the surplus in trust for the person who ultimately succeeds in due course of law in establishing his title thereto.

(3) If no title is established to that surplus at the end of 5 years after the date of the sale under section 42(1), the surplus shall be paid into the Consolidated Fund.

#### Title conferred upon purchaser at a sale under section 42

45.—(1) The purchaser at a sale under section 42(1)(b) shall be deemed to have acquired the right or property offered for sale free from all encumbrances created over it and from all subordinate interests derived from it, except such as are expressly reserved by the competent authority at the time of the sale.

(2) The competent authority shall, by notification in the *Gazette*, notify the result of the sale and the conveyance or transfer to the purchaser of the right or property offered for sale.

#### Costs of proceedings for recovery of sum due

**46.** All costs and expenses incurred in the recovery of any sum due under this Act may be recovered as if they formed part of the sum due.

#### Power to stop sale

**47.** If any person, having any interest in any land liable to be sold at any time before the sale, tenders to the competent authority the sum due with interest and costs, the competent authority shall thereupon desist from all further proceedings in respect thereof.

## **Application to court**

**48.**—(1) If any person whose movable property, crops or land has been attached or offered for sale under section 42 or 43 disputes the attachment or sale, he may apply to the High Court or, when the sum due does not exceed \$1,000, to a District Court for an order to stay the proceedings.

(2) After hearing the competent authority and after making such further inquiry as is necessary, the court shall make such order as it thinks fit.

## Security to be given

**49.** No application shall be entertained by the court under section 48 unless the applicant has deposited in court the amount of the sum due and costs or has given security for that sum to the satisfaction of the court.
#### PART VII

#### MISCELLANEOUS

#### Determination of development charge, etc., not to be rendered invalid for want of form

**50.** So long as the provisions of this Act are substantially complied with, no determination of a development charge or any other sum due under this Act, and no seizure or sale shall be rendered invalid by reason of any mistake in —

- (*a*) the name of any person liable to pay the development charge or other sum due;
- (b) the description of any land with respect to which the development charge or other sum due is payable; or
- (c) the amount of the development charge or other sum due or the mode of seizure and sale.

#### Authentication of documents

**51.**—(1) Any document which —

(*a*) purports to bear the signature or facsimile signature of the competent authority or any officer or person authorised under section 5(2) or (3A); or

[17/2005 wef 15/07/2005]

(b) is or purports to be authenticated in such other manner as may be prescribed,

shall be deemed, until the contrary is proved, to have been duly prepared, issued or served by the competent authority.

(2) In any proceedings under this Act, the contents of any such document shall be presumed to be correct until the contrary is proved.

### Service of documents

**52.**—(1) Without prejudice to subsection (2), any notice or other document required or authorised to be served or given under this Act, and every summons issued by a court in connection with any offence under this Act, may be served or given —

- (a) by delivering it to the person on whom it is to be served or to whom it is to be given;
- (b) by leaving it at the usual or last known place of residence of that person or, in a case where an address for service has been given by that person, at that address;
- (c) by sending it by registered post addressed to that person at his usual or last known place of residence or, in the case where an address for service has been given by that person, at that address;
- (*d*) in the case of an incorporated company or body, by delivering it to the registered or principal office of the company or body, or by sending it by registered post addressed to the company or body at that office; or
- (*e*) in the case of an unincorporated body, by delivering it to the registered address of the unincorporated body or by sending it by registered post to the unincorporated body at that address.

(2) Where the notice or document is required to be served on or given to a person who is the occupier of any premises comprised in any land, the notice or document shall be taken to be duly served on that person if it is addressed to that person and is affixed conspicuously to some object on the land.

(3) Any notice, document or summons sent by registered post to a person, company or body in accordance with subsection (1) shall be deemed to be duly served on or given to that person, company or body at the time when it would, in the ordinary course of post, be delivered and in proving service of the same it shall be sufficient to prove that the envelope containing the notice, document or summons was properly addressed to that person, company or body, stamped and posted by registered post.

#### Exemption

**53.** The Minister may, from time to time, by notification in the *Gazette*, exempt any land or lands either generally or for a specified period from the operation of all or any of the provisions of this Act.

#### **Exclusion of liability**

54. Where the competent authority furnishes information of any provision or content of the Master Plan or any entry in the records kept by the competent authority under section 23 to any person in any manner or form whatsoever, the competent authority and any officer authorised under section 5(2) shall not be liable for any loss or damage suffered by that person or any other person by reasons of errors or omissions of whatever nature or however caused if such information was furnished in good faith and in the ordinary course of the discharge of the duties of the competent authority or the officer concerned as a delegate of the competent authority.

#### **Protection from liability**

55. No matter or thing done or omitted to be done by the competent authority or by any officer or person authorised under section 5(2) or (3A) shall subject him or such person personally to any action, liability, claim or demand whatsoever if it were done or omitted to be done bona fide for the purpose of carrying out the provisions of this Act.

[17/2005 wef 15/07/2005]

#### Power of Magistrate's Court and District Court

**56.** Notwithstanding the provisions of the Criminal Procedure Code (Cap. 68), a Magistrate's Court or a District Court shall have powers to impose the maximum penalties provided for an offence under this Act.

#### **Composition of offences**

**57.**—(1) The competent authority may, in his discretion, compound any offence under this Act or any rules made thereunder which is prescribed as a compoundable offence by collecting from a person reasonably suspected of having committed the offence a sum not exceeding \$1,000.

(2) The Minister may make rules to prescribe the offences which may be compounded.

#### Offences by officers, etc., of bodies corporate

**58.** Where an offence under this Act has been committed by a body corporate, a partnership or unincorporated association of persons, any person who, at the time of the commission of the offence, was a director, manager, partner, secretary or other similar officer thereof, or was purporting to act in any such

capacity, shall also be guilty of that offence unless he proves that ----

- (a) the offence was committed without his consent or connivance; and
- (b) he exercised all such diligence to prevent the commission of the offence as he ought to have exercised having regard to the nature of his functions in that capacity and to all the circumstances.

## Correction of errors in register

**59.**—(1) The competent authority may at any time —

- (a) correct any erroneous entry in any record, register, plan or document required to be kept or maintained under this Act; or
- (b) add to the record, register, plan or document any matter which has been erroneously omitted.

(2) Any correction shall be made in such manner as to leave the erroneous matter cancelled and the correct entry clearly legible.

(3) The competent authority shall indicate the date on which any correction or addition is made to the record, register, plan or document.

## Charges, fees and penalties to be paid into Consolidated Fund

**60.**—(1) There shall be paid into the Consolidated Fund —

- (a) all development charges collected by the competent authority under this Act; and
- (b) subject to any agreement made between the Minister and any statutory authority referred to in section 5(3) and to any direction of the Minister, all fines, fees, charges and other moneys collected under this Act.

(2) No agreement or direction under subsection (1) shall apply to any fees, charges or other moneys which are expressly required by any provision of this Act to be paid into the Consolidated Fund.

## Amendment of Schedules

**60A.**—(1) The Minister may at any time, by order published in the *Gazette*, amend the Schedules.

[30/2003 wef 10/12/2003]

(2) The Minister may, in any order made under subsection (1), make such incidental, consequential or supplementary provisions as may be necessary or expedient.

[30/2003 wef 10/12/2003]

(3) Any order made under subsection (1) shall be presented to Parliament as soon as possible after publication in the *Gazette*.

[30/2003 wef 10/12/2003]

## Rules

61.—(1) The Minister may make rules generally to give effect to the provisions of this Act and for

prescribing anything that is to be prescribed.

- (2) Without prejudice to the generality of subsection (1), the Minister may by such rules provide for
  - (*a*) the development of land;
  - (b) the control of density of buildings on land;
  - (c) the regulation of the height, design, appearance and siting of buildings;
  - (d) the control of means of access to land or buildings;
  - (e) the protection of ancient monuments and land and buildings of historic or architectural interest;
  - (f) the conservation of buildings, premises or land;
  - (g) the form and manner in which applications for planning permission, conservation permission or subdivision permission shall be made;
  - (*h*) the manner in which the competent authority shall deal with applications for planning permission, conservation permission and subdivision permission;
  - (*i*) the fees or charges to be paid for any matter or thing done by the competent authority or the Minister under this Act;
  - (*j*) the payment of a deposit by any person applying for planning permission, conservation permission or subdivision permission and the circumstances under which such deposit may be forfeited by the competent authority;

[30/2003 wef 10/12/2003]

- (*k*) the manner in which appeals may be made and determined under this Act and the information to be supplied by the competent authority in connection therewith;
- (*l*) the requirements to be complied with for an application for planning permission, conservation permission or subdivision permission;

[30/2003 wef 10/12/2003]

(*m*) the types of applications for planning permission, conservation permission or subdivision permission which shall be accompanied by such certificates or declarations of an appropriate qualified person on such matters as may be specified by the competent authority in relation to the application;

#### [30/2003 wef 10/12/2003]

(*n*) the circumstances under which the competent authority may not accept a qualified person's certificate or declaration for the purpose of the requirement referred to in paragraph (*m*);

[30/2003 wef 10/12/2003]

(o) the duties, responsibilities and liabilities of a qualified person in relation to the certificate or declaration referred to in paragraph (m);

#### [30/2003 wef 10/12/2003]

(*p*) the circumstances under which a qualified person's certificate or declaration may not be lodged with or submitted to the competent authority as being in satisfaction of any requirement or condition specified in any notification made under section 21(6); and

#### [30/2003 wef 10/12/2003]

(q) the duties, responsibilities and liabilities of a qualified person in relation to the certificate or declaration made by him and lodged with or submitted to the competent authority in satisfaction of any requirement or condition specified in any notification made under section 21(6).

#### [30/2003 wef 10/12/2003]

(3) Rules relating to the making of applications and appeals, to the notification of decisions thereon and to the granting of written permissions may allow or require the application, appeal, notification or other information to be made and transmitted by such electronic means and in such manner as may be prescribed, and may provide for the manner in which they are to be authenticated or certified.

(3A) The Minister may, in making any rules under this Act, provide that any contravention of any rule shall be an offence and may prescribe punishment by a fine not exceeding \$20,000 or imprisonment for a term not exceeding 6 months or both.

[30/2003 wef 10/12/2003]

(4) All rules made under this Act shall be presented to Parliament as soon as possible after publication in the *Gazette*.

[30/2003 wef 10/12/2003]

#### PART VIII

#### TRANSITIONAL AND SAVING PROVISIONS

#### **Transitional and saving provisions**

**62.**—(1) Any permission, approval, decision, notice, warrant, order or other document prepared, made, granted, issued, and any act or thing done or given, under or pursuant to the repealed Act and valid immediately prior to 1st April 1998 shall be deemed to have been prepared, made, granted, issued, done or given under or pursuant to the corresponding provision of this Act and shall continue to have effect accordingly.

(2) Any map, plan, record or register prepared, made or kept under or pursuant to the repealed Act shall be deemed to have been prepared, made or kept under or pursuant to the corresponding provision of this Act and shall continue to have effect accordingly.

(3) All conservation guidelines made or deemed to have been made by the conservation authority under the repealed Act shall be deemed to have been made by the competent authority under section 11.

(4) Any order made or issued by the competent authority determining the development charge payable under section 33(1) or (3) of the repealed Act shall, if made or issued within the period of 12 months immediately prior to 1st April 1998, be deemed to be an interim order made by the competent authority under section 38 or 39, respectively, for the estimated amount of development charge payable, and the provisions of sections 38 and 39 shall apply to such order accordingly.

(5) Subject to the Constitution, any breach, contravention or non-compliance of the repealed Act shall be deemed to be a breach, contravention or non-compliance of the corresponding provision of this Act and the powers conferred on the competent authority by this Act may be exercised in respect of such breach, contravention or non-compliance.

(6) Any enforcement process or proceedings commenced or pending immediately prior to 1st April 1998 in connection with any breach, contravention or non-compliance of or under the repealed Act may be continued and disposed of under the repealed Act as if this Act has not been passed.

(7) Any application for permission made to the competent authority under section 10 or 13 of the repealed Act and any appeal made to the Minister under section 16 or 17 of the repealed Act which is pending immediately before 1st April 1998 shall be deemed to have been made and shall be dealt with under the corresponding provisions of this Act.

(8) Any reference in any written law to the repealed Act or any provision thereof shall, as from 1st April 1998, be a reference to this Act or the corresponding provision of this Act.

(9) Any reference in any written law or document to the planning functions of the Singapore Improvement Trust shall be construed as a reference to the planning functions of the competent authority.

#### FIRST SCHEDULE

Section 2

#### QUALIFIED PERSONS

1. Any person who is registered as an architect under the Architects Act (Cap. 2) and who has in force a practising certificate issued under that Act.

[30/2003 wef 10/12/2003]

2. Any person who is registered as a professional engineer under the Professional Engineers Act (Cap. 253) and who has in force a practising certificate issued under that Act.

[30/2003 wef 10/12/2003]

3. Any person who is registered as a land surveyor under the Land Surveyors Act (Cap. 156) and who has in force a practising certificate issued under that Act.

[30/2003 wef 10/12/2003]

### SECOND SCHEDULE

Section 3(3)(i)

#### USES

Section 3(3)(i) applies to any building or buildings or part of a building which is or are approved or authorised to be used for any of the following uses:

- (a) boarding house;
- (b) hotel;
- (c) serviced apartments;
- (d) student hostel;
- (e) place of worship;
- (f) workers' dormitory;
- (g) industrial retail building;
- (*h*) warehouse retail building.

[\$ 657/2004 wef 28/10/2004]

[\$ 657/2004 wef 28/10/2004] [30/2003 wef 10/12/2003]

#### THIRD SCHEDULE

#### PART I

Section 4(2)(a) applies to any development which is or is to be lawfully used for any of the following uses:

- (*a*) condominium;
- (b) townhouse;
- (c) cluster housing;
- (d) strata bungalow;
- (e) residential flat.

#### PART II

Section 4(2)(b) applies to any development which is or is to be lawfully used for any of the following uses:

- (*a*) flatted factories;
- (b) flatted warehouse;
- (c) office;
- (d) shopping;
- (e) any combination of office, shopping and residential flat uses.

Section 4

### LEGISLATIVE HISTORY

### PLANNING ACT

This Legislative History is provided for the convenience of users of the Planning Act. It is not part of this Act.

1. Act 12 of 1959—Planning Act 1959	
Date of First, Second and Third Readings	: Date not available.
Date of commencement	: 1 February 1960
2. 1990 Revised Edition—Planning Act	
Date of operation	: 15 March 1990
3. Act 3 of 1998—Planning Act 1998	
Date of First Reading	: 19 November 1997
	(Bill No. 18/97 published on 20 November 1997)
Date of Second and Third Readings	: 14 January 1998
Date of commencement	<sup>:</sup> 1 April 1998
4. 1998 Revised Edition—Planning Act	
Date of operation	: 15 December 1998
5 Act 17 of 2001—Singapore Land Authority Act 2001	
Date of First Reading	5 March 2001
	(Bill No. 17/2001 published on 11 May 2001)
Date of Second and Third Readings	19 April 2001
Date of commencement	<sup>1</sup> 1 June 2001
6. Act 30 of 2003—Planning (Amendment) Act 2003	
Date of First Reading	: 16 October 2003
	(Bill No. 27/2003 published on 12 December 2003)
Date of Second and Third Readings	: 11 November 2003
Dates of commencement	: Date of coming into operation: 10th December 2003
	Date of coming into operation: 24th December 1998 (section 6)
	Date of coming into operation: 1st January 2008 (section 12)
7 C N No S 657/2004 Diagning Act (Amondment of Second	Schodyla) Ordan 2004

7. G. N. No. S 657/2004—Planning Act (Amendment of Second Schedule) Order 2004

Date of commencement

: 28 October 2004

### 8. Act 17 of 2005—Statutes (Miscellaneous Amendments and Repeal) Act 2005

Date of First Reading	: 18 April 2005
	(Bill No. 7/2005 published on 10 June 2006)
Date of Second and Third Readings	: 16 May 2005
Date of commencement	: 15 July 2005
9. Act 16 of 2009—Preservation of Monuments Act 2009	
Date of First Reading	: 23 March 2009
	(Bill No. 9/2009 published on 12 June 2009)
Date of Second and Third Readings	: 13 April 2009
Date of commencement	: 1 July 2009

## NATIONAL PARKS BOARD ACT (CHAPTER 198A)

(Original Enactment: Act 22 of 1996)

**REVISED EDITION 2012** (31st July 2012)

An Act to reconstitute the National Parks Board and to provide for the transfer of the property, rights and liabilities of the Parks and Recreation Department to the National Parks Board, and for matters connected therewith.

[1st July 1996]

### Part I PRELIMINARY

Short title
 Interpretation

#### Part II RECONSTITUTION OF BOARD

3 Reconstitution of National Parks Board4 Common seal5 Constitution of Board

# Part III FUNCTIONS AND POWERS OF BOARD

6 Functions of Board
7 Powers of Board
8 Directions of Minister
9 Appointment of committees
10 Delegation of powers
11 Protection from personal liability
12 Annual report

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- 20 Transfer to Board of property, assets and liabilities
- 21 Transfer of employees
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27 Symbol of Board
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29 All moneys recovered to be paid to Board
30 (Repealed)
31 (Repealed)
32 (Repealed)
33 (Repealed)
34 (Repealed)
35 (Repealed)
36 (Repealed)
37 (Repealed)
38 (Repealed)
39 (Repealed)
40 Power to make regulations
41 Transitional provisions

#### FIRST SCHEDULE Constitution and Proceedings of Board

### **SECOND SCHEDULE Powers of Board**

#### **THIRD SCHEDULE Financial Provisions**

### FOURTH SCHEDULE Provisions relating to Transfer of Employees

#### **Legislative History**

### PART I PRELIMINARY

#### Short title

**1.** This Act may be cited as the National Parks Board Act.

#### Interpretation

[4/2005]

2. In this Act, unless the context otherwise requires —

"animal" has the same meaning as in the Parks and Trees Act (Cap. 216);

"Board" means the National Parks Board established under the repealed National Parks Act (Cap. 198A, 1991 Ed.) in force before 1st July 1996 and continued by section 3;

"Chairman" means the Chairman of the Board and includes any acting Chairman of the Board;

"Chief Executive" means the Chief Executive of the Board and includes any person acting in that capacity;

"member" means a member of the Board;

"national park" has the same meaning as in the Parks and Trees Act;

"nature reserve" has the same meaning as in the Parks and Trees Act;

"organism" has the same meaning as in the Parks and Trees Act;

"Parks and Recreation Department" means the Parks and Recreation Department of the Ministry of National Development;

"plant" has the same meaning as in the Parks and Trees Act;

"public park" has the same meaning as in the Parks and Trees Act.

[4/2005]

#### PART II RECONSTITUTION OF BOARD

## **Reconstitution of National Parks Board**

**3.** As from 1st July 1996, the Board shall continue in existence and shall continue to be a body corporate with perpetual succession and capable of --

(*a*) suing and being sued;

(*b*) acquiring, owning, holding, developing and disposing of property, movable and immovable; and

(c) doing and suffering such other acts or things as bodies corporate may lawfully do and suffer.

## **Common seal**

**4.**—(1) As from 1st July 1996, the Board shall continue to have a common seal and the seal may, from time to time, be broken, changed, altered and made anew as the Board thinks fit.

(2) All deeds and other documents requiring the seal of the Board shall be sealed with the common seal of the Board and every document to which the common

seal is affixed shall be signed by any 2 members generally or specially authorised by the Board for the purpose or by one member so authorised and the Chief Executive.

(3) Any document purporting to be a document duly executed under the seal of the Board shall be received in evidence and shall, unless the contrary is proved, be deemed to be a document so executed.

(4) The Board may, by resolution or otherwise in writing, appoint an officer of the Board or any other agent either generally or in a particular case to execute or sign on behalf of the Board any agreement or other instrument not under seal in relation to any matter coming within the powers of the Board.

### **Constitution of Board**

5. The First Schedule shall have effect as respects the Board and its members.

## PART III FUNCTIONS AND POWERS OF BOARD

### **Functions of Board**

**6.**—(1) The functions of the Board shall be —

(a) to control, administer and manage the national parks and nature reserves;

(b) to plan, design, develop, manage and maintain public parks;

(*ba*) to provide, manage and maintain park and recreational infrastructure and facilities in the national parks, nature reserves and public parks;

(*c*) to propagate, protect and preserve the animals, plants and other organisms of Singapore and, within the national parks, nature reserves and public parks, to preserve objects and places of aesthetic, historical or scientific interest;

(*d*) to provide and control facilities for the study of and research into matters relating to animals, plants and other organisms in Singapore and the physical conditions in which they live;

(e) to exhibit objects illustrative of the life sciences, applied sciences, history, technology and industry;

(*f*) to promote the study, research and dissemination of knowledge in botany, horticulture, biotechnology, arboriculture, landscape architecture, parks and recreation management and natural and local history;

(g) to provide, manage and promote recreational, cultural, historical, research and educational facilities and resources in national parks, nature reserves and public parks and encourage their full and proper use by members of the public;

(*h*) to advise the Government on all matters relating to nature conservation and the planning, development and management of public parks; and

(*i*) to carry out such other functions and duties as are imposed upon the Board by or under this Act or any other written law.

[4/2005] (2) In addition to the functions of the Board under subsection (1), the Board may undertake such other functions as the Minister may assign to the Board and in so doing the Board shall be deemed to be fulfilling the purposes of this Act and the provisions of this Act shall apply to the Board in respect of such functions.

### **Powers of Board**

7. -(1) The Board may, for the purposes of this Act, carry on such activities as appear to the Board to be advantageous, necessary or convenient for it to carry on for or in connection with the discharge of its duties and functions under this Act and, in particular, may exercise any of the powers specified in the Second Schedule.

(2) This section shall not be construed as limiting any power of the Board conferred by or under any other written law.

### **Directions of Minister**

**8.**—(1) The Minister may, after consultation with the Board, give to the Board such directions, not inconsistent with the provisions of this Act, as he thinks fit, as to the exercise of the functions of the Board under this Act, and the Board shall give effect to all such directions.

(2) The Board shall furnish the Minister with such information or facilities for obtaining information with respect to its property and activities in such manner and at such times as the Minister may require.

### **Appointment of committees**

**9.** The Board may, in its discretion, appoint from among its own members or other persons who are not members such number of committees consisting of members or other persons or members and other persons for purposes which, in the opinion of the Board, would be better regulated and managed by means of such committees.

### **Delegation of powers**

10. -(1) The Board may, subject to such conditions or restrictions as it may impose, delegate to the Chief Executive, the Chairman or a committee appointed under

section 9 all or any of the functions, duties and powers vested in the Board by or under this Act or any other written law, except the power to borrow money.

(2) Any power, function or duty delegated under subsection (1), may be exercised or performed by the Chief Executive, the Chairman or such committee, as the case may be, in the name and on behalf of the Board.

(3) The Board may, subject to such conditions or restrictions as it thinks fit, delegate to any member or employee of the Board or any person all or any of its functions, duties and powers vested in the Board by or under this Act or any other written law, except the power to borrow money or to raise or grant loans or advances to or subscribe to stocks, shares, bonds or debentures of a company or corporation.

(4) Any power, function or duty delegated under subsection (3) may be exercised or performed by such member, employee or person in the name and on behalf of the Board.

(5) The Board may continue to exercise a power conferred upon it, or perform a function or duty under this Act or any other written law, notwithstanding the delegation of such power, function or duty under this section.

### **Protection from personal liability**

**11.** No suit or other proceedings shall lie personally against any member or employee of the Board or any other person acting under the direction of the Board in respect of anything which is in good faith done or intended to be done in the execution or purported execution of this Act.

### **Annual report**

**12.**—(1) The Board shall, as soon as practicable after the close of each financial year, submit to the Minister an annual report on the activities of the Board during the preceding financial year.

(2) The Minister shall as soon as practicable cause a copy of every such report to be presented to Parliament.

#### PART IV PROVISIONS RELATING TO STAFF

### Appointment of Chief Executive and other employees

**13.**—(1) The Board shall, after consultation with the Public Service Commission and with the approval of the Minister, appoint a Chief Executive on such terms and conditions as the Board may determine.

(2) The Chief Executive shall —

(a) be known by such designation as the Board may determine;

(*b*) be responsible to the Board for the proper administration and management of the functions and affairs of the Board in accordance with the policy laid down by the Board; and

(c) not be removed from office without the consent of the Minister.

(3) If the Chief Executive is temporarily absent from Singapore, or is temporarily unable to perform his duties by reason of illness or otherwise, another person may be appointed by the Board to act in the place of the Chief Executive during any such period of absence from duty.

(4) The Board may, from time to time, appoint such other employees and agents as it thinks fit for the effective performance of its functions on such terms and conditions as the Board may determine and may terminate the appointment of such employees and agents.

### Public servants for purposes of Penal Code

**14.** All members, employees and agents of the Board shall be deemed to be public servants for the purposes of the Penal Code (Cap. 224).

## PART V

## FINANCIAL PROVISIONS

## Grants

**15.** For the purpose of enabling the Board to carry out its functions under this Act, the Minister may, from time to time, make grants to the Board of such sums of money as the Minister may determine out of moneys to be provided by Parliament.

### Issue of shares, etc.

**15A.** As a consequence of the vesting of any property, rights or liabilities of the Government in the Board under this Act, or of any capital injection or other investment by the Government in the Board in accordance with any written law, the Board shall issue such shares or other securities to the Minister for Finance as that Minister may from time to time direct.

[5/2002]

## Bank accounts and payments

16. --(1) The Board may open and maintain an account or accounts with such bank or banks as the Board thinks fit and every such account shall be operated upon as far as practicable by cheque signed by such person or persons as may, from time to time, be authorised in that behalf by the Board.

(2) The moneys of the Board shall be applied only in payment or discharge of the expenses, obligations and liabilities of the Board and in making any payment that the Board is authorised or required to make.

### **Power of investment**

**17.** The Board may invest its moneys in accordance with the standard investment power of statutory bodies as defined in section 33A of the Interpretation Act (Cap. 1).

[45/2004]

### Annual estimates

**18.**—(1) The Board shall in every year prepare and adopt annual estimates of income and expenditure of the Board for the ensuing year.

(2) Supplementary estimates may be adopted by the Board at any of its meetings.

(3) A copy of all annual and supplementary estimates shall, upon their adoption by the Board, be sent forthwith to the Minister who may approve or disallow any item or portion of any item shown in the estimates, and shall return the estimates as amended by him to the Board, and the Board shall be bound thereby. **Financial provisions** 

**19.** The financial provisions set out in the Third Schedule shall have effect with respect to the Board.

### PART VI

## TRANSFER OF ASSETS, LIABILITIES AND EMPLOYEES TO BOARD

### Transfer to Board of property, assets and liabilities

**20.**—(1) As from 1st July 1996, all movable property vested in the Government immediately before that date for the purposes of the Parks and Recreation Department, and all assets, rights or interests vested in, and all outstanding debts, liabilities and obligations incurred by, the Government in connection therewith shall be transferred to and shall vest in the Board without further assurance.

(2) If any question arises as to whether any particular movable property vested in the Government, or whether any particular asset, right, interest, liability or obligation of the Government has been transferred to or vested in the Board under subsection (1), a certificate under the hand of the Minister for Finance shall be conclusive evidence that the property, asset, right, interest, liability or obligation was or was not so transferred or vested.

## **Transfer of employees**

**21.**—(1) As from 1st July 1996, such persons employed immediately before that date in the Parks and Recreation Department as the Minister may determine shall be transferred to the service of the Board on terms no less favourable than those enjoyed by them immediately prior to their transfer.

(2) The provisions relating to the transfer of employees set out in the Fourth Schedule shall have effect.

#### Existing agreements and pending proceedings

**22.** —(1) All deeds, bonds, agreements, instruments and arrangements subsisting immediately before 1st July 1996 affecting any movable property transferred under section 20 or any person transferred to the service of the Board under section 21 shall continue in full force and effect on and after that date and shall be enforceable by or against the Board instead of the Government or any person acting on its behalf as if the Board had been named therein or had been a party thereto.

(2) Any proceedings or cause of action relating to any movable property transferred under section 20 or any person transferred to the service of the Board under section 21 pending or existing immediately before 1st July 1996 by or against the Government may be continued and shall be enforced by or against the Board.

### PART VII NATIONAL PARKS AND NATURE RESERVES

**23.** [*Repealed by Act 4 of 2005*]

**24.** [*Repealed by Act 4 of 2005*]

**25.** [*Repealed by Act 4 of 2005*]

**26.** [*Repealed by Act 4 of 2005*]

### PART VIII GENERAL

#### Symbol of Board

**27.**—(1) The Board shall have the exclusive right to the use of such symbols or representations as it may select or devise (referred to in this section as the Board's symbols) and thereafter display or exhibit in connection with its activities or affairs.

(2) Any person who, without the permission of the Board, uses a symbol or representation identical with any of the Board's symbols, or which so resembles any of the Board's symbols as to or be likely to deceive or cause confusion, shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$10,000 or to imprisonment for a term not exceeding 6 months or to both.

## Exclusion of liability for information supplied by Board

**28.** Where the Board provides a service to the public whereby information is supplied to the public on payment of a prescribed fee, neither the Board nor any of its employees involved in the supply of such information shall be liable for any loss or damage suffered by members of the public by reason of any error or omission of whatever nature appearing therein or however caused if made in good faith and in the ordinary course of the discharge of the duties of such employees.

## All moneys recovered to be paid to Board

**29.** All moneys recovered or sums collected under this Act or any regulations made thereunder shall be paid into and form part of the general funds of the Board.

- **30.** [*Repealed by Act 4 of 2005*]
- **31.** [*Repealed by Act 4 of 2005*]
- **32.** [*Repealed by Act 4 of 2005*]
- **33.** [*Repealed by Act 4 of 2005*]
- **34.** [*Repealed by Act 4 of 2005*]
- **35.** [*Repealed by Act 4 of 2005*]
- **36.** [*Repealed by Act 4 of 2005*]
- **37.** [*Repealed by Act 4 of 2005*]
- **38.** [*Repealed by Act 4 of 2005*]
- **39.** [*Repealed by Act 4 of 2005*]

## Power to make regulations

**40.** --(1) The Board may, with the approval of the Minister, make regulations for carrying out the purposes and provisions of this Act.

[4/2005]

(2) Without prejudice to the generality of subsection (1), the Board may, with the approval of the Minister, make regulations for or with respect to all or any of the following matters:

(a) regulating the proceedings of the Board or of the committees of the Board;

(*b*) the manner of appointment, conduct and discipline and the terms and conditions of service of the employees of the Board;

(*c*) the establishment of funds for the payment of gratuities and other benefits to employees of the Board;

(*d*) any other matter which by this Act is required or permitted to be prescribed or is necessary or convenient to be prescribed for carrying out or giving effect to any provision of this Act.

### **Transitional provisions**

**41.** —(1) Any scheme, contract, document, licence, permission or resolution prepared, made, granted or approved by the Parks and Recreation Department or under the repealed National Parks Act (Cap. 198A, 1991 Ed.) shall, so far as it is not inconsistent with the provisions of this Act and except as otherwise expressly provided in this Act or in any other written law, continue and be deemed to have been prepared, made, granted or approved by the Board under the corresponding provisions of this Act or any other written law, as the case may be.

(2) Any subsidiary legislation made under the repealed National Parks Act in force immediately before 1st July 1996 shall, so far as it is not inconsistent with the provisions of this Act, continue in force as if made under this Act until it is revoked or repealed by subsidiary legislation made under this Act.

### FIRST SCHEDULE

Section 5

### CONSTITUTION AND PROCEEDINGS OF BOARD

1. The Board shall consist of —

(*a*) a Chairman; and

(b) not less than 6 nor more than 10 other members as the Minister may, from time to time, determine.

2.—(1) The Chairman and members of the Board shall be appointed by the Minister.

(2) The Minister may appoint one member to be the Deputy Chairman who may, subject to such directions as may be given by the Chairman, exercise all or any of the powers exercisable by the Chairman under this Act.

(3) The Minister may appoint the Chief Executive to be a member of the Board.

3. A member shall hold office on such conditions and for such term as the Minister may determine and shall be eligible for reappointment.

[4/2005]

3A. The Minister may appoint any member of the Board to be a temporary Chairman or temporary Deputy Chairman during the incapacity from illness or otherwise of the Chairman or the Deputy Chairman, as the case may be.

4. The Minister may, at any time, revoke the appointment of the Chairman or any member without assigning any reason.

5. Any member may resign from his appointment at any time by giving notice in writing to the Minister.

5A. The Minister may appoint a person to be a temporary member of the Board during the incapacity from illness or otherwise of any member.

6. The Chairman may, in writing, authorise any member to exercise any power or perform any function conferred on the Chairman by or under this Act.

7. The office of a member shall be vacated if the member —

(*a*) has been absent, without leave of the Board, from 3 consecutive meetings of the Board; or

(*b*) becomes in any manner disqualified from membership of the Board under paragraph 9.

8. If a member resigns, dies or has his appointment revoked or otherwise vacates his office before the expiry of the term for which he has been appointed, the Minister may appoint a person to fill the vacancy for the residue of the term of which the vacating member was appointed.

9. No person shall be appointed or shall continue to hold office as a member if he —

(a) is an undischarged bankrupt or has made any arrangement with his creditors;

(*b*) has been sentenced to imprisonment for a term of not less than 6 months and has not received a free pardon; or

(c) is mentally disordered and incapable of managing himself or his affairs.

10.—(1) A member who is in any way, directly or indirectly, interested in a transaction or project of the Board shall disclose the nature of his interest at a meeting of the Board and the disclosure shall be recorded in the minutes of the Board and the member shall not take part in any deliberation of the Board with respect to that transaction or project.

(2) For the purpose of determining whether there is a quorum, a member shall be treated as being present at a meeting notwithstanding that under sub-paragraph (1) he cannot vote or has withdrawn from the meeting.

11. There shall be paid to the Chairman and other members, out of the funds of the Board, such salaries, fees and allowances as the Minister may, from time to time, determine.

12.—(1) The Board shall meet for the despatch of business at such times and places as the Chairman may, from time to time, appoint.

(2) At every meeting of the Board, 5 members shall form a quorum.

(3) A decision at a meeting of the Board shall be adopted by a simple majority of the members present and voting except that in the case of an equality of votes the Chairman or member presiding shall have a casting vote in addition to his original vote.

(4) The Chairman or, in his absence, the Deputy Chairman shall preside at meetings of the Board.

(5) Where both the Chairman and the Deputy Chairman are absent at a meeting of the Board, such member as the members present may elect shall preside at the meeting of the Board.

(6) Where not less than 4 members of the Board request the Chairman by notice in writing signed by them to convene a meeting of the Board for any purpose specified in the notice, the Chairman shall, within 7 days from the receipt of the notice, convene a meeting for that purpose.

13. The Board may act notwithstanding any vacancy in its membership.

14. Subject to the provisions of this Act, the Board may make rules to regulate its own procedure generally, and in particular, regarding the holding and proceedings of meetings, the notice to be given of such meetings, the keeping of minutes and the custody, production and inspection of such minutes.

15. The validity of any proceedings of the Board shall not be affected by any defect in the appointment of any member or by any contravention of paragraph 10 by any member.

[4/2005; 21/2008]

### SECOND SCHEDULE

Section 7

#### POWERS OF BOARD

1. To manage the national parks, nature reserves and public parks.

2. To regulate the planting and maintenance of plants in public parks by prescribing guidelines and requirements for the design and maintenance thereof.

2A. To lay out, construct, plant, improve, equip, maintain, supervise and control the national parks, nature reserves and public parks and carry out the following activities:

(a) erect any pavilion, recreation room, outhouse or other building;

(b) provide entertainment or any amenity;

(*c*) set apart any part thereof for the purpose of any game or recreation and exclude the public from such part while it is in actual use for that purpose;

(*d*) provide any apparatus for games and recreation and facilities for boating and charge for the use thereof;

(e) place or authorise any person to place chairs or seats and charge or authorise any person to charge for the use thereof;

(*f*) provide and maintain refreshment stalls, food-stalls and restaurants and manage them or let them to any person on such conditions as the Board may determine;

(g) authorise any person to erect, maintain and operate any facility and charge or authorise any person to charge for the use thereof.

2B. To plant trees, plants and vegetation in public parks.

3. To enter into contracts for the supply of goods, services or materials or for the execution of works or other contracts as may be necessary for the discharge of the duties and functions of the Board under this Act.

4. To receive fees, donations, grants, gifts of movable or immovable property from any source or raise funds by any lawful means.

5. To regulate and control public access to the national parks, nature reserves and public parks.

6. To promote or undertake publicity in any form.

7. To make provision for the specialised training of any employee of the Board and in that connection offer scholarships for such training and expenditure incidental thereto.

8. To make awards of recognition, grants, scholarships or contributions as the Board considers fit for the purposes of this Act.

9. To offer consultancy services, inform, advise and make recommendations or proposals to the Government or any person on any matter relating to the designation, conservation, development and management of parks and other areas reserved for the propagation of plants and animals, or any other function of the Board.

10. To act in combination or association with any person engaged, concerned or interested in the promotion of the functions of the Board, and pay for or contribute to the cost and expenses involved in such combination or association.

11. With the approval of the Minister, to form or participate in the formation of companies or to enter into a partnership or an arrangement for the sharing of profits.

12. With the approval of the Minister, to raise loans for the purposes of this Act.

12A. To collect, analyse, compile, publish or disseminate information relating to such subject-matter as may be necessary for the discharge of the functions, objects or duties of the Board.

12B. To provide technical, consultancy or advisory services to any Government agency or to any other person or body in Singapore or elsewhere on any matter related to or connected with the functions, objects or duties of the Board.

12C. To charge fees or commissions for services rendered by the Board or for any use of any of its facilities.

12D. To carry out promotional activities or publicity in any form.

12E. To organise such courses and other programmes as the Board thinks necessary or desirable for the discharge of its functions, objects or duties.

13. To do anything incidental to any of its functions.

[4/2005]

## THIRD SCHEDULE

Section 19

# FINANCIAL PROVISIONS

1. The financial year of the Board shall begin on 1st April of each year and end on 31st March of the following year.

2. The Board shall keep proper accounts and records of its transactions and affairs and shall do all things necessary to ensure that all payments out of its moneys are correctly made and properly authorised and that adequate control is maintained over the assets of, or in the custody of, the Board and over the expenditure incurred by the Board.

3. The Board shall, as soon as practicable after the close of each financial year, prepare and submit financial statements in respect of that year to the auditor of the Board.

4.—(1) The accounts of the Board shall be audited by the Auditor-General or such other auditor as may be appointed annually by the Minister in consultation with the Auditor-General.

(2) A person shall not be qualified for appointment as an auditor under subparagraph (1) unless he is a public accountant who is registered or deemed to be registered under the Accountants Act (Cap. 2).

(3) The remuneration of the auditor shall be paid out of the funds of the Board.

5. The auditor or any person authorised by him is entitled at all reasonable times to full and free access to all accounting and other records relating, directly or indirectly, to the financial transactions of the Board and may make copies of, or extracts from, any such accounting and other records.

6.—(1) The auditor shall in his report state —

(*a*) whether the financial statements show fairly the financial transactions and the state of affairs of the Board;

(*b*) whether proper accounting and other records have been kept, including records of all assets of the Board whether purchased, donated or otherwise;

(c) whether receipts, expenditure, and investment of moneys and the acquisition and disposal of assets by the Board during the financial year were in accordance with this Act; and

(d) such other matters arising from the audit as he considers necessary.

(2) The auditor shall, as soon as practicable after the accounts have been submitted for audit, send a report of his audit to the Board and shall also submit such periodical and special reports to the Minister and to the Board as may appear to him to be necessary or as the Minister or the Board may require.

7.—(1) The auditor or any person authorised by him may require any person to furnish him with such information in the possession of that person or to which that person has access as the auditor considers necessary for the purposes of his functions under this Act.

(2) Any person who fails without reasonable excuse to comply with any requirement of the auditor under sub-paragraph (1) or who otherwise hinders, obstructs or delays the auditor in the performance of his duties or the exercise of his powers shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$1,000 and, in the case of a continuing offence, to a further fine not exceeding \$250 for every day or part thereof during which the offence continues after conviction.

8.—(1) The Board shall, as soon as the financial statements have been audited in accordance with the provisions of this Act, send to the Minister a copy of the audited financial statements, signed by the Chairman, together with a copy of the auditor's report.

(2) Where the Auditor-General is not the auditor of the Board, a copy of the audited financial statements and any report made by the auditor shall be forwarded to the Auditor-General when they are submitted to the Board.

(3) The Minister shall as soon as practicable cause a copy of the audited financial statements and of the auditor's report to be presented to Parliament.

## FOURTH SCHEDULE

Section 21

## PROVISIONS RELATING TO TRANSFER OF EMPLOYEES

1. Until such time as terms and conditions of service are drawn up by the Board, the scheme and terms and conditions of service in the Government shall continue to apply to every person transferred to the service of the Board under section 21 as if he were still in the service of the Government.

2. The terms and conditions to be drawn up by the Board shall take into account the salaries and terms and conditions of service, including any accrued rights to leave, enjoyed by the persons transferred to the service of the Board under section 21 while in the employment of the Government and any term or condition relating to the length of service with the Board shall provide for the recognition of service under the Government by the persons so transferred to be service by them under the Board.

3. Nothing in the terms and conditions to be drawn up by the Board shall adversely affect the conditions that would have been applicable to persons transferred to the service of the Board as regards any pension, gratuity or allowance payable under the Pensions Act (Cap. 225).

4. In every case where a person has been transferred to the service of the Board under section 21, the Government shall be liable to pay to the Board such portion of any gratuity, pension or allowance payable to that person on his retirement as the same shall bear to the proportion which the aggregate amount of his pensionable emoluments during his service with the Government bears to the aggregate amount of his pensionable emoluments during his service under both the Government and the Board.

5. Where any person in the service of the Board whose case does not come within the scope of any pension or other schemes established under this Schedule retires or dies in the service of the Board or is discharged from such service, the Board may grant to

him or to such other person or persons wholly or partly dependent on him, as the Board thinks fit, such allowance or gratuity as the Board may determine.

6. Notwithstanding the provisions of the Pensions Act, no person who is transferred to the service of the Board under section 21 shall be entitled to claim any benefit under that Act on the ground that he has been retired from the service of the Government on account of abolition or re-organisation of office in consequence of his transfer to the service of the Board.

7. Where on 1st July 1996, any disciplinary proceedings were pending against any employee of the Government transferred to the service of the Board under section 21, the proceedings shall be carried on and completed by the Board; but where on that date any matter was in the course of being heard or investigated or had been heard or investigated by a committee acting under due authority but no order or decision had been rendered thereon, the committee shall complete the hearing or investigation and make such order, ruling or direction as it could have made under the authority vested in it before that date.

8. Any order, ruling or direction made or given by a committee pursuant to paragraph 7 shall be treated as an order, a ruling or a direction of the Board and have the same force or effect as if it had been made or given by the Board pursuant to the authority vested in the Board under this Act.

9. The Board may reprimand, reduce in rank, retire, dismiss or punish in some other manner a person who had, whilst he was in the employment of the Parks and Recreation Department, been guilty of any misconduct or neglect of duty which would have rendered him liable to be so reprimanded, reduced in rank, retired, dismissed or punished if he had continued to be in the employment of the Government, and as if this Act had not been enacted.

### LEGISLATIVE HISTORY NATIONAL PARKS BOARD ACT (CHAPTER 198A)

#### (Formerly known as the National Parks Act (Cap. 198A, 1997 Ed.))

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This Legislative History is provided for the convenience of users of the National Parks Board Act. It is not part of the Act. Act 22 of 1996—National Parks Act 1996

I.	Act 22 of 1996—National Parks Act 1996		
	Date of First Reading	:	2 May 1996
			(Bill No. 13/96 published on 3
			May 1996)
	Date of Second and Third Readings	:	21 May 1996
	Date of commencement	:	1 July 1996
2.	1997 Revised Edition—National Parks Act (Chapter 198	A)	
	Date of operation	:	30 May 1997
3.	G.N. No. S 669/2001-National Parks Act (Amendment of	of F	ifth Schedule) Order 2001
	Date of commencement	:	1 January 2002
4.	Act 5 of 2002—Statutory Corporations (Capital Contribu	utio	on) Act 2002
	(Consequential amendments made to Act by)		,
	Date of First Reading	:	3 May 2002
		•	(Bill No. 7/2002 published on 4
			May 2002)
	Date of Second and Third Readings	:	24 May 2002
	Dates of commencement	•	15 July 2002 (except item (18) of
		•	the Schedule)
			29 July 2002 (item (18) of the
			Schedule)
5.	G.N. No. S 534/2003—National Parks Act (Amendment of	of F	ifth Schedule) Order 2003
	Date of commencement	:	26 November 2003
6.	Act 45 of 2004—Trustees (Amendment) Act 2004		
	(Consequential amendments made to Act by)		
	Date of First Reading	:	21 September 2004
			(Bill No. 43/2004 published on 22
			September 2004)
	Date of Second and Third Readings	:	19 October 2004
	Date of commencement	:	15 December 2004
7.	Act 4 of 2005—Parks and Trees Act 2005		
	(Consequential amendments made to Act by)		
	Date of First Reading	:	19 October 2004
			(Bill No. 55/2004 published on 20
			October 2004)
	Date of Second and Third Readings	:	25 January 2005
	Date of commencement	:	1 August 2005
8.	Act 21 of 2008—Mental Health (Care and Treatment) Ac	et 2	008
	(Consequential amendments made to Act by)		
	Date of First Reading		21 July 2008
		•	(Bill No. 11/2008 published on 22
			July 2008)
	Date of Second and Third Readings	•	16 September 2008
	Date of commencement	•	1 March 2010 (item 1(34) of the
		•	Second Schedule — Amendment

 9. 2012 Revised Edition—National Parks Board Act (Chapter 198A)
 of National Parks Board Act (Chapter 198A)

 Date of operation
 : 31 July 2012

# PARKS AND TREES ACT

## (CHAPTER 216)

History	Act	-> 2006REVISED
	4 of 2005	EDITION

An Act to provide for the planting, maintenance and conservation of trees and plants within national parks, nature reserves, tree conservation areas, heritage road green buffers and other specified areas, and for matters connected therewith.

[1st August 2005]

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## LEGISLATION HISTORY

### COMPARATIVE TABLE

# PARKS AND TREES ACT

# (CHAPTER 216)

An Act to provide for the planting, maintenance and conservation of trees and plants within national parks, nature reserves, tree conservation areas, heritage road green buffers and other specified areas, and for matters connected therewith.

[1st August 2005]

*Notes*:—Unless otherwise stated, the abbreviations used in the references to other Acts and statutory provisions are references to the following Acts and statutory provisions. The references are provided for convenience and are not part of the Act:

Parks and Trees 1996 Ed.	:Parks and Trees Act (Chapter 216, 1996 National Edition)
Parks 1997 Ed.	:National Parks Act (Chapter 198A, 1997 Edition)

## PART I

## PRELIMINARY

Short title 1.This Act may be cited as the Parks and Trees Act.

Interpretation

2. In this Act, unless the context otherwise requires —

"animal" means any mammal (other than man), bird, reptile, amphibian, fish (including shellfish), insect or any other living creature, vertebrate or invertebrate, and includes any egg or young thereof;

"authorised officer" means any person appointed under section 4 (3);

"Board" means the National Parks Board established under the National Parks Board Act (Cap. 198A);

"boat" means any launch, vessel or floating craft used in navigation by water, however propelled or moved;

"bridge" includes any flyover, overpass and viaduct;

"building" has the same meaning as in the Building Control Act (Cap. 29);

"building works" means any of the following works:

(a) the erection, alteration, restoration, addition or extension of a building or part thereof;

(b) the demolition or dismantling of a building or part thereof with a view to rebuilding;

(c) any site clearance, earth-moving, excavation, tunnelling, boring or laying of foundations;

(d) any site restoration or provision of roadways and other access works; and

(e) any other kind of building operation which forms part of, is preparatory to, is for rendering complete or is otherwise connected with any works referred to in paragraph (a), (b), (c) or (d);
"Commissioner" means the Commissioner of Parks and Recreation appointed under section 4 (1);

"competent authority" means the authority appointed under section 5 of the Planning Act (Cap. 232) to be responsible for the operation of Part III of that Act;

"cut", in relation to a tree or plant, means felling or lopping a tree or plant;

"damage", in relation to a tree or plant, includes ----

(a) poisoning the tree or plant through —

(i) applying any herbicide or other plant toxic chemical to it; or

(ii) spilling (including washing off or directing water contaminated by) any oil, petroleum, paint, cement, mortar or the like onto the root zone of the tree or plant;

(b) ringbarking the tree or plant or scarring its bark when operating any machinery, or by affixing any object (such as a sign) to it using nails, staples, wires or other means;

(c) using tree climbing spikes on a healthy tree (except for the purpose of gaining access to an injured person on it) or fastening materials that significantly restrict the normal vascular function of the trunk or branches of the tree or plant; and

(d) causing damage to the tree's or plant's root zone by compaction, excavation or asphyxiation (including filling or stockpiling it with materials);

"footway" includes any footpath, verandah-way, open or covered walkway, pedestrian mall, plaza, square, and other related structures and facilities;

"green verge" means the portion along the centre median or side of a public street, or a traffic island within a public street, which is provided for the growing of trees or plants;

"heritage road green buffer" means any area designated by the Minister as such under section 16 (1);

"national park" means any area designated for the time being in Part I of the Schedule;

"nature reserve" means any area designated for the time being in Part II of the Schedule;

"occupier", in relation to any premises, means ----

(a) the person in actual occupation of the premises (whether or not he is also the owner thereof) or, if there is no person in actual occupation, the person entitled to possession of the premises; and

(b) if there is more than one occupier of the premises — any one of the occupiers;

"organism" means —

(a) a genetic structure that is capable of replicating itself, whether that structure comprises all or only part of an entity, and whether it comprises all or only part of the total genetic structure of an entity; or

(b) a reproductive cell or developmental stage of an entity referred to in paragraph (*a*);

"owner", in relation to a vehicle, includes —

(a) every person who is the owner or joint owner or part owner of the vehicle and any person who is the hirer or has the use of the vehicle under a hire-purchase agreement but not the lessor under any such agreement;

(b) the person in whose name the vehicle is registered except where the person has sold or otherwise disposed of the vehicle and has complied with the provisions of the rules applicable to him in regard to the sale or disposal; and

(c) in the case of a vehicle in respect of which a general licence is issued under section 28 of the Road Traffic Act (Cap. 276), the person to whom the general licence is issued;

"park ranger" means any person appointed under section 4 (5);

"plant" means any member of the plantae, protista, monera or fungi kingdom, and includes any angiosperm, gymnosperm, pteridophyte, bryophyte, algae, lichen or fungus;

"planting area" means any planting area referred to in section 23;

"premises" means —

(a) any building or land or part thereof; or

(b) any place (whether enclosed or built on or not) and includes any place situated underground or under water;

"public park" means any State land, any land belonging to the Board or any other land, which is —

(a) utilised as a public park, recreation ground, playground, garden, public open space, walk, park connector or green verge; and

(b) managed or maintained by the Board;

"public street" means any street over which the public has a right of way and which has been vested in the Government under the Street Works Act (Cap. 320A) or the repealed Local Government Integration Act (Cap. 166, 1985 Ed.) or in any other manner;

"qualified person" means a person who is registered as —

(a) an architect under the Architects Act (Cap. 12) and has in force a practising certificate issued under that Act; or

(b) a professional engineer under the Professional Engineers Act (Cap. 253) and has in force a practising certificate issued under that Act;

"repealed Act" means the Parks and Trees Act (Cap. 216, 1996 Ed.) repealed by this Act;

"road authority" means the Land Transport Authority of Singapore established under section 3 of the Land Transport Authority of Singapore Act (Cap. 158A);

"street" means —

(a) any road, bridge, underpass, tunnel, square, footway or passage, whether a thoroughfare or not, and whether the public has a right of way thereover or not;

(b) the way over any public bridge; or

(c) any road, footway or passage, open court or open alley, used or intended to be used as a means of access to 2 or more holdings, whether the public has a right of way thereover or not, and includes all channels, drains, ditches, reserves and verges at the side of any street;

"street works" includes works of levelling, paving, metalling, flagging, kerbing, channelling, draining, lighting, laying of cables and mains and other utility services executed in a street or part thereof and the reinstatement of a street or part thereof;

"tree" includes any seedling, sapling or re-shoot of every description and any part thereof;

"tree conservation area" means any land designated by the Minister as such under section 13 (1);

"vacant land" means —

(a) any land upon which no building or other structure exists; or

(b) any land where the Commissioner has reasonable grounds to believe is not occupied by anyone, and includes any land upon which exists any building or other structure which is constructed or used contrary to any written law;

"vehicle" means a vehicle whether mechanically propelled or otherwise.

[Parks and Trees 1996 Ed., s. 2; National Parks 1997 Ed., s. 2]

Application of Act to Government

3.—(1) This Act shall bind the Government except that nothing in this Act shall render the Government liable to prosecution for an offence.

(2) For the avoidance of doubt, no person shall be immune from prosecution for any offence under this Act by reason that the person is a contractor engaged to provide services to the Government, or is acting in any other similar capacity for, or on behalf of, the Government.

### PART II

## ADMINISTRATION OF ACT

Appointment of Commissioner of Parks and Recreation and other officers 4.—(1) The Minister may appoint any officer or employee of the Board to be the Commissioner of Parks and Recreation.

(2) The Commissioner shall, subject to any general or special directions of the Minister, be responsible for the administration of this Act and may perform such duties as are imposed and may exercise such powers as are conferred upon him by this Act or any other written law.

(3) The Commissioner may appoint, by name or office, from among —

(a) public officers; or

(b) officers of the Board,

such number of authorised officers as he considers necessary for the purpose of assisting him in administering and carrying out the provisions of this Act or any other written law.

(4) Any powers conferred on and duties to be performed by the Commissioner under this Act or any other written law may, subject to any general or special directions of the Commissioner, be exercised or performed by any authorised officer.

(5) The Commissioner may appoint, by name or office, any officer of the Board or any public officer as a park ranger who may exercise within any national park, nature reserve or public park, the powers conferred on a park ranger under Part VII.

(6) Every authorised officer and park ranger shall be subject to the general supervision of the Commissioner.

[Parks and Trees 1996 Ed., s. 3]

Officers deemed to be public servants

5. The Commissioner, every authorised officer and park ranger shall be deemed to be a public servant within the meaning of the Penal Code (Cap. 224).

[Parks and Trees 1996 Ed., s. 3 (4)]

Identification card to be produced

6.—(1) The Commissioner or any authorised officer or park ranger, when exercising any of the powers conferred upon him by this Act shall, if not in uniform, declare his office and, on demand, produce such identification card as may be issued to him for the purposes of this Act or any other written law.

(2) It shall not be an offence for any person to refuse to comply with any request, demand or order made by the Commissioner or any authorised officer or park ranger not in uniform, who fails to declare his office and refuses to produce his identification card on demand being made by that person.

[Parks and Trees 1996 Ed., s. 21]

## PART III

# NATIONAL PARKS AND NATURE RESERVES

Establishment of national parks and nature reserves 7.—(1) The areas designated in Part I of the Schedule are set aside as national parks.

(2) The areas designated in Part II of the Schedule are set aside as nature reserves.

(3) National parks and nature reserves are set aside for all or any of the following purposes:

(a) the propagation, protection and conservation of the trees, plants, animals and other organisms of Singapore, whether indigenous or otherwise;

(b) the study, research and preservation of objects and places of aesthetic, historical or scientific interest;

(c) the study, research and dissemination of knowledge in botany, horticulture, biotechnology, or natural and local history; and

(d) recreational and educational use by the public.

[National Parks 1997 Ed., s. 23]

Restricted activities in respect of trees, plants, etc., in national parks and nature reserves

8.—(1) No person shall, except with the approval of the Commissioner granted under section 12 and in accordance with the terms and conditions of such approval, carry out any of the following activities within any national park or nature reserve:

(a) cut, collect or displace any tree or plant or any part thereof;

(b) affix, set up or erect any sign, shrine, altar, religious object, shelter, structure or building;

(c) clear, break up, dig or cultivate any land;

(d) use or occupy any building, vehicle, boat or other property of the Board; or

(e) wilfully drop or deposit any dirt, sand, earth, gravel, clay, loam, manure, refuse, sawdust, shavings, stone, straw or any other matter or thing from outside the national park or nature reserve.

(2) No person shall carry out any activity within any national park or nature reserve which he knows or ought reasonably to know causes or may cause alteration, damage or destruction to any property, tree or plant within the national park or nature reserve.

(3) Any person who contravenes subsection (1) or (2) shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$50,000 or to imprisonment for a term not exceeding 6 months or to both and, in the case of a continuing offence, to a further fine of \$500 for every day or part thereof during which the offence continues after conviction.

(4) Subsections (1) and (2) shall not apply to —

(a) the Commissioner, an authorised officer or a park ranger acting in the performance of his duty under this Act;

(b) any other officer or employee of the Board acting in the performance of his duty under this Act or any other written law; and

(c) any police officer or workman assisting a person referred to in paragraph (a) or (b) to carry out his duty.

[National Parks 1997 Ed., s. 24]

Restricted activities in respect of animals, etc., in national parks and nature reserves

9.—(1) No person shall, except with the approval of the Commissioner granted under section 12 and in accordance with the terms and conditions of such approval, carry out any of the following activities within any national park or nature reserve:

(a) capture, displace or feed any animal;

(b) disturb or take the nest of any animal;

(c) collect, remove or wilfully displace any other organism;

(d) use any animal, firearm, explosive, net, trap, hunting device or instrument or means whatever for the purpose of capturing any animal; or

(e) carry or have in the person's possession any explosive, net, trap or hunting device.

(2) No person shall carry out any activity within any national park or nature reserve which he knows or ought reasonably to know causes or may cause injury to, or the death of, any animal or any other organism within the national park or nature reserve.

(3) No person shall, except with the approval of the Commissioner granted under section 12 and in accordance with the terms and conditions of such approval —

(a) bring or release or cause any animal to be brought or released into a nature reserve; or

(b) permit any domestic animal to stray into a nature reserve.

(4) Any person who contravenes subsection (1), (2) or (3) shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$50,000 or to

imprisonment for a term not exceeding 6 months or to both and, in the case of a continuing offence, to a further fine of \$500 for every day or part thereof during which the offence continues after conviction.

(5) Subsections (1), (2) and (3) shall not apply to —

(a) the Commissioner, an authorised officer or a park ranger acting in the performance of his duty under this Act;

(b) any other officer or employee of the Board acting in the performance of his duty under this Act or any other written law; and

(c) any police officer or workman assisting a person referred to in paragraph (a) or (b) to carry out his duty.

[National Parks 1997 Ed., s. 24]

Destruction, damage, etc., of notices, boundary marks, etc. 10.—(1) No person shall wilfully or negligently destroy, damage or deface any object of zoological, botanical, geological, ethnological, scientific or aesthetic interest within any national park or nature reserve.

(2) No person shall —

(a) destroy, damage, deface, alter or remove any notice or other sign erected by or on behalf of the Board within any national park or nature reserve; or

(b) knowingly destroy, damage, deface, alter or remove any boundary mark within any national park or nature reserve.

(3) Any person who contravenes subsection (1) or (2) shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$20,000.

(4) Subsections (1) and (2) shall not apply to —

(a) the Commissioner, an authorised officer or a park ranger acting in the performance of his duty under this Act;

(b) any other officer or employee of the Board acting in the performance of his duty under this Act or any other written law; and

(c) any police officer or workman assisting a person referred to in paragraph (a) or (b) to carry out his duty.

[National Parks 1997 Ed., s. 25]

Reinstatement notices as regards national parks and nature reserves 11.—(1) Where it appears to the Commissioner that there has been a contravention of any provision of section 8, 9 or 10, he may serve a reinstatement notice on any person who is carrying out or has carried out any activity in contravention of that provision requiring the person on whom it is served to carry out such repairs, work or alteration to any part of the national park or nature reserve as the Commissioner thinks fit to be carried out in order to remedy (wholly or in part) the contravention or to remedy any injury or damage to the national park or nature reserve caused by that contravention.

(2) A reinstatement notice referred to in subsection (1) may, in particular, require

(a) the alteration, demolition or removal of any sign, shrine, altar, religious object, shelter, structure or building;

(b) the carrying out of any building works or other operations;

(c) the cessation, either wholly or to the extent specified in the notice, of any activity;

(d) the removal from the national park or nature reserve of all property, material or animals used in connection with the contravention of section 8, 9 or 10, as the case may be; or

(e) the restoration of any part of the national park or nature reserve to its former state or, if such restoration is not reasonably practicable or is undesirable, the execution of such works as the Commissioner may specify in the notice to alleviate the effect of the contravention of section 8, 9 or 10, as the case may be.

(3) A reinstatement notice shall specify the date on which it is to take effect and the period (which shall run from the date the reinstatement notice takes effect) within which any step required by the notice shall be taken.

Approval for restricted activities in national parks and nature reserves 12.—(1) An application for approval to carry out or cause the carrying out of any

activity referred to in section 8 (1) or 9 (1) or (3) shall be made to the Commissioner in such form and manner as may be prescribed.

(2) The Commissioner may require an applicant to furnish him with such further information or documents as he considers necessary in relation to the application for approval.

(3) The Commissioner may, upon an application by any person for approval to carry out or cause the carrying out of any activity referred to in section 8 (1) or 9 (1) or (3) —

(a) refuse to grant approval under this section; or

(b) grant approval under this section unconditionally or subject to such conditions as he thinks fit.

(4) The Commissioner may, at any time, by notice in writing revoke any approval granted under this section if he is satisfied —

(a) that any information given in the application for the approval or any document submitted to the Commissioner in respect of the application is false in a material particular; or

(b) that the person has failed to comply with any condition imposed under subsection (3) (*b*).

## PART IV

## PROTECTION AND CONSERVATION OF TREES AND PLANTS

### Division 1 — Tree conservation areas

Tree conservation areas

13.—(1) If, after consulting the Board, it appears to the Minister expedient in the interests of amenity to make provision for the conservation of trees in any geographical area of Singapore, the Minister may, by order published in the *Gazette*, designate any geographical area in Singapore (outside a national park or nature reserve) as a tree conservation area.

(2) A copy of any map of a tree conservation area published in the *Gazette*, being a copy purporting to be certified by the Commissioner as being a true copy of the map so published, shall be admissible in any legal proceedings and shall be evidence of the matters contained in the map.

[Parks and Trees 1996 Ed., s. 5 (1)]

No cutting or damaging of tree having girth of more than one metre 14.—(1) Subject to subsection (6), no person shall, except with the approval of the Commissioner under section 20 and in accordance with the terms and conditions of such approval, cut any tree with a girth exceeding one metre growing on —

- (a) any tree conservation area; or
- (b) any vacant land (whether within or outside a tree conservation area).

(2) Any person who contravenes subsection (1) or damages any tree referred to in that subsection shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$50,000.

(3) In determining the amount of fine to be imposed on a person convicted of an offence under subsection (2), the court shall, in particular, have regard to any financial benefit which has accrued or appears likely to accrue to him in consequence of the offence.

(4) For the purposes of this section, the girth of a tree shall be measured half a metre from the ground.

(5) Where in any proceedings for an offence under this section, a question arises as to whether the girth of a tree measured half a metre from the ground exceeds or does not exceed one metre, a certificate purporting to be signed by the Commissioner or an authorised officer certifying the girth of the tree shall be admissible as prima facie evidence of the matters stated therein and of the signature of the Commissioner or authorised officer, as the case may be.

(6) No approval referred to in subsection (1) shall be required where the condition of the tree constitutes an immediate threat to life or property.

[Parks and Trees 1996 Ed., s. 5 (2) to (4)]

#### Tree conservation notice

15.—(1) If it appears to the Commissioner necessary to make provision for the maintenance or conservation of any tree with a girth exceeding one metre growing —

(a) within any tree conservation area; or

(b) on any vacant land (whether within or outside a tree conservation area),

or a group of such trees, the Commissioner may serve a tree conservation notice with respect to such tree or group of trees addressed to —

(i) the occupier of the premises or land on which the tree or group of trees is growing; or

(ii) any person carrying out or intending to carry out any building works, whether on the premises or within its vicinity which, in the opinion of the Commissioner, causes or is likely to cause damage to the tree or group of trees.

(2) A tree conservation notice under subsection (1) may, in particular, require the occupier or person referred to in that subsection —

(a) to cease or refrain from, either wholly or to the extent specified in the tree conservation notice, any activity on the premises concerned;

(b) to alter, demolish or remove any property or material from the premises concerned, or any sign, structure or building he has erected or caused to be erected thereon; or

(c) to take such other measures as the Commissioner reasonably considers necessary to maintain or conserve the tree or group of trees concerned.

(3) Every tree conservation notice under subsection (1) shall specify —

(a) the tree or group of trees covered by the notice, by reference to the type, species, size, location and such other particulars of the tree or group of trees;

(b) the date on which it is to take effect; and

(c) the period (which shall run from the date the tree conservation notice takes effect) within which any step required by the notice shall be taken.

(4) The Commissioner may, at any time, revoke any tree conservation notice made under this section.

[Parks and Trees 1996 Ed., s. 6]

### Division 2 — Heritage road green buffers

#### Heritage road green buffers

16.—(1) If, after consulting the Board, it appears to the Minister expedient to conserve the flora or vegetation in any area of Singapore (not within any national park or nature reserve) as important elements of the surrounding streetscape or landscape, the Minister may, by order published in the *Gazette*, designate —

(a) any green verge (whether within or outside a tree conservation area); or

(b) any other area located along or on land fronting, adjoining or abutting any street (whether within or outside a tree conservation area), as a heritage road green buffer.

(2) A copy of any map of a heritage road green buffer published in the *Gazette*, being a copy purporting to be certified by the Commissioner as being a true copy of the map so published, shall be admissible in any legal proceedings and shall be evidence of the matters contained in the map.

Maintenance of heritage road green buffers

17.—(1) It shall be the function and duty of the Board to manage and maintain all heritage road green buffers and carry out all acts necessary thereto.

(2) For the purpose of managing and maintaining heritage road green buffers, the Commissioner or any officer, employee of or other person authorised in writing by the Board shall have the right, at any reasonable time, to enter upon any heritage road green buffer that is State land and do all things as are reasonably necessary for the management and maintenance of the heritage road green buffer.

(3) Subject to subsection (4), where a heritage road green buffer, or any part of it, lies within any premises other than State land, the Commissioner or any officer, employee of or other person authorised in writing by the Board shall have the right, at any reasonable time, to enter upon the heritage road green buffer or any part thereof for the purpose of —

(a) ascertaining whether any of the functions conferred by this section on the Board should or may be exercised, including taking photographs of the premises and any property or material found thereon and such other steps as he may consider necessary without involving any search or seizure of any premises, thing or person; and (b) taking any action or carrying out any work that is reasonably necessary for the management and maintenance of the heritage road green buffer.

(4) The right to enter upon any premises under subsection (3) may be exercised if, and only if, the Commissioner or any officer, employee of or other person authorised in writing by the Board has given notice of his intention to perform the Board's function and discharge its duty under this section to the occupier of the premises or any person having any estate, right, share or interest in the premises.

(5) A notice under subsection (4) shall be in writing and shall be deemed to be given to and received by an occupier if it is affixed to a conspicuous part of the premises to be entered.

No cutting or damaging of tree or plant in heritage road green buffer 18.—(1) Subject to subsection (4), no person shall, except with the approval of the Commissioner granted under section 20 and in accordance with the terms and conditions of such approval, cut any tree or plant within a heritage road green buffer.

(2) Any person who contravenes subsection (1) or damages any tree or plant within a heritage road green buffer shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$50,000.

(3) In determining the amount of fine to be imposed on a person convicted of an offence under subsection (2), the court shall, in particular, have regard to any financial benefit which has accrued or appears likely to accrue to him in consequence of the offence.

(4) No approval referred to in subsection (1) shall be required where —

(a) the tree or plant is determined by the Commissioner as dying or dead; or

(b) the condition of the tree or plant constitutes an immediate threat to life or property.

Heritage road green buffers not to be interfered with 19.—(1) Without prejudice to section 18, no person (other than a road authority) shall, except with the approval of the Commissioner granted under section 20 and in accordance with the terms and conditions of such approval — (a) alter, close up or remove any heritage road green buffer;

(b) erect or place any structure or object in, above, across or under any heritage road green buffer; or

(c) erect, construct or lay within any heritage road green buffer any fence, retaining wall, foundation, manhole, pipe, cable, mains or any obstruction or structure (whether temporary or permanent).

(2) Any person who, without reasonable cause, contravenes subsection (1) shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$50,000 and, in the case of a continuing offence, to a further fine of \$500 for every day or part thereof during which the offence continues after conviction.

(3) The road authority shall, before carrying out within a heritage road green buffer any work or activity in the performance of any function or discharge of any duty conferred on the road authority by or under any written law, consult the Board in respect thereof.

## Division 3 — Approvals, reinstatement notices and evidence

Application for approval to cut trees and plants, etc.

20.—(1) An application for an approval to carry out or cause the carrying out of any activity referred to in section 14 (1), 18 (1) or 19 (1) shall be made to the Commissioner in such form and manner as may be prescribed.

(2) An application for an approval to carry out or cause to be carried out any activity referred to in section 14 (1) or 18 (1) may be made by a person having such estate or interest in the premises on which the tree or plant is growing as would enable him to cut the tree or plant.

(3) The Commissioner may require an applicant to furnish him with such further information or documents as he considers necessary in relation to the application for approval.

(4) The Commissioner may, upon an application by any person for approval to carry out or cause to be carried out any activity referred to in section 14 (1), 18 (1) or 19(1) —

(a) refuse to grant approval under this section; or

(b) grant approval under this section unconditionally or subject to such conditions as he thinks fit.

(5) The Commissioner may, at any time, by notice in writing revoke any approval granted under this section if he is satisfied —

(a) that any information given in the application for the approval or any document submitted to the Commissioner in respect of the application is false in a material particular; or

(b) that the person has failed to comply with any condition imposed under subsection (4) (*b*).

(6) In determining whether to grant an approval to cut a tree or plant within a heritage road green buffer, the Commissioner may have regard to the following matters:

(a) the visibility and contribution of the tree or plant in the surrounding landscape or streetscape;

(b) the type and rarity of the species of tree or plant;

(c) the number of trees or plants in the vicinity;

(d) any heritage significance of the tree or plant;

(e) whether the tree or plant may become dangerous or damage property or utility services; and

(f) soil conservation and erosion issues.

[Parks and Trees 1996 Ed., s. 7 (1)]

Reinstatement notices as regards heritage road green buffers 21.—(1) Where it appears to the Commissioner that there has been a contravention of section 18 (1) or (2) or 19 (1), he may serve a reinstatement notice on all or any of the following persons:

(a) any person who appears to the Commissioner to have been responsible for or have participated in anything done in contravention of section 18 (1) or (2) or 19 (1); or (b) any occupier of the premises on which anything is done in contravention of section 18 (1) or (2) or 19 (1).

(2) A reinstatement notice under subsection (1) shall require the person upon whom it is served to remedy (wholly or in part) the contravention or to remedy any injury or damage to the heritage road green buffer caused by that contravention and may, in particular, require that person —

(a) to cease or refrain from, either wholly or to the extent specified in the notice, any activity on the premises concerned;

(b) to alter, demolish or remove any property or material from the premises concerned, or any structure, object, fence, retaining wall, foundation, manhole, pipe, cable, mains or any obstruction or structure (whether temporary or permanent) he has erected or caused to be erected thereon in contravention of section 19 (1);

(c) to restore any part of the heritage road green buffer to its former state or, if such restoration is not reasonably practicable or is undesirable, to execute such works as the Commissioner may specify in the notice to alleviate the effect of the contravention of section 18 (1) or (2) or 19 (1), as the case may be, including planting such trees or plants and taking measures for their maintenance; or

(d) to take such other measures which the Commissioner reasonably considers necessary for the purposes of paragraph (a), (b) or (c).

(3) A reinstatement notice under this section shall specify the date on which it is to take effect and the period (which shall run from the date the reinstatement notice takes effect) within which any step required by the notice shall be taken.

## PART V

### PLANTING AREAS, PUBLIC OPEN SPACES AND GREEN VERGES

### Division 1 — Planting areas and streetscapes

Application

22.Unless otherwise expressly provided, this Division shall apply only to premises on which any building works are or are to be carried out —

(a) the building plans of which require the approval of the Commissioner of Building Control under the Building Control Act (Cap. 29); and

(b) in respect of which planning permission is granted on or after 1st August 2005.

#### Planting areas

23.—(1) All premises referred to in section 22 shall be surrounded by a planting area measuring —

(a) not more than 2 metres wide, except as otherwise specified in paragraph (b); and

(b) not more than 5 metres wide from the front boundary of the premises adjoining or abutting a public street.

(2) Without prejudice to subsection (1), all premises referred to in section 22, and such other premises as may be prescribed under subsection (3), shall be provided with such other planting areas within the premises as the Minister may, by notification in the *Gazette*, prescribe under subsection (3).

(3) The Minister may, for the purpose of enhancing greenery and promoting the use of trees and plants as important elements of streetscapes and landscapes, by notification in the *Gazette*, prescribe different dimensions (including the location and site specifications) of planting areas for different classes or descriptions of premises, whether or not the premises are those referred to in section 22.

(4) All planting areas shall be made up in accordance with the specifications of the Commissioner.

(5) Every notification made under subsection (3) shall be presented to Parliament as soon as possible after publication in the *Gazette*.

(6) For the purposes of this section, the dimensions of a planting area shall be measured along the ground.

#### Provision of planting areas

24.—(1) No person shall, except with the approval of the Commissioner granted under section 32 in respect of the planting areas to be made up within any premises referred to in section 22, or within such other premises as may be prescribed under section 23 (3), and in accordance with the terms and conditions of such approval, commence or carry out, or permit or authorise the commencement or carrying out of any building works on those premises. (2) Any person who contravenes subsection (1) shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$30,000 and, in the case of a continuing offence, to a further fine of \$500 for every day or part thereof during which the offence continues after conviction.

(3) If any works are carried out in contravention of subsection (1), or no planting area as required by section 23 is provided within any premises, the Commissioner may serve upon —

(a) any person who carried out, or caused or permitted the works to be so carried out; and

(b) the occupier of the premises, an enforcement notice in writing requiring him to make up such planting areas within those premises in such manner and according to such specifications and within such time as may be specified in the notice.

#### Occupier's duty to maintain planting areas

25.—(1) It shall be the duty of the occupier of the premises within which any planting area has been made up to maintain the planting area, either wholly or to the extent specified by the Commissioner in respect of that planting area, and in accordance with the specifications of the Commissioner.

(2) The Commissioner may, by a maintenance notice, require the occupier of the premises referred to in subsection (1) to carry out such works to the planting area or any part of it as he thinks fit to be carried out for the proper maintenance of the planting area and to take such other measures as may be specified in the notice.

(3) A maintenance notice under this section shall specify the date on which it is to take effect and the period (which shall run from the date the maintenance notice takes effect) within which any step required by the notice shall be taken.

(4) In this section and section 26, "planting area" includes any area that has, before 1st August 2005, been set aside as a green buffer or peripheral planting strip pursuant to any requirement imposed by the competent authority under the Planning Act (Cap. 232).

[Parks and Trees 1996 Ed., s. 6]

Planting areas not to be interfered with 26.—(1) No person shall, except with the approval of the Commissioner granted

under section 32 and in accordance with the terms and conditions of such approval —

(a) alter, close up or remove any planting area in any premises;

(b) erect or place any structure or object in, above, across or under any such

planting area;

(c) erect, construct or lay within any planting area in any premises any fence, retaining wall, foundation, manhole, pipe, cable, mains or any obstruction or structure (whether temporary or permanent); or

(d) carry out any works within a planting area in any premises which deviate from any specifications issued or approved by the Commissioner under section 34.

(2) Any person who, without reasonable excuse, contravenes subsection (1) shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$30,000 and, in the case of a continuing offence, to a further fine of \$500 for every day or part thereof during which the offence continues after conviction.

(3) Where it appears to the Commissioner that there has been a contravention of subsection (1), he may serve a reinstatement notice on all or any of the following persons:

(a) any person who appears to the Commissioner to have been responsible for or have participated in anything done in contravention of subsection (1); or

(b) any occupier of the premises on which anything is done in contravention of subsection (1), requiring the person to remedy (wholly or in part) the contravention.

(4) The reinstatement notice under subsection (3) may, in particular, require the person on whom it is served —

(a) to cease or refrain from, either wholly or to the extent specified in the notice, any activity on the premises concerned;

(b) to alter, demolish or remove any property or material from the premises concerned, or any structure, object, fence, retaining wall, foundation, manhole, pipe, cable, mains or any obstruction or structure

(whether temporary or permanent) he has erected or caused to be erected thereon in contravention of subsection (1);

(c) to restore any part of the planting area to its former state or, if such restoration is not reasonably practicable or is undesirable, to execute such works as the Commissioner may specify in the notice to alleviate the effect of the contravention of subsection (1), as the case may be, including planting such trees or plants and taking measures for their maintenance; or

(d) to take such other measures which the Commissioner reasonably considers necessary for the purposes of paragraph (a), (b) or (c).

(5) A reinstatement notice under this section shall specify the date on which it is to take effect and the period (which shall run from the date the reinstatement notice takes effect) within which any step required by the notice shall be taken.

Notice to plant or replant trees and plants, etc.

27.—(1) For the purpose of enhancing greenery and promoting the use of trees and plants as important elements of streetscapes and landscapes or otherwise enhancing the amenity of any area located along or on premises fronting, adjoining or abutting any public street, the Commissioner may at any time serve on the occupier of any premises fronting, adjoining or abutting that public street a notice requiring the occupier, within such period as may be specified in the notice, to do all or any of the following within the green margin of those premises:

(a) to plant or replant any tree or plant of such size and species and at such places and provide for their maintenance and protection in such manner as may be specified;

(b) to take such measures for the maintenance or conservation of any tree or plant growing on the green margin as may be specified;

(c) to clear the green margin of weeds or cut the grass; or

(d) to take such other measures which the Commissioner considers necessary for such purpose.

(2) No person shall, at any time, cut or damage any tree or plant which has been planted pursuant to a notice under subsection (1).

(3) Subject to subsection (4), any person who, without reasonable excuse, contravenes subsection (2) shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$30,000.

(4) Nothing in this section shall render unlawful the cutting or damaging of any tree or plant by any person where the condition of the tree or plant constitutes an immediate threat to life or property.

(5) In this section, the green margin of any premises means that part of the premises (whether or not part of a planting area) that is fronting, adjoining or abutting the public street, which is of a width of not more than 5 metres measured from —

(a) the boundary of those premises; or

(b) the boundary of the road reserve line (if any) encroaching upon those premises,

whichever is the narrower.

[Parks and Trees 1996 Ed., s. 8]

Division 2 — Open spaces set aside as public parks

Provision of open spaces as public parks

28.—(1) All premises on which any building works referred to in section 22 are to be carried out shall also have such open spaces to be used as public parks (if any) pursuant to any development proposal or plan approved by the competent authority.

(2) It shall be the duty of the occupier of the premises referred to in section 22 who carries out or causes to be carried out any building works referred to in that section to make up every open space referred to in subsection (1) in accordance with the specifications of the Commissioner.

(3) Where it appears to the Commissioner that there has been a contravention of subsection (2), he may serve an enforcement notice on the occupier of the premises on which anything is done in contravention of that subsection.

(4) An enforcement notice under this section shall specify the date on which it is to take effect and the period (which shall run from the date the enforcement notice takes effect) within which any step required by the notice shall be taken.

Vesting of open space set aside as public park in Government 29.—(1) Where any open space has been set aside for use or is being used as a public park pursuant to any development proposal or plan approved by the competent authority, the Commissioner may, by an instrument in the form approved by the Registrar of Titles or the Registrar of Deeds, as the case may be, declare that the open space shall vest in the Government.

(2) Any plan prepared by the Commissioner under subsection (1) shall comply with the requirements of the Land Titles Act (Cap. 157) in respect of registered land and of the Registration of Deeds Act (Cap. 269) in respect of other land and shall show thereon the premises which will vest in the Government.

(3) Any declaration referred to in subsection (1) shall be published in the Gazette.

(4) Where any premises that are to be vested in the Government under this section consist of premises included in separate lots already set aside as a public park, the declaration shall be registered against those lots under the provisions of the Land Titles Act (Cap. 157) in respect of registered land and under the provisions of the Registration of Deeds Act (Cap. 269) in respect of other land.

(5) Where any premises that are to be vested in the Government under this section consist of premises included in an existing lot or lots, those premises forming the public park shall be excised from the existing lot or lots and the declaration shall be registered in respect of the excised portions under the provisions of the Land Titles Act in respect of registered land and under the provisions of the Registration of Deeds Act in respect of other land.

(6) Upon the registration of a declaration made under subsection (1), the premises forming the public park shall vest in the Government free from all encumbrances and where the premises are held under a statutory land grant, such vesting shall not be deemed to create a subdivision within the meaning of the State Lands Act (Cap. 314).

(7) No compensation shall be payable for any premises that are vested in the Government under this section.

(8) When any premises are vested in the Government under this section, the Board may take possession of the premises and proceed to demolish and remove any building or portion of any building forming part thereof.

### Division 3 — Green verges

Provision of green verges of public streets

30.—(1) No person other than the road authority shall, except with the approval of the Commissioner granted under section 32 in respect of the green verges to be made up and in accordance with the terms and conditions of such approval, commence or carry out, or permit or authorise the commencement or carrying out of any construction of —

(a) any new public street; or

(b) any street which is to be set aside for use as a public street pursuant to any development proposal or plan approved by the competent authority.

(2) Any person who contravenes subsection (1) shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$30,000 and, in the case of a continuing offence, to a further fine of \$500 for every day or part thereof during which the offence continues after conviction.

(3) Where it appears to the Commissioner that any construction works are carried out in contravention of subsection (1), or no green verges are made up in respect of those construction works, he may serve upon —

(a) any person who appears to the Commissioner to have been responsible for or have participated in anything done in contravention of subsection (1); or

(b) any occupier of the premises on which anything is done in contravention thereof,

an enforcement notice in writing requiring him to make up such green verges in such manner and according to such specifications and within such time as may be specified in the notice.

(4) The road authority shall, before commencing or carrying out, or permitting or authorising the commencement or carrying out of any construction works referred to in subsection (1) in the performance of any function or discharge of any duty conferred on the road authority by or under any written law, consult the Commissioner in respect thereof.

(5) Nothing in this section shall require an application for approval under section 32 in respect of any construction works referred to in subsection (1) for which the relevant approval has been obtained from the Board before 1st August 2005.

(6) For the purposes of this section, the construction of a new public street shall be deemed to include —

(a) the continuation of an existing public street;

(b) the widening or alteration of any existing public street; and

(c) the adapting of a public street made for foot traffic only for carriage traffic or vice versa.

#### Street works affecting green verges

31.—(1) No person other than the road authority shall, except with the approval of the Commissioner granted under section 32 in respect of street works carried out under this subsection and in accordance with the terms and conditions of such approval, commence or carry out, or permit or authorise the commencement or carrying out of any street works on or within the vicinity of —

(a) any public street; or

(b) any street which is to be declared a public street under section 26 of the Street Works Act (Cap. 320A), which may affect any green verge along that street.

(2) Any person who contravenes subsection (1) shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$30,000 and, in the case of a continuing offence, to a further fine of \$500 for every day or part thereof during which the offence continues after conviction.

(3) Where it appears to the Commissioner that there has been a contravention of subsection (1), he may serve a reinstatement notice on any person who appears to the Commissioner to have been responsible for or have participated in anything done in contravention of that subsection requiring the person to remedy (wholly or in part) the contravention.

(4) The reinstatement notice under subsection (3) may, in particular, require the person on whom it is served —

(a) to cease or refrain from, either wholly or to the extent specified in the notice, any activity on the premises concerned;

(b) to alter, demolish or remove any property or material from the green verge concerned, or any structure, object, fence, retaining wall, foundation, manhole, pipe, cable, mains or any obstruction or structure (whether temporary or permanent) he has erected or caused to be erected thereon in contravention of subsection (1);

(c) to restore any part of the green verge to its former state or, if such restoration is not reasonably practicable or is undesirable, to execute such works as the Commissioner may specify in the notice to alleviate the effect of the contravention of subsection (1), including planting such trees or plants and taking measures for their maintenance; or

(d) to take such other measures which the Commissioner reasonably considers necessary for the purposes of paragraph (*a*), (*b*) or (*c*).

(5) A reinstatement notice under this section shall specify the date on which it is to take effect and the period (which shall run from the date the reinstatement notice takes effect) within which any step required by the notice shall be taken.

(6) The road authority shall, before commencing or carrying out, or permitting or authorising the commencement or carrying out of any street works referred to in subsection (1) in the performance of any function or discharge of any duty conferred on the road authority by or under any written law, consult the Commissioner in respect thereof.

(7) Nothing in this section shall require an application for approval under section 32 in respect of any street works referred to in subsection (1) for which the relevant approval has been obtained from the Board before 1st August 2005.

### Division 4 — Specifications and approvals

Approvals required

32.—(1) Subject to the provisions of this Act, every application for an approval for the purposes of section 24, 26, 30 or 31 shall be —

(a) made to the Commissioner in such form and manner as the Commissioner may require;

(b) accompanied by such plans of the works to which the application relates, and such other documents, as the Commissioner may require; and

(c) accompanied by such non-refundable application fee as the Commissioner may require which shall be paid in the prescribed manner.

(2) The Commissioner may require the plans referred to in subsection (1) (b) —

(a) to be made or certified by a qualified person appointed by the person for whom the works are or are to be carried out; and

(b) to show such details or specifications as the Commissioner may determine.

(3) Upon receipt of an application referred to in subsection (1) in respect of any works, the Commissioner may, subject to subsection (4) -

(a) refuse to grant approval; or

(b) grant approval unconditionally or subject to such conditions as he thinks fit.

(4) The Commissioner shall not grant any approval under section 30 (1) unless —

(a) the competent authority has first given written permission under the provisions of the Planning Act (Cap. 232) for the use of the land for the construction of a street referred to in section 30 (1); or

(b) the use of the land for the construction of a street referred to in section 30 (1) has been authorised under section 21 (6) of the Planning Act.

(5) Where the plans referred to in subsection (1) (*b*) are certified by a qualified person, the Commissioner may, on the basis of such certification and without checking those plans, issue an approval in respect of the works, except that nothing shall prohibit or prevent the Commissioner from carrying out random checks on any of the plans referred to in subsection (1) (*b*) before approving the works.

(6) Where an approval has been granted under subsection (3) in respect of plans submitted under subsection (1) (*b*) and the applicant intends to depart or deviate from the plans approved, he shall apply to the Commissioner for his approval of the plans showing the proposed departure or deviation, and subsections (2) to (5) shall apply, with the necessary modifications, to an application for an approval under this subsection.

(7) Any approval granted in respect of any works under this section shall automatically lapse —

(a) in a case where a written permission has been granted by the competent authority under the Planning Act in respect of works, if the written permission lapses pursuant to section 20 of that Act; or

(b) if the works are not commenced within the period specified in the approval.

(8) The Commissioner may, at any time, by notice in writing revoke any approval granted under subsection (3) if he is satisfied —

(a) that any information given in the application for the approval or any document submitted to the Commissioner in respect of the application is false in a material particular; or

(b) that the person has failed to comply with any condition imposed by the Commissioner under subsection (3).

#### Compliance certificates

33.—(1) Where any works in respect of which an approval has been granted under section 32 have been completed, the person to whom the approval was granted shall apply for a compliance certificate in such form and manner as the Commissioner may require.

(2) If the Commissioner is satisfied that the works in respect of which an approval has been granted under section 32 have been completed in accordance with the plans for those works referred to in section 32 (1) (*b*) and any condition imposed by the Commissioner under section 32 (3), he may grant a compliance certificate unconditionally or subject to such conditions as he thinks fit.

(3) Where the Commissioner has revoked any approval under section 32 (8), any compliance certificate granted in respect of the works shall be automatically revoked.

#### Specifications

34.—(1) The Commissioner may issue or approve and from time to time review and revise specifications for planting areas, green verges and open spaces to be used as public parks.

(2) If any provision in any specifications issued or approved by the Commissioner under subsection (1) is inconsistent with any regulations made under this Act, such provision shall, to the extent of the inconsistency, either have effect subject to such regulations or, where appropriate, having regard to such regulations, shall not have effect.

#### Duties of qualified person

35.—(1) Every qualified person referred to in section 32 (2) (a) shall —

(a) take all reasonable steps and exercise due diligence in supervising and inspecting the works to ensure that those works are carried out in

accordance with this Act and with the plans submitted under section 32 and with all conditions imposed by the Commissioner under that section; and

(b) notify the Commissioner of any contravention of the provisions of this Act pertaining to the works.

(2) Any qualified person who contravenes any of the requirements of subsection(1) shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$30,000 and, in the case of a continuing offence, to a further fine not exceeding \$500 for every day or part thereof during which the offence continues after conviction.

(3) In any prosecution against a qualified person for an offence under subsection (1) (*b*), it shall be a defence for him to prove to the satisfaction of the court that he did not know or could not reasonably have discovered the contravention referred to in the charge.

Liabilities related to plans, certificates and documents

36.—(1) Any person for whom any works are carried out, or any person who in carrying out the works deviates, or permits or authorises any planting area, open space or green verge to deviate, in any material way from any plans approved by the Commissioner under section 32 shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$30,000 and, in the case of a continuing offence, to a further fine not exceeding \$500 for every day or part thereof during which the offence continues after conviction.

(2) Any person who —

(a) being required by this Act to make or produce to the Commissioner any plan or document;

(b) for the purpose of obtaining any certificate or approval from the Commissioner under this Act; or

(c) for the purpose of establishing any fact relevant to the administration of this Act,

makes or produces any plan or document which —

(i) is false in a material particular;

(ii) has not been made by the person by whom it purports to have been made; or

(iii) has been in any way altered or tampered with, shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$30,000.

### PART VI

### PREVENTION OF DANGERS

Trees and plants obstructing traffic

37.Where the Commissioner is satisfied that any tree or plant, whether or not dead or dying, on any premises adjoining a street, railway or rapid transit system or any part thereof —

(a) is likely, by falling or otherwise, to obstruct the traffic on the street, railway or rapid transit system or endanger the lives or property of travellers thereon; or

(b) is obstructing or is likely, in any way, to obstruct the view of —

(i) any motorist on the street; or

(ii) any operator of the railway or rapid transit system, the Commissioner may serve an enforcement notice requiring the occupier of the premises to take such measures (including cutting the tree or plant or any part of it) as the Commissioner thinks fit within the time specified in the notice.

[Parks and Trees 1996 Ed., s. 11 (1)]

Imminently dangerous trees or plants 38.—(1) Where the Commissioner is satisfied that —

(a) the condition of any tree or plant, whether or not dead or dying, on any premises constitutes an immediate threat to life or property; or

(b) it is reasonably necessary to cut or damage a tree or plant, whether or not dead or dying, on any premises to protect human life or property from fire or for extinguishing or restricting the spread of fire,

he may take such measures and do such works on those premises or other premises adjacent thereto as may be necessary to cut or damage the tree or plant or any part of it. (2) All costs and expenses incurred by the Commissioner under subsection (1) shall constitute a debt due from the occupier of the premises referred to in that subsection to the Board, and may be recoverable in the manner provided for in this Act.

[Parks and Trees 1996 Ed., s. 12]

# PART VII

## POWERS OF ENFORCEMENT

Power to require information in respect of contraventions 39.—(1) Where it appears to the Commissioner or any authorised officer that there may have been a contravention of any provision of this Act, he may serve an information notice to require any person who appears to him to be acquainted with the circumstances of the case to furnish him, within such time as may be specified in the notice, with information relating to that case in the possession or within the knowledge of that person.

(2) An information notice under subsection (1) shall be complied with by giving the required information in writing to the Commissioner or authorised officer, as the case may be.

(3) Any person who fails to comply with any notice under subsection (1) shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$10,000.

(4) It shall be a defence for a person charged with an offence under subsection (3) to prove that he did not know and could not with reasonable diligence have ascertained, the information required in the information notice.

(5) If any person —

(a) makes any statement purporting to comply with a requirement of an information notice which he knows to be false or misleading in a material particular; or

(b) recklessly makes such a statement which is false or misleading in a material particular,

he shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$10,000.

[National Parks 1997 Ed., s. 30]

Power of entry and to demand particulars of identity

40.—(1) The Commissioner or any authorised officer may, with such assistants and workmen as are necessary, at any reasonable time, enter upon any land for the purpose of —

(a) ascertaining whether there is, or has been, on or in connection with the premises, a contravention of this Act;

(b) ascertaining whether circumstances exist that would authorise the Commissioner to take any action or execute any works under this Act; or

(c) taking any action or carrying out any works, authorised or required by this Act.

(2) The Commissioner or any authorised officer may take or cause to be taken any photograph of the premises and any property or material found thereon and such other steps as he may consider necessary without involving any search or seizure of any premises, thing or person.

(3) The occupier of any premises shall, if required by the Commissioner or any authorised officer, as the case may be —

- (a) give his name and address;
- (b) provide proof of his identity; and
- (c) give the name and address of the owner of the premises, if known.

(4) Any person who —

(a) wilfully obstructs the Commissioner or any authorised officer in the performance of any matter or thing which he is authorised to do by this section; or

(b) upon being required by the Commissioner or any authorised officer to give his name and address or to furnish any particulars under subsection (3), refuses to do so or wilfully mis-states his name or address or furnishes false particulars,

shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$10,000.

Powers of arrest in certain circumstances

41.—(1) The Commissioner, an authorised officer or a police officer may arrest, without warrant, any person who has committed or whom he reasonably suspects to have committed an offence under this Act if —

- (a) the person declines to give his name and address; or
- (b) there is reason to doubt the accuracy of the name and address, if given.

(2) A person arrested under this section may be detained until his name and address are correctly ascertained except that no person so arrested shall be detained longer than is permitted by written law and is necessary for bringing him before a court unless the order of a court for his detention is obtained.

[Parks and Trees 1996 Ed., s. 22]

Enforcement powers in national parks, nature reserves and public parks 42.—(1) The Commissioner, an authorised officer, a park ranger or a police officer may, without warrant, arrest any person within any national park, nature reserve or public park if that person, in contravention of this Act, fails or refuses to leave the national park, nature reserve or public park, as the case may be, or any part thereof, after being requested by the Commissioner, authorised officer, park ranger or police officer to do so.

(2) A park ranger may, without warrant, arrest any person who has committed or whom he reasonably suspects to have committed an offence under this Act within a national park, nature reserve or public park if —

- (a) the person declines to give his name and address; or
- (b) there is reason to doubt the accuracy of the name and address, if given.

(3) If the Commissioner, an authorised officer, a park ranger or a police officer has reason to believe that any offence has been committed under this Act within any national park, nature reserve or public park, he may inspect and search any baggage, equipment, package, container, tent, vehicle, boat, craft or place and seize any thing therein which he requires as evidence that any such offence has been committed.

(4) The Commissioner, an authorised officer, a park ranger or a police officer may remove from any national park, nature reserve or public park any vehicle, boat or thing brought into or left in the national park, nature reserve or public park or any part thereof in contravention of this Act or which is likely to cause danger or obstruction. [National Parks 1997 Ed., ss. 34, 35 and 37]

## PART VIII

### OFFENCES, PENALTIES AND PROCEEDINGS

Penalty for obstructing Commissioner, etc., in his duty 43. Any person who —

(a) hinders or obstructs the Commissioner, an authorised officer or a park ranger in the performance or execution of his duty or of any thing which he is empowered or required to do under this Act; or

(b) interferes with any works authorised to be done by the Commissioner or any authorised officer or park ranger under this Act, shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$10,000 or to imprisonment for a term not exceeding 6 months or to both.

[Parks and Trees 1996 Ed., s. 18; National Parks 1997 Ed., s. 32]

Parking of vehicles on green verges and turfed open spaces prohibited 44.—(1) Any person who, without reasonable excuse, parks a vehicle on any green verge or any turfed open space which is managed or maintained by the Board shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$10,000.

(2) In this section, "park" means to bring a vehicle to a stationary position or to cause it to wait for any purpose.

[Parks and Trees 1996 Ed., s. 13]

Liability of owner, etc., of vehicle for offence committed

45.—(1) When an offence under this Act is committed in relation to a vehicle, the person who at the time of the commission of the offence is the owner of the vehicle or, in the case of a deregistered vehicle, is the person who immediately prior to the deregistration was registered as the owner of the vehicle in respect of which the offence is committed shall be guilty of the offence in all respects as if he were the actual offender guilty of the offence unless the court is satisfied that the vehicle was at the relevant time a stolen vehicle or a vehicle illegally taken or used.

(2) Nothing in this section shall affect the liability of the actual offender but, where a penalty has been imposed on or recovered from a person in relation to an offence, no further penalty shall be imposed on or recovered from any other person in relation thereto.

(3) Notwithstanding subsection (1), no owner of a vehicle shall, by virtue of this section, be guilty of an offence if he —

(a) within 14 days after service on him of a notice alleging that he has been guilty of an offence, furnishes by a statement in writing to the Commissioner stating truthfully the name and address of the person who was in charge of the vehicle at all relevant times relating to the offence concerned; or

(b) satisfies the court that he did not know and would not with reasonable diligence have ascertained such name and address.

(4) A statement made under subsection (3) if produced in any proceedings against the person named therein in respect of the offence concerned shall be sufficient evidence that such person was in charge of the vehicle at all relevant times relating to such offence unless evidence to the contrary is adduced.

[Parks and Trees 1996 Ed., s. 17]

Default in compliance with notice or condition 46.—(1) Any person who, without reasonable excuse —

(a) fails to comply with the requirements of any of the following notices served on him:

(i) a tree conservation notice under section 15 (1);

(ii) a reinstatement notice under section 11 (1), 21 (1), 26 (3) or 31 (3);

(iii) an enforcement notice under section 24 (3), 28 (3), 30 (3) or 37;

(iv) a maintenance notice under section 25 (2); or

(v) a notice to plant or replant under section 27 (1); or

(b) contravenes any condition of approval imposed by the Commissioner under section 12, 20 or 32,
shall be guilty of an offence and shall be liable on conviction to a fine not exceeding \$20,000 and, in the case of a continuing offence, to a further fine not exceeding \$200 for every day or part thereof during which the offence continues after conviction.

(2) In any proceedings against a person for an offence under subsection (1), it shall be a defence for that person charged to prove to the satisfaction of the court that he has used all due diligence to comply with the notice or condition of approval imposed.

(3) The cost of any measures or works carried out in accordance with any notice referred to in subsection (1) (*a*) shall be borne by the person on whom the notice is served.

(4) If any notice or condition of approval referred to in subsection (1) is not complied with to the satisfaction of the Commissioner, the Commissioner may at any time enter the premises concerned and carry out or cause to be carried out all or any of the steps which are in his opinion necessary to secure compliance with the notice or condition of approval, as the case may be, including cutting or removing any tree, or removing, detaining and disposing of any property or materials on the premises.

(5) All costs and expenses reasonably incurred by the Commissioner in exercise of the powers conferred by subsection (4) shall constitute a debt due from any person in default of the notice or condition of approval referred to in subsection (1), and may be recoverable in the manner provided for in this Act.

(6) Where —

(a) any land has 2 or more occupiers; and

(b) any measures have been taken or works have been executed by the Commissioner under this Act pursuant to any contravention of the notice or condition of approval referred to in subsection (1), the occupiers shall be liable jointly for the whole costs and expenses incurred by the Commissioner, and those costs and expenses shall be apportioned in such manner as appears to the Commissioner to be reasonable.

(7) The certificate of the Commissioner stating the amount of the costs and expenses so incurred in exercise of the powers conferred by subsection (4) shall be conclusive evidence of that amount.

(8) Any person to whom a notice has been issued as an occupier of the premises shall, if he is not the occupier of the premises in respect of which the notice has been issued, within 7 days from the date on which the notice was served on him, inform the Commissioner in writing that he is not the occupier.

(9) Any person who fails to comply with subsection (8) shall, unless he proves to the satisfaction of the court before which the question of liability to pay the costs and expenses is determined under section 48, be deemed, for the purpose of recovering such costs and expenses, to be the occupier of the premises in respect of which the notice was issued.

(10) Where, in any case referred to in subsection (9), the court is satisfied that the person in default has shown sufficient cause for his default in not complying with any notice referred to in subsection (1), the costs and expenses incurred by the Commissioner in exercise of the powers conferred by subsection (4) may, notwithstanding that the notice has not been issued to the occupier of the premises, be recoverable by the Board from the occupier in the manner provided for in this Act.

#### Recovery of costs

47.—(1) Where in any court proceedings against any person for an offence under this Act which relates to any damaged or destroyed property which is —

(a) owned by the Government or the Board;

(b) maintained or managed by the Board; or

(c) under the management or control of the Commissioner under this Act, the court before which the person is convicted of the offence may, in addition to passing any sentence for that offence, make an order requiring that person to pay to the Government or the Board, as the case may be, a sum of money to be fixed by the court which, in the opinion of the court, represents the value (including any intrinsic value) of the damaged or destroyed property.

(2) The court may, in its discretion, allow time for the payment of the sum of money under subsection (1) and grant extension of the time so allowed, or direct payment of that sum to be made by instalments.

Compensation, damages, fees, costs and expenses to be determined by Magistrate's Court or District Court 48.—(1) Except as otherwise provided, in all cases where compensation, damages, fees, costs or expenses are provided under this Act to be paid, the amount and, if necessary, the apportionment of the amount and any question of liability shall, in case of dispute, or failure to pay, be summarily ascertained and determined by a Magistrate's Court or, if the amount claimed exceeds the Magistrate's Court limit, by a District Court.

(2) If the amount of compensation, damages, fees, costs or expenses is not paid by the party liable to pay it within 7 days after demand, that amount may be reported to a Magistrate's Court or District Court and recovered in the same way as if it were a fine imposed by a Magistrate's Court or a District Court.

(3) An appeal shall lie to the High Court from any decision of a Magistrate's Court or a District Court under this section, and the provisions of the Criminal Procedure Code (Cap. 68) shall apply, with the necessary modifications, to all such appeals.

Offences by bodies corporate, etc.

49.—(1) Where an offence under this Act committed by a body corporate is proved —

(a) to have been committed with the consent or connivance of an officer; or

(b) to be attributable to any act or default on his part, the officer as well as the body corporate shall be guilty of the offence and shall be liable to be proceeded against and punished accordingly.

(2) Where the affairs of a body corporate are managed by its members, subsection (1) shall apply in relation to the acts and defaults of a member in connection with his functions of management as if he were a director of the body corporate.

(3) Where an offence under this Act committed by a partnership is proved —

(a) to have been committed with the consent or connivance of a partner; or

(b) to be attributable to any act or default on his part, the partner as well as the partnership shall be guilty of the offence and shall be liable to be proceeded against and punished accordingly.

(4) Where an offence under this Act committed by an unincorporated association (other than a partnership) is proved —

(a) to have been committed with the consent or connivance of an officer of the unincorporated association or a member of its governing body; or

(b) to be attributable to any act or default on the part of such an officer or a member,

the officer or member as well as the unincorporated association shall be guilty of the offence and shall be liable to be proceeded against and punished accordingly.

(5) In this section —

"officer" —

(a) in relation to a body corporate, means any director, member of the committee of management, chief executive, manager, secretary or other similar officer of the body corporate and includes any person purporting to act in any such capacity; and

(b) in relation to an unincorporated association (other than a partnership), means the president, the secretary, or any member of the committee of the unincorporated association, or any person holding a position analogous to that of the president, secretary or member of the committee and includes any person purporting to act in any such capacity;

"partner" includes a person purporting to act as a partner.

(6) The Minister may, by regulations made under this section, provide for the application of any provision of this section, with such modifications as the Minister considers appropriate, to any body corporate or unincorporated association formed or recognised under the law of a territory outside Singapore.

[Parks and Trees 1996 Ed., s. 25; National Parks 1997 Ed., s. 33]

#### Jurisdiction of court

50. Notwithstanding any provision to the contrary in the Criminal Procedure Code (Cap. 68), a District Court shall have jurisdiction to try any offence under this Act and shall have power to impose the full penalty or punishment in respect of the offence.

## Composition of offences

51.—(1) The Commissioner may, in his discretion, compound any offence under this Act as may be prescribed as being an offence which may be compounded by

collecting from the person reasonably suspected of having committed the offence a sum amounting to —

(a) one half of the amount of the maximum fine that is prescribed for the offence; or

(b) \$2,000, whichever is the lower.

(2) Notwithstanding the payment of the composition amount under subsection (1), any compensation, damages, fees, costs or expenses which are provided to be paid under this Act shall remain payable.

(3) On payment of the composition amount under subsection (1), no further proceedings shall be taken against that person in respect of the offence.

[Parks and Trees 1996 Ed., s. 20 (1); National Parks 1997 Ed., s. 38]

#### Prosecutions

52.Proceedings in respect of any offence under this Act may be conducted by any police officer or authorised officer authorised in writing in that behalf by the Commissioner.

[National Parks 1997 Ed., s. 39]

## Evidence

53.—(1) Subject to this section, the contents of any document prepared, issued or served under, by virtue of or for the purposes of this Act shall, until the contrary is proved, be presumed to be correct.

(2) In any proceedings instituted for the carrying out of any works in contravention of the provisions of this Act, the occupier of the premises at the time the works were carried out shall be presumed, until the contrary is proved, to be the person carrying out the works.

(3) Where any information in respect of any works or any matter relating to or for the purposes of this Act is provided by electronic means, the production of any document under the hand of the officer responsible for providing such information purporting to be a hard-copy transcript of all or any such information shall, in all courts and in all proceedings, be sufficient evidence of the information provided electronically and all courts shall in all proceedings take judicial notice of the signature of the officer. Presumptions and defences

54.—(1) Where it is proved that a tree or plant was cut or damaged in contravention of section 14 (1) or (2), 18 (1) or (2) or 27 (2), it shall be presumed, until the contrary is proved —

(a) that the occupier of the premises on which the tree or plant was growing; or

(b) where any building works were being carried out in that part of the premises where the tree or plant was growing at or about the time that the tree or plant was cut or damaged, that —

(i) the person who was carrying out the works at the time;

(ii) the employer of the person referred to in sub-paragraph (i) at the time of the offence; and

(iii) the qualified person or other person who instructed or caused or permitted the person referred to in sub-paragraph (i) to cut or damage that tree or plant, had cut or damaged the tree or plant.

(2) In any proceedings for an offence under section 14 (2), 18 (2) or 27 (3) against any person referred to in subsection (1) (*b*) (ii) or (iii), it shall be a defence for that person charged to prove to the satisfaction of the court —

(a) that the offence was committed without his consent or connivance; and

(b) that he had exercised all such diligence to prevent the commission of the offence as he ought to have exercised having regard to the nature of his responsibilities as an employer or a qualified person or such other person and to all the circumstances.

# PART IX

# GENERAL

Act not to affect liability in tort of occupier

55. Nothing in this Act shall affect the liability in tort of an occupier for any injury or damage caused to any person or property arising from any tree or plant growing on his land.

[Parks and Trees 1996 Ed., s. 24]

Appeal to Minister

56.—(1) Any person who is aggrieved by —

(a) any tree conservation notice under section 15 (1);

(b) any reinstatement notice under section 11 (1), 21 (1), 26 (3) or 31 (3);

(c) any enforcement notice under section 24 (3), 28 (3), 30 (3) or 37;

(d) any maintenance notice under section 25 (2);

(e) any notice to plant or replant under section 27 (1); or

(f) any decision of the Commissioner in refusing to grant an approval under section 12, 20 or 32, may, within 14 days from the date of service of the notice, or the date he is notified of the Commissioner's decision, appeal to the Minister in the prescribed form and manner.

(2) Notwithstanding that an appeal is lodged under subsection (1), the notice or decision appealed against shall take effect and be complied with unless otherwise ordered by the Minister.

(3) The Minister may, after considering the appeal, dismiss or allow the appeal, unconditionally or subject to such conditions as he thinks fit, and the notice or decision shall be confirmed, rescinded or varied in such manner as the Minister may decide.

(4) The Minister may, in considering an appeal under this section, give the appellant an opportunity to make representations in writing.

(5) The decision of the Minister in any appeal under this section shall be final.

Payment to Board of fees, charges, etc.

57.All fees, charges, composition amounts and any other moneys collected under this Act shall be paid to the Board.

[Parks and Trees 1996 Ed., s. 26]

Exemption

58.—(1) The Minister may, by order published in the *Gazette*, with or without conditions, exempt any class or description of person, thing, premises or works from any of the provisions of this Act.

(2) If an exemption is granted under this section with conditions, the exemption operates only if the conditions are complied with.

[Parks and Trees 1996 Ed., s. 27]

#### Service of documents

59.—(1) Any notice or document required or authorised by this Act to be served on any person, and any summons issued by a court against any person in connection with any offence under this Act may be served on the person —

(a) by delivering it to the person or to some adult member or employee of his family or household at his usual or last known place of residence;

(b) by leaving it at his usual or last known place of residence or business in an envelope addressed to the person;

(c) by sending it by registered post addressed to the person at his usual or last known place of residence or business; or

(d) in the case of an incorporated company, a partnership or a body of persons —

(i) by delivering it to the secretary or other like officer of the company, partnership or body of persons at its registered office or principal place of business; or

(ii) by sending it by registered post addressed to the company, partnership or body of persons at its registered office or principal place of business.

(2) Any notice, document or summons sent by registered post to any person in accordance with subsection (1) shall be deemed to be duly served on the person at the time when the notice, document or summons, as the case may be, would in the ordinary course of post be delivered and, in proving service of the notice, document or summons, it shall be sufficient to prove that the envelope containing the same was properly addressed, stamped and posted by registered post.

(3) Any notice or document required or authorised by this Act to be served on the owner or occupier of any premises or any summons issued by a court against any such owner or occupier in connection with any offence under this Act may be served by delivering it or a true copy thereof to some adult person on the premises or, if there is no such person on the premises to whom it can with reasonable diligence be delivered, by affixing the notice, document or summons to some conspicuous part of the premises.

(4) Any notice or document required or authorised by this Act to be served on the owner or occupier of any premises or any summons issued by a court against any such owner or occupier in connection with any offence under this Act shall be deemed to be properly addressed if addressed by the description of the owner or occupier of the premises without further name or description.

(5) Notwithstanding subsection (1), a notice required or authorised by this Act to be served on the owner of any vehicle may be served by addressing the notice to the owner of that vehicle without stating his name or address and may also be served personally or by affixing the notice to the vehicle.

[Parks and Trees 1996 Ed., s. 14; National Parks 1997 Ed., s. 31]

#### Inaccuracies in document

60.—(1) No misnomer or inaccurate description of any person, premises, building, holding, street or place named or described in any document prepared, issued or served under, by virtue of or for the purposes of this Act shall in any way affect the operation of this Act as respects that person or place if that person or place is so designated in the document as to be identifiable.

(2) No proceedings taken under or by virtue of this Act shall be invalid for want of form.

#### Protection from liability

61.—(1) No suit or other legal proceedings shall lie personally against the Commissioner, an authorised officer or a park ranger for anything which is in good faith done or intended to be done in the execution or purported execution of this Act or any other written law.

(2) Nothing in this Act shall make it obligatory for the Commissioner or any authorised officer —

(a) to inspect any works or the site of any proposed works to ascertain --

(i) whether the provisions of this Act are complied with; or

(ii) whether any plans or other documents submitted to him are accurate;

(b) to issue any notice under this Act; or

(c) to take any action or carry out any works authorised under this Act.

[Parks and Trees 1996 Ed., s. 23; National Parks 1997 Ed., s. 28]

#### Amendment of Schedule

62.—(1) The Minister may, after consulting the Board, by order published in the *Gazette*, amend, add to, vary or revoke the whole or any part of the Schedule.

(2) Every order made under subsection (1) shall be presented to Parliament as soon as possible after publication in the *Gazette*.

#### Regulations

63.—(1) The Board may, with the approval of the Minister, make regulations for carrying out the purposes and provisions of this Act.

(2) Without prejudice to the generality of subsection (1), the Board may, with the approval of the Minister, make regulations for or with respect to all or any of the following matters:

(a) in relation to the management and control of national parks, nature reserves and public parks —

(i) the preservation of order and the prevention of nuisance therein;

(ii) prescribing the days and times of admission thereto or to any part thereof;

(iii) the conservation and protection of plants, animals and other organisms and property;

(iv) the admission of vehicles thereto and the regulation of traffic therein;

(v) the prohibition of any particular act therein;

(vi) prescribing the fees payable in respect of admission thereto or to any part thereof;

(vii) prescribing the fees payable for the use of the premises or the facilities therein;

(viii) prescribing for the forfeiture, sale or disposal of any vehicle, boat or thing removed under section 42 and the recovery of any expenses connected therewith;

(b) the applications for approval under section 12, 20 or 32, including the form, manner and mode of such applications, the documents to be submitted and other matters related to those sections;

(c) the management of heritage road green buffers, including the prohibition and regulation of any particular act within the heritage road green buffers and the conservation and protection of trees and plants growing on heritage road green buffers;

(d) prescribing that any act or omission in contravention of any regulations shall be an offence and prescribing penalties for such offences, which penalties shall not exceed a fine of \$10,000;

(e) regulating and prescribing standards for the planting, aeration and maintenance of trees and plants within any planting areas, green verges and open spaces to be used as public parks;

(f) the prescribing of forms necessary for the administration of this Act;

(g) the prescribing of fees and charges for the purposes of this Act; and

(h) any other matter which by this Act is required or permitted to be prescribed or is necessary or convenient to be prescribed for carrying out or giving effect to any provision of this Act.

[Parks and Trees 1996 Ed., s. 28]

Transitional provisions

64.—(1) A person who, immediately before 1st August 2005, is —

(a) the Commissioner of Parks and Recreation;

(b) an officer appointed by the Minister under section 3 (2) of the repealed Act; or

(c) an officer authorised by the Minister under section 3 (5) of the repealed Act,

shall continue to hold such office as if he were appointed under section 4 (1) as the Commissioner, as an authorised officer under section 4 (3) and as a park ranger under section 4 (5) of this Act, respectively.

(2) Any permission, approval, decision, notice, summons, warrant, order or other document prepared, made, granted, issued by the Commissioner of Parks and Recreation under the repealed Act shall, so far as it is not inconsistent with the provisions of this Act, continue and be deemed to have been prepared, made, granted or issued under the corresponding provisions of this Act and except as otherwise expressly provided in this Act, shall continue to have effect accordingly.

(3) All acts done by or on behalf of the Commissioner of Parks and Recreation before 1st August 2005 under the repealed Act shall continue to remain valid and applicable as though done by the Commissioner under this Act, until such time as invalidated, revoked, cancelled or otherwise determined by the Commissioner.

(4) Where anything has been commenced by or on behalf of the Commissioner of Parks and Recreation before 1st August 2005, such thing may be carried on and completed by or under the authority of the Commissioner under the corresponding provisions of this Act.

(5) Any application or other document lodged for approval under the provisions of the repealed Act before 1st August 2005 and whose application was not approved before that date shall, where applicable, be deemed to be an application or a document lodged for approval under the corresponding provisions of this Act.

(6) Any investigation, legal proceeding or remedy in respect of any right, privilege, obligation, liability, penalty, forfeiture or punishment acquired, accrued or incurred under the repealed Act may be instituted, continued or enforced by the Commissioner as if a reference in the repealed Act to the Commissioner of Parks and Recreation is a reference to the Commissioner under this Act.

(7) In any written law or document, a reference to the repealed Act shall, in so far as it is necessary for preserving its effect, be construed as a reference to this Act and a reference to the Commissioner of Parks and Recreation shall be construed as a reference to the Commissioner under this Act.

(8) Where an appeal has been made to the Minister under section 7 or 8 of the repealed Act and the appeal has not been dealt with or disposed of immediately

before 1st August 2005, the appeal may be dealt with in accordance with that repealed section as if this Act had not been enacted.

(9) Where a period of time specified in any provision of the repealed Act is current on 1st August 2005, this Act shall have effect as if the corresponding provision in this Act had been in force when that period began to run.

(10) Any subsidiary legislation made under the repealed Act and in force immediately before 1st August 2005 shall, so far as it is not inconsistent with the provisions of this Act, continue in force as if made under this Act until it is revoked or repealed by subsidiary legislation made under this Act.

References in other written laws 65.Any reference in any written law to the National Parks Act (Cap. 198A) shall be read as a reference to the National Parks Board Act.

[66

## THE SCHEDULE

Sections 2, 7 and 62

## AREAS DESIGNATED AS NATIONAL PARKS AND NATURE RESERVES

## PART I

## NATIONAL PARKS

1.All those pieces of land situated in T.S. No. 25 known as the Singapore Botanic Gardens, described as follows:

T.S. No.	Lot No.	Area (square metres)
No. 25	01642T	523,043.8
	01644K	305.8
	01640V	4,550.3
Total		527,934.3

The boundaries of these areas are more particularly delineated on Certified Plans Nos. 38578, 38579 and 38065 filed in the office of the Chief Surveyor.

2.All those pieces of land situated in T.S. No. 20 known as Fort Canning Park, described as follows:

T.S. No.	Lot No.	Estimated Area (square metres)
No. 20	Part of 00501X 00500N 00551C	166,837.6 11,768.4 1,000
Total		179,606

The boundaries of these areas are more particularly delineated on Plan No. NP 5.9.1.9 (Fort Canning Park) filed in the Registry of the National Parks Board.

## PART II

# NATURE RESERVES

All those pieces of land situated in the Mukims of Sembawang, Mandai, Ulu Kalang, Bukit Timah and Toa Payoh, forming parts of the Public Utilities Board Catchment Area, known as the Central Catchment Nature Reserve, described as follows:

Mukim No.	Lot No.	Estimated Area (square metres)
No. 13 Sembawang	Part of 04120X	339.879
J	Part of 04121L	1,911,045
	Part of 04122C	409
	04123M	31,379
	04513P	52
	04518X	1,951
	04522L	16,587
	04524M	65,406
No. 14 Mandai	Part of 00187M	11,867,890
	Part of 00289C	1832
	Part of 01253P	193
	Part of 01255A	85
	Part of 01256K	190
	Part of 99741N	25
	Part of 99871P	1,053
No. 15 Ulu Kalang	00028N	14,438

	00030K	22,877
	00031N	7,660
	Part of 00046X	284
	Part of 01370W	747
	01371V	550
	Part of 02505T	6,273,325
	Part of 02506A	4,336,843
	99676T	14,679
	Part of 99686M	56,201
No. 16 Bukit Timah	Part of 01224N	387
	Part of 01226L	2,081
	Part of 01231M	1,532
	02041M	1,871,333
	Part of 02044P	12,561
No. 17 Toa Pavoh	03797X	231
j.	03799C	19
	Part of 05941W	3,577,758
Total		30,431,482

The boundaries of these areas are more particularly delineated on Plan No. NP 5.9.1.9 (Central Catchment Nature Reserve) filed in the Registry of the National Parks Board.

2.All those pieces of land situated in Mukim No. 16, Bukit Timah, known as Bukit Timah Nature Reserve, described as follows:

Mukim No.	Lot No.	Estimated Area (square metres)
No. 16 Bukit Timah	Part of 00087A	43,680
	00354A	7,595
	Part of 00357X	654,750
	01176P	365
	01636T	9,698
	Part of 01637A	244,306
	Part of 01916P	11,347
	Part of 02042W	357,229
	Part of 02044P	24,027
	99501L	11,715
	Part of 99509K	137,107
	Part of 99531X	4,840

Part of 99679X	43,222
99762V	31
Part of 99763P	76,530
	1,626,442

Total

The boundaries of these areas are more particularly delineated on Plan No. NP 5.9.1.9 (Bukit Timah Nature Reserve) filed in the Registry of the National Parks Board.

3.All those pieces of land (including foreshore) situated in Mukim No. 3, Pasir Panjang, known as Labrador Nature Reserve, described as follows:

Mukim No.	Lot No.	Estimated Area (square metres)
No. 3 Pasir Panjang	99995P 99992M Part of 01019A Part of 01580X Part of 00492M	993 1,553 40,316 49,135 7,881
Total		99,878

The boundaries of these areas are more particularly delineated on Plan No. NP 5.9.1.9 (Labrador Nature Reserve) filed in the Registry of the National Parks Board.

4.All those pieces of land (including foreshore) situated in Mukim No. 12, Lim Chu Kang, known as Sungei Buloh Wetland Reserve, described as follows:

Mukim No.	Lot No.	Estimated Area (square metres)
No. 12 Lim		
Chu Kang	00990N	117,088
_	00020N	32,775
	01312V	20,049
	01311W	25,798
	01313P	39,865
	01314T	13,967
	01324M	33,646
	01325W	11,158
	01023X	2,818
	Part of 01255P	57,663
	Part of 00989L	156,177

Part of 01310M	54,933
Part of 01240V	512,050
Part of 01590K	235,718

Total

1,313,705

The boundaries of these areas are more particularly delineated on Plan No. NP 5.9.1.9 (Sungei Buloh Wetland Reserve) filed in the Registry of the National Parks Board.

#### LEGISLATION HISTORY

1. Act 14 of 1975 — Parks and Trees Act 1975

Date of First Reading	: 17 March 1975 (Bill No. 18/75 published on 18 March 1975)
Date of Second and Third	
Readings	: 27 March 1975
Date of commencement	: 15 May 1975

Note: The Parks and Trees Act 1975 repealed the Botanic Gardens Act (Chapter 300, 1970 Revised Edition), the Trees and Plants (Preservation and Improvement of Amenities) Act 1970 (No. 59 of 1970) and section 79 and Part V of the Local Government Integration Act (Chapter 210, 1970 Revised Edition) were repealed by the Parks and Trees Act 1975.

2. Act 27 of 1982 — Parks and Trees (Amendment) Act 1982

Date of First Reading	: 27 July 1982 (Bill No. 18/82 published on 4 August 1982)
Date of Second and Third	-
Readings	: 31 August 1982
Date of commencement	: 5 November 1982
3. Act 12 of 1987 — Parks and Tr	rees (Amendment) Act 1987

Date of First Reading	: 4 March 1987 (Bill No. 3/87 published on 6 March 1987)
Date of Second and Third	
Readings	: 26 March 1987
Date of commencement	: 1 May 1987

4. 1985 Revised Edition — Parks and Trees Act (Chapter 216) Date of operation : 30 March 1987 5. Act 10 of 1990 — National Parks Act 1990 (Consequential amendments made to Act by) Date of First Reading : 13 March 1990 (Bill No. 12/90 published on 14 March 1990) Date of Second and Third Readings : 29 March 1990 Date of commencement : 6 June 1990 6. Act 25 of 1994 — Parks and Trees (Amendment) Act 1994 : 31 October 1994 (Bill No. 32/94 published on Date of First Reading 1 November 1994) Date of Second and Third Readings : 5 December 1994 Date of commencement : 29 January 1995 7. Act 22 of 1996 — National Parks Act 1996 (Consequential amendments made to Act by) Date of First Reading : 2 May 1996 (Bill No. 13/96 published on 3 May 1996) Date of Second and Third Readings : 21 May 1996 Date of commencement : 1 July 1996 8. 1996 Revised Edition — Parks and Trees Act (Chapter 216) Date of operation : 27 December 1996 9. Act 4 of 2005 — Parks and Trees Act 2005 Date of First Reading : 19 October 2004 (Bill No. 55/2004 published on 20 October 2004) Date of Second and Third Readings : 25 January 2005 Date of commencement : 1 August 2005

Note: The Parks and Trees Act 2005 repealed the Parks and Trees Act (Chapter 216, 1996 Revised Edition).

#### COMPARATIVE TABLE

The following provisions in the Parks and Trees Act (Act 4 of 2005) have been renumbered by the Law Revision Commissioners in this 2006 Revised Edition.

This Comparative Table is provided for the convenience of users. It is not part of the Parks and Trees Act.

2006 Ed.	Act 4 of 2005
Omitted	64—(1)
64—(1) to (10)	(2) to (11)
Omitted	65
65	66

# PARKS AND TREES ACT

# (CHAPTER 216, SECTION 5 (1))

# PARKS AND TREES (PRESERVATION OF TREES) ORDER

History	1990	->	01
	REVISEDEDITION		1998
			REVISED
			EDITION

[2nd August 1991]

<u>1 Citation</u> <u>2 Tree conservation area</u>

FIRST SCHEDULE

SECOND SCHEDULE

THIRD SCHEDULE

# PARKS AND TREES ACT

# (CHAPTER 216, SECTION 5 (1))

# PARKS AND TREES (PRESERVATION OF TREES) ORDER

[2nd August 1991]

Citation

1. This Order may be cited as the Parks and Trees (Preservation of Trees) Order.

Tree conservation area 2. The lands specified in the Schedule are hereby designated for the purposes of section 5 (1) of the Act.

# FIRST SCHEDULE

(1) The area bounded by Dunearn Road, Whitley Road, Mt. Pleasant Road, Thomson Road, Lornie Road, Pan Island Expressway, Clementi Road, Pasir Panjang Road, Telok Blangah Road, Lower Delta Road, Ayer Rajah Expressway, Alexandra Road, River Valley Road, Fort Canning Road and Selegie Road and more particularly delineated in the Sketch Map set out in the Second Schedule.

(2) The area bounded by Netheravon Road, Cranwell Road, Loyang Avenue, Loyang Way, Upper Changi Road North and Changi Village Road and more particularly delineated in the Sketch Map set out in the Third Schedule.

# SECOND SCHEDULE



# THIRD SCHEDULE



[G.N. No. 8 32791]

## PARKS AND TREES ACT (CHAPTER 216, SECTION 63) PARKS AND TREES REGULATIONS

Rg 1

G.N. No. S 519/2005

REVISED EDITION 2006 (30th November 2006)

[1st August 2005]

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1 Citation 2 Definitions

# Part II MANAGEMENT AND CONTROL OF NATIONAL PARKS, NATURE RESERVES AND PUBLIC PARKS

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15 Application for approvals under section 12(1), 20(1) or 32(1) of Act16 Application for approvals and permits under Regulations17 Fees

#### Part IV POWER OF ENFORCEMENT

18 Removal, sale and disposal of vehicles, boats and things

#### Part V GREEN MARGINS AND STREETSCAPES

19 Damage to tree planted pursuant to notice20 Reinstatement of tree planted pursuant to notice

#### Part VI MISCELLANEOUS

- 21 Appeal to Minister
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#### **THE SCHEDULE Fees**

#### **Legislative History**

## PART I

### PRELIMINARY

#### Citation

**1.** These Regulations may be cited as the Parks and Trees Regulations.

#### Definitions

2. In these Regulations, unless the context otherwise requires —

"carpark" means any area that is within or adjacent to a national park, nature reserve or public park and is designated as a carpark by the Commissioner, and includes any access road to such an area;

"dangerous fireworks" has the same meaning as in the Dangerous Fireworks Act (Cap. 72);

"explosive" has the same meaning as in the Arms and Explosives Act (Cap. 13);

"park", in relation to a vehicle, means to bring the vehicle to a stationary position and cause it to wait for any purpose;

"parking lot" means any space within a carpark marked out for the parking of any single vehicle;

"reserved parking lot" means any space within a carpark marked out for the parking of any specific vehicle authorised by the Commissioner;

"tout" means to solicit any person in connection with any trade or business, whether or not carried on by the person so soliciting;

"trap" means any contrivance, device or thing by means of which any animal can be captured.

#### PART II MANAGEMENT AND CONTROL OF NATIONAL PARKS, NATURE RESERVES AND PUBLIC PARKS

Division 1 — Prohibited activities

#### Entry, etc., into national parks, nature reserves and public parks

**3.** -(1) No person shall -

- (*a*) enter any national park, nature reserve or public park or any part thereof that is closed to the public;
- (*b*) enter or leave any national park, nature reserve or public park or any part thereof except at designated points of entry to or exit from, as the case may be, the national park, nature reserve or public park; or
- (c) enter or leave any part of a national park, nature reserve or public park that is reserved for the use of particular persons or bodies or for a particular sector of the public unless the person is a person, or belongs to a body or sector of the public, for whose use it is reserved.

(2) No person shall, except with the approval of the Commissioner and in accordance with the terms and conditions of such approval, enter or remain in any national park, nature reserve or public park or any part thereof outside of the days and beyond the times of admission specified by the Commissioner in notices posted at every entrance to the national park, nature reserve or public park.

#### Prohibited acts within national parks, nature reserves and public parks

- 4. —(1) No person shall, within a national park, nature reserve or public park
  - (a) cause any lake, pool or other body of water to be fouled;
  - (*b*) throw, deposit or leave behind any refuse, litter, object or article except in a litter bin provided for that purpose;
  - (c) soil or deface any building, structure, furniture, ornament, equipment or other property;
  - (d) gamble or assist in gambling;
  - (e) beg, tout or solicit;
  - (f) appear nude or be clad in such manner as to offend against public decency;
  - (g) behave in a disorderly or an indecent or offensive manner;

- (*h*) enter or attempt to enter any public restroom designated for use by the opposite sex;
- (*i*) bathe or wash in any body of water; or
- (*j*) use any facility, utility or amenity for a purpose other than that for which it is provided.

(2) Where the Commissioner has, by means of notice displayed in, or at the boundary of, a national park, nature reserve or public park or part thereof to which the notice relates, or by means of written notice issued to a user of the national park, nature reserve or public park —

- (a) prohibited the use of any musical instrument or sound equipment in the national park, nature reserve or public park or that part thereof; or
- (b) prohibited the carrying on of any activity which, in the Commissioner's opinion, may endanger or cause discomfort or inconvenience to other users of the national park, nature reserve or public park,

a person shall not use such instrument or equipment, or carry on that prohibited activity, in the national park, nature reserve or public park or the part to which the notice relates.

(3) For the purposes of paragraph (1)(g), a person does not conduct himself in an offensive manner as referred to in that paragraph merely by using offensive language.

#### Prohibited acts within public parks

5. No person shall carry out any activity within any public park which he knows or ought reasonably to know —

- (*a*) causes or may cause alteration, damage or destruction to any property, tree or plant within the public park; or
- (b) causes or may cause injury to, or the death of, any animal or any other organism within the public park.

#### Smoking in nature reserve prohibited

**6.** -(1) No person shall smoke within any part of a nature reserve.

(2) In paragraph (1), "smoke" means to inhale and expel the smoke of tobacco or any other substance and includes the holding of any cigar, cigarette, pipe or any other form of tobacco product which is alight or emitting smoke.

#### Division 2 — Regulated activities

#### Residing in national park, nature reserve or public park

7. No person shall reside in any national park, nature reserve or public park, unless the person has been granted a lease or licence to reside therein.

#### General acts requiring approval

**8.** --(1) No person shall, except with the approval of the Commissioner and in accordance with the terms and conditions of such approval, do any of the following in any national park, nature reserve or public park:

- (*a*) sell or hire, attempt to sell or hire, expose or display for sale or hire, or solicit for sale or hire, any article, thing or service to any person;
- (b) organise or participate (other than solely as a member of an audience) in any amusement, entertainment, instruction, performance or activity for money or other consideration of any kind;
- (c) film any video, movie or television film for sale, hire or profit;
- (d) climb any wall, fence, barrier, railing, hedge, tree, post or other structure;
- (e) hang or affix any light, bill, placard, notice or other thing on any plant, tree or structure;
- (f) discharge any dangerous fireworks, explosive or weapon;
- (g) remove or displace any seat, barrier, railing, post, structure, ornament or any implement used in the laying out or maintenance of the national park, nature reserve or public park.

(2) No person shall, except with the approval of the Commissioner and in accordance with the terms and conditions of such approval, carry out any of the following activities within any public park:

- (a) cut, collect or displace any tree or plant or any part thereof;
- (b) affix, set up or erect any sign, shrine, altar, religious object, shelter, structure or building;
- (c) clear, break up, dig or cultivate any land;
- (d) use or occupy any building, vehicle, boat or other property of the Board;
- (e) wilfully drop or deposit any dirt, sand, earth, gravel, clay, loam, manure, refuse, sawdust, shavings, stone, straw or any other matter or thing from outside the public park;
- (f) capture, displace or feed any animal;
- (g) disturb or take the nest of any animal;
- (h) collect, remove or wilfully displace any other organism;

- (*i*) use any animal, firearm, explosive, net, trap, hunting device or instrument or means whatever for the purpose of capturing any animal;
- (j) carry or have in the person's possession any explosive, net, trap or hunting device;
- (k) erect any post, rail, fence, pole, booth, stand, stall or other structure.

(3) In addition to paragraphs (1) and (2), no person shall, except with the approval of the Commissioner and in accordance with the terms and conditions of such approval —

- (a) carry out any play-reading, recital, lecture, talk, address, debate or discussion;
- (b) organise or participate (other than solely as a member of audience) in any performance or exhibition; or
- (c) organise any demonstration, at the area in Hong Lim Park known as the Speakers' Corner and delineated in the Schedule to the Public Entertainments and Meetings (Speakers' Corner) (Exemption) Order 2013 (G.N. No. S 31/2013) and the Schedule to the Public Order (Unrestricted Area) Order 2013 (G.N. No. S 30/2013), respectively.

[S 224/2012 wef 27/05/2012] [S 74/2013 wef 27/01/2013]

#### **Camping and barbecues**

**9.**—(1) No person shall camp in any national park, nature reserve or public park or any part thereof except —

- (a) with a permit from the Commissioner and in accordance with the terms and conditions of that permit; and
- (b) within the area of the national park, nature reserve or public park that is set aside for camping.

(2) No person shall light, maintain or use a fire or hold a barbecue in any national park or public park or any part thereof except —

- (a) with a permit from the Commissioner and in accordance with the terms and conditions of that permit; and
- (b) within the area of the national park or public park that is set aside as a fireplace or for barbecues.
- (3) No person shall leave unattended any fire that the person has lit, maintained or used.

(4) Notwithstanding paragraphs (1) and (2), the Commissioner may, in any particular case or class of cases, determine that no permit shall be required for the purpose of carrying out any of the activities referred to in paragraph (1) or (2).

#### Restrictions relating to animals in national park or public park

**10.**—(1) No person shall, except with the approval of the Commissioner —

- (a) bring an animal (other than a domestic animal that is his pet or guide dog) into, or allow any such animal belonging to him or under his charge to remain in, a national park or public park; or
- (b) leave, abandon or release any animal in a national park or public park.

(2) No person shall bring an animal (being an animal that is not prohibited under paragraph (1)(a)) into, or allow any such animal belonging to him or under his charge to remain in, a national park or public park unless —

- (a) in the case of a dog, it is
  - (i) on a leash, chain or cord which is suitable to restrain the animal except when in an area referred to in paragraph (4);
  - (ii) kept under the control of the person; and
  - (iii) restrained from causing annoyance or nuisance to any person, or damage to or interference with any plant or property or any other animal; or
- (b) in the case of any other animal (being an animal that is not prohibited under paragraph (1)(a)), it is
  - (i) kept under the control of the person; and
  - (ii) restrained from causing annoyance or nuisance to any person, or damage to or interference with any plant or property or any other animal.

(3) Notwithstanding paragraphs (1) and (2), where the Commissioner has, by notice in, or at the boundary of, a national park or public park or part thereof to which the notice relates, prohibited the entry of any animal to any part of the national park or public park or part thereof, no person shall bring any such animal into, or allow any such animal belonging to him or under his charge to remain in, that part of the national park or public park.

(4) Notwithstanding paragraph (2)(a), where the Commissioner has, by notice in, or at the boundary of, a national park or public park or part thereof to which the notice relates, designated any part of the national park or public park to be an area where dogs can run freely, a person shall not be required to restrain any dog belonging to him or under his charge on a leash, chain or cord but may let it run freely in that part of the national park or public park.

(5) No person shall cause or permit any animal belonging to him or under his charge to enter any public restroom, lake, reservoir, pond, stream or fountain in any national park or public park.

(6) A person who brings an animal into, or allows an animal belonging to him or under his charge to enter or remain in, a national park or public park shall pick up and remove from the national park or public park any faeces deposited by the animal and dispose of any such faecal matter properly in a hygienic manner.

#### Restrictions relating to vehicles, etc.

11. -(1) No person shall, without the permission of the Commissioner, in any national park, nature reserve or public park -

- (a) bring, ride or drive a vehicle except within a carpark;
- (b) park a vehicle except in a parking lot (designated for the parking of that class of vehicle) within a carpark;
- (c) obstruct any entrance, exit, road, path, carpark or parking lot;
- (*d*) ride a bicycle or use skates except on any track or path specified, by notice, for such use or any road for use by vehicles;
- (e) ride a motorised bicycle;
- (f) secure a motorcycle or bicycle to any plant, tree or structure that is not constructed for that purpose; or
- (g) park a motor vehicle in any parking lot reserved for handicapped drivers when he is not a handicapped driver.

(2) No person shall drive, bring into or park any vehicle within a carpark otherwise than in an orderly manner with due regard to the safety of other vehicles, property and persons within the carpark.

(3) Any person driving or parking a vehicle within a carpark shall obey all the signs exhibited in the carpark.

(4) No person shall park any vehicle in such manner as to cause the vehicle to protrude beyond the boundary lines of the parking lot.

(5) No person shall park or stop his vehicle so as to obstruct or prevent the smooth circulation of traffic in or around a carpark.

- (6) In this regulation
  - "bicycle" includes any pedal cycle but does not include a child's toy vehicle used solely by a child;
  - "motorised bicycle" means a bicycle that is equipped with a motor and that may be propelled by muscular power or by the motor with which it is equipped, or by both;
  - "signs" includes all warning sign posts, direction posts or other devices for the guidance or direction of persons driving vehicles within a carpark;

"skates" includes roller skates, roller blades, in-line skates and any skateboard.

#### **Reserved parking lots**

12. -(1) No person shall park any vehicle in any reserved parking lot unless he is authorised by the Commissioner to do so.

(2) Any authorisation under paragraph (1) must be displayed on the near side of the front windscreen of the vehicle, and where the vehicle is a motorcycle, such authorisation must be displayed in a conspicuous position on the motorcycle.

(3) No person shall display on a vehicle any authorisation that has any alteration, erasure or other irregularity therein which indicates that the authorisation has been tampered with.

(4) The Commissioner or any person authorised by him may require any driver of a vehicle parked in a reserved parking lot to produce for his inspection the authorisation displayed on such vehicle and may retain the authorisation.

(5) The driver of a vehicle shall produce the authorisation to the Commissioner or any person authorised by him for inspection or retention in accordance with paragraph (4).

#### **Boats**

13. -(1) No person shall moor a boat in a national park, nature reserve or public park or any part thereof except -

- (a) with a permit from the Commissioner and in accordance with the terms and conditions of that permit; and
- (b) at a public mooring within the national park, nature reserve or public park, or at a mooring within the national park, nature reserve or public park in respect of which the person is the licensee, or is the hirer from the licensee, of the mooring to which the licence relates.

(2) No person shall store a boat in any national park, nature reserve or public park or any part thereof except —

- (a) with a permit from the Commissioner and in accordance with the terms and conditions of that permit; and
- (b) within the area of the national park, nature reserve or public park that is set aside for storing boats.

#### Division 3 — Regulation by notices

#### **Display of notices**

14. The Board may affix or set up a notice in some conspicuous position in any part of the national park, nature reserve or public park, as the case may be, for the purpose of notifying the public that —

- (a) the use of any musical instrument or sound equipment in that part of the national park, nature reserve or public park is prohibited;
- (b) any activity in that part of the national park, nature reserve or public park is prohibited;
- (c) that part of the national park or public park has been designated as a fireplace or an area where a barbeque may be held;
- (*d*) that part of the national park, nature reserve or public park has been designated as an area where camping is permitted;
- (e) that part of the public park has been designated as an area where boats may be moored or stored;
- (f) the entry of any animal to that part of the national park or public park is prohibited;
- (g) that part of the national park or public park has been designated as an area where dogs can run freely;
- (*h*) that part of the national park, nature reserve or public park has been designated as a carpark or as a parking lot for any class of vehicle; and
- (*i*) any track, path or road in that part of the national park, nature reserve or public park has been specified as a track, path or road where bicycles may be ridden or skates may be used.

#### PART III

#### APPROVALS AND PERMITS

#### Application for approvals under section 12(1), 20(1) or 32(1) of Act

**15.** -(1) The form to be used for the purpose of an application for the Commissioner's approval under section 12(1), 20(1) or 32(1) of the Act -

- (a) is that set out at the website at https://www.corenet-ess.gov.sg; and
- (b) may be submitted through that website unless the Board requires a hard copy of the form to be served on the Commissioner.

[S 379/2011 wef 15/07/2011]

(2) Every form referred to in paragraph (1) shall be completed in the English language and in accordance with such directions as may be specified in the form or by the Board.

(3) The Board may refuse to accept any form that is not completed in accordance with this regulation.

(4) Where strict compliance with any form is not possible, the Board may allow for the necessary modifications to be made to that form, or for the requirements of that form to be complied with in such other manner as the Board thinks fit.

#### Application for approvals and permits under Regulations

16. -(1) A person applying for any approval or permit under these Regulations shall apply in such form and manner and furnish such particulars and information and pay such fees referred to in regulation 17.

(2) Any approval or permit granted under this regulation shall be subject to such terms and conditions as the Commissioner may impose.

#### Fees

17. -(1) The following fees shall be as specified in the Schedule and shall be inclusive of goods and services tax:

- (a) the fee for any permit under regulation 9(1) or (2) or 13(2);
- (b) the fee for any application for an approval for the purposes of section 24, 26, 30 or 31 of the Act, being a fee which the Commissioner may require under section 32(1)(c) of the Act.

[S 379/2011 wef 15/07/2011]

- (2) The Commissioner may, in any particular case or class of cases
  - (a) waive, in whole or in part, any fee payable under this regulation; or
  - (b) refund any such fee which has been paid or any part of it.

#### PART IV

#### POWER OF ENFORCEMENT

#### Removal, sale and disposal of vehicles, boats and things

18. -(1) When any vehicle, boat or thing is removed by the Commissioner under section 42(4) of the Act, the Commissioner shall, as soon as is practicable, give notice in writing to the owner (if the name and address of the owner are known to him) of the removal, and if the vehicle, boat or thing is not claimed by its owner within one month of the date of notice, the Commissioner may sell or otherwise dispose of such vehicle, boat or thing.

(2) Notwithstanding paragraph (1), the Commissioner may immediately sell or dispose of —

(a) any perishable thing removed under section 42(4) of the Act; or

(b) any vehicle, boat or thing where the name or address of the owner cannot be ascertained with reasonable degree.

(3) The proceeds of the sale or disposal of any vehicle, boat or thing sold pursuant to this regulation shall be applied in payment of any expenses incurred by the Board in connection with the sale or disposal of that vehicle, boat or thing.

(4) After the application of the proceeds of the sale or disposal in accordance with paragraph (3), the remainder of the proceeds shall be applied in payment of all charges and fines payable under the Act and any regulations made thereunder.

(5) Any surplus proceeds after such payment referred to in paragraph (4) shall be paid to the owner of the vehicle, boat or thing, or if not claimed by the owner of the vehicle, boat or thing within 12 months of the date of the sale or disposal, shall be forfeited to the Board.

(6) Any expenses incurred in connection with the sale or disposal of any vehicle, boat or thing pursuant to this regulation shall be recoverable as a debt due to the Board from the owner of that vehicle, boat or thing.

#### PART V

#### GREEN MARGINS AND STREETSCAPES

#### Damage to tree planted pursuant to notice

19. For the purposes of section 27(2) of the Act, any excavation, cementing or sealing up in any way, or otherwise rendering impervious to air or water, any part of the ground within a radius of 2 metres from the collar of a tree planted pursuant to a notice under section 27(1) of the Act shall be regarded as damaging the tree.

#### **Reinstatement of tree planted pursuant to notice**

- **20.**—(1) Where it appears to the Commissioner that there has been a contravention of section 27(2) of the Act, he may serve a notice on
  - (*a*) any person who appears to the Commissioner to have been responsible for or participated in anything done in contravention of section 27(2) of the Act; or
  - (b) the occupier of the premises on which anything is done in contravention of that section,

requiring the person to take such remedial or reinstatement measures within such time as may be specified in the notice.

(2) A notice under paragraph (1) shall specify the date on which it is to take effect and the period (which shall run from the date the notice takes effect) within which any step required by the notice shall be taken.

(3) The person on whom a notice under paragraph (1) is served shall comply with all the requirements of the notice within the time specified in the notice.

(4) Where the person on whom a notice under paragraph (1) is served fails, without reasonable excuse, to comply with any requirement of the notice, the Commissioner may, at any reasonable time after the expiration of the time specified in the notice for the taking of the measures specified therein, enter upon the premises and carry out the remedial or reinstatement measures.

(5) All costs and expenses incurred by the Commissioner under paragraph (4) shall constitute a debt due from the occupier of the premises or that person to the Board and be recoverable as such.

#### PART VI

#### MISCELLANEOUS

#### **Appeal to Minister**

- **21.** Any appeal under section 56(1) of the Act to the Minister shall
  - (a) be in writing and addressed to the Minister;
  - (b) state the type of notice or the decision of the Commissioner in respect of which the appeal is brought;
  - (c) specify the grounds on which the appeal is brought; and
  - (d) be accompanied by such documentary evidence as the Minister considers necessary.

#### Manner of payment of moneys

- 22. All fees and any other moneys payable to the Board may be paid
  - (a) by money order, postal order or cheque drawn on any bank in Singapore delivered or sent by post to the Board's office;
  - (b) by any electronic means as the Board may permit from time to time, subject to such terms and conditions as the Board may impose in connection with the use of such means; or
  - (c) in such other manner as the Board may, from time to time, authorise in any particular case or class of cases.

#### Penalty

- 23. -(1) Any person who --
  - (a) contravenes any of these Regulations; or

(b) aids, abets or procures the contravention by any other person of any of these Regulations,

shall be guilty of an offence.

(2) A person who is guilty of an offence under these Regulations shall be liable on conviction to a fine not exceeding —

- (a) \$2,000 if the contravention is in relation to regulation 3(1)(a), (b) or (c) or (2), 4(1)(a), (c), (d), (e), (f), (g), (h), (i) or (j) or (2)(a) or (b), 6(1), 7, 8(1)(a), (b), (c), (d) or (e) or (2)(b), (c), (d) or (k), 9(1)(a) or (b), (2)(a) or (b) or (3), 10(1)(a) or (b), (2)(a) or (b) or (3), 10(1)(a) (b), (c), (f) or (g), (3), (4) or (5), 12(1), (2), (3) or (5) or 13(1)(a) or (b) or (2)(a) or (b); or
- (*b*) \$5,000 if the contravention is in relation to regulation 4(1)(*b*), 5(*a*) or (*b*), 8(1)(*f*) or (*g*), (2)(*a*), (*e*), (*f*), (*g*), (*h*), (*i*) or (*j*) or (3) or 11(1)(*a*), (*d*) or (*e*) or (2).

#### Regulations not to prevent Commissioner, etc., from performance of duty

**24.** Nothing in these Regulations shall prevent the Commissioner, an authorised officer, a park ranger or an agent of the Board from acting in the performance of his duty under these Regulations.

#### THE SCHEDULE

FEES

First column Second column			
Purpose of fee	Fee		
1. For a permit under regulation 9(1) to camp in any national park, nature reserve or public park	Nil		
2. For a permit under regulation 9(2) to hold a barbeque at —			
(a) Changi Beach Park	\$16 per pit per day		
(b) East Coast Park	(i) \$16 per single pit per day		
	(ii) \$20 per double pit per day		
(c) Labrador Park	\$12 per pit per day		
(d) Pasir Ris Park	\$20 per pit per day		
(e) Punggol Park	\$12 per pit per day		
(f) Sembawang Park	\$12 per pit per day		

Regulation 17(1)
	First column	Second column	
	Purpose of fee	Fee	
(g) We	st Coast Park	\$20 per pit per day	
3. For a store reserv	a permit under regulation 13(2) to a boat in any national park, nature we or public park —		
<i>(a)</i> for	up to 6 months	\$85	
(b) for	up to 12 months	\$170	
4. For a the appro 26, 30 first submit	an application under section 32 of Act (for the Commissioner's val for the purposes of section 24, 0 or 31 of the Act) made for the time at the development control ission stage, for —		
(a) woi vac	rks in a tree conservation area or on ant land relating to —		
(i)	a good class bungalow	\$2,675 per submission	
(ii)	a detached house or bungalow (other than a good class bungalow), semi-detached house or terrace house	\$2,140 per submission	

- (iii) landed housing with provision for an open space (to be vested as a public park under section 29 of the Act)
- (iv) strata landed housing or cluster housing
- (v) any flat or apartment

- (vi) a condominium development
- (vii) a commercial development other than one referred to in subparagraph (viii) or (ix)
- (viii) a hotel, boarding house, guest apartment, house. serviced students' hostel or workers' dormitory
- (ix) industrial development, a an warehouse. utilities. telecommunication or business park development, a warehouse

\$2,675 per submission

\$9,095 per submission

\$2,140 per submission

\$2,675 per submission

\$2,675 per submission

\$2,675 per submission

\$2,675 per submission

#### First column

#### Purpose of fee

retail building or an industrial retail building

- (x) a place of worship
- (xi) a civic and community institution or an educational institution
- (xii) a hospital, petrol station or golf course
- (xiii) a rapid transit system depot, bus depot or bus interchange
- (xiv) a conservation building
- (xv) a project other than one referred to in sub-paragraphs (i) to (xiv) and (xvi)
- (xvi) an open vehicle park or open car park not relating to any project referred to insub-paragraphs (i) to (xv)
- (b) earthworks or site clearance in a tree conservation area or on vacant land, and not relating to any project referred to in paragraph (a) at the time of the application
- 5. For an application under section 32 of the Act (for the Commissioner's approval for the purposes of section 24, 26, 30 or 31 of the Act) made for the first time at the development control submission stage, for works in any area other than a tree conservation area or on any land other than vacant land, and relating to any project described in item 4(a)
- For an application under section 32 of the Act (for the Commissioner's approval for the purposes of section 24, 26, 30 or 31 of the Act) made for the first time at the building plan submission stage, for —

#### (*a*) external works

(b) a pedestrian overhead bridge, link

#### Second column Fee

- \$2,140 per submission
- \$2,140 per submission
- \$2,140 per submission
- \$2,675 per submission
- \$2,140 per submission
- \$2,140 per submission
- \$2,140 per submission
- \$2,140 per submission

\$1,605 per submission

\$2,140 per submission\$2,140 per submission

First column	Second column
Purpose of fee	Fee
bridge, covered linkway or covered public walkway	
(c) an underground pedestrian linkway or underpass	\$2,140 per submission
(d) a promenade or pedestrian mall	\$2,140 per submission
(e) a new street under section 18 of the Street Works Act (Cap. 320A)	\$2,675 per submission
(f) an open air parking area at street level within any premises referred to in section 22 of the Act	\$107 per submission
(g) a project other than one referred to in paragraphs (a) to (f)	\$2,140 per submission
7. For an application under section 32 of the Act (for the Commissioner's approval for the purposes of section 24, 26, 30 or 31 of the Act) made either at the development control submission stage or at the building plan submission stage, relating to a project abutting a category 5 road under a self-declaration scheme, and for —	
(a) external works; or	\$107 per submission
(b) works within any building or development	\$107 per submission.

[S 379/2011 wef 15/07/2011]

#### LEGISLATIVE HISTORY

#### PARKS AND TREES REGULATIONS (CHAPTER 216, RG 1)

This Legislative History is provided for the convenience of users of the Parks and Trees Regulations. It is not part of these Regulations. **1. G. N. No. S 519/2005—Parks and Trees Regulations 2005** 

1.	. G. N. No. 5 519/2005—Parks and Trees Regulations 2005					
	Date of commencement	: 1 August 2005				
2.	2006 Revised Edition—Parks and Trees Regulations	s				
	Date of operation	: 30 November 2006				
3. G. N. No. S 425/2008—Parks and Trees (Amendment) Regulations 2008						
	Date of commencement	: 1 September 2008				
4.	I. G. N. No. S 484/2009—Parks and Trees (Amendment) Regulations 2009					
	Date of commencement	: 9 October 2009				
5.	5. G.N. No. S 379/2011—Parks and Trees (Amendment) Regulations 2011					
	Date of commencement	: 15 July 2011				
6.	6. G.N. No. S 224/2012—Parks and Trees (Amendment) Regulations 2012					
	Date of commencement	: 27 May 2012				
7.	7. G.N. No. S 74/2013—Parks and Trees (Amendment) Regulations 2013					
	Date of commencement	: 27 January 2013				

#### APPENDIX G EXISTING PLANS RELATING TO MUNICIPALITY AND REGION

G

Home | Concept Plan 2001



## URA Online

# Concept Plan 2001

Номе

HOUSING

RECREATION

BUSINESS

IDENTITY

CONCLUSION

MAKING OF CP2001

A city that's **DYNAMIC** A city that's **DISTINCTIVE** 

A city that's DELIGHTFUL



The Concept Plan 2001 maps out our vision for the next 40 to 50 years. It is based on a population scenario of 5.5 million.

With only 660 square kilometres today, our main challenge in planning for Singapore is the scarcity of land. Demand for land will continue to increase as our economy grows and population expands. Besides land for housing, industry and recreation, we need to ensure there is sufficient land for infrastructure needs, water catchment and military uses. We also need to work within various technical constraints, for example height constraints imposed by our airports.



Future reclamation can increase our existing land size by another 15 per cent. However, there is a limit to how much we can reclaim, as Singapore's shoreline is not far from the boundaries of its neighbours.

Even with these considerations in mind, we can still continue to ensure a high quality of living. The Concept Plan will provide a variety of housing choices and a comfortable living environment for all. In addition, more green spaces will be made accessible and there will be greater recreational choices.

The Concept Plan also includes initiatives to be flexible and responsive to the needs of businesses, to support value-added industries, and to provide for the growth of Singapore into an international business hub.

#### Key Proposals in Concept Plan 2001

The seven key proposals represent the key thrusts of Concept Plan 2001 for housing, recreation, business, infrastructure and identity. They are:

- ¿ New homes in familiar places
- ¿ High-rise city living a room with a view
- ¿ More choices for recreation
- ¿ Greater flexibility for businesses
- ¿ A global business centre
- ¿ An extensive rail network
- ¿ Focus on identity

Foreword By Minister for National Development, Mr Mah Bow Tan | Press Release

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**IDENTITY** 

URA Online

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# Concept Plan 2001

#### THE MAKING OF CONCEPT PLAN 2001

The review for the Concept Plan 2001 began in 1998 with a strategic review to identify the development directions and land requirements for various uses. An extensive public consultation programme was also drawn up.

# Public Consultation through Focus Groups Discussions and Internet Feedback

On 26 Aug 2000, Minister of National Development launched the public consultation phase of the Concept Plan 2001 with the formation of two focus groups to study land use dilemmas.

Two dilemmas were studied on balancing our scarce land resources among the competing land uses of housing, parks, industries, and how to retain identity in the context of the intensive use of land. To reach out to a wide spectrum of Singaporeans, the two focus groups comprised professionals, interest groups, industrialists, businessmen, academics, grassroots and students. The focus groups in turned consulted many members of the public. Much public feedback was also received via the Internet and other feedback channels.



The focus groups convened between August and November 2000. They were briefed by various government agencies and brought on site visits to better understand the dilemmas. A public forum was held on 8 December 2000 for the public to discuss the focus groups' interim proposals before the final recommendations were made.

The focus groups submitted their final report in Dec 2000. After much study and consideration, many of their proposals were accepted and incorporated into the Draft Concept Plan 2001.

#### Draft Plan

The Draft Plan was exhibited from 28 Apr to 11 May 2001. A public dialogue chaired by Minister of National Development was held on 11 May 2001 to discuss views on the Draft Concept Plan.

A city that's **DYNAMIC** A city that's **DISTINCTIVE** 

A city that's DELIGHTFUL



The feedback received at the public exhibition and dialogue was supportive of the main proposals of the Draft Concept Plan.

#### **Final Plan**

The Concept Plan 2001 adopted has taken into account the extensive public feedback received as part of the review. The Concept Plan 2001 will guide the preparation of the development guide plans for the 55 planning areas in the Master Plan.

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# HOME HOUSING RECREATION BUSINESS **IDENTITY** CONCLUSION MAKING OF CP2001

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# **Concept Plan 2001**

#### HOUSING

The Concept Plan aims to create a more livable city, one where Singaporeans can live comfortably, with a wide choice of housing locations and housing types. A total of 1.8 million homes will be needed for the 5.5 million population. This is another 800,000 new homes on top of the existing 1 million homes today.



#### New Homes in Familiar Places

In future, people can choose to set up new homes in established existing areas and regions as there will be more new housing in places like Bukit Merah, Bedok, Ang Mo Kio and Toa Payoh. People can live in a familiar area, close to their parents' home and enjoy ready amenities such as markets, MRT and kindergartens. Having new homes in familiar places will also help to foster community bonds and rejuvenate existing towns.

For those who want to live in a new area, one to two new towns will be developed in the future, for example, Simpang.



#### Better Housing Environment in the West Region

More housing will be provided in the West Region. This will provide homes closer to the work areas in Tuas and Jurong, and also strengthen the residential image of the region. Having more housing here will also increase the amenities and facilities in the area. Accessibility in and around Jurong Lake will be made easier and more convenient.

#### Room with a View and Innovative Housing

More people will get to live on higher floors and enjoy the views. In areas with little height constraints, housing can rise to 30 stories and higher. Currently, only about 35,000 people live



above the 20th storey.

Some high-density housing areas are more constrained. For these areas, we can still achieve higher densities by being creative. Housing blocks might no longer look alike as "experimental designs" can be introduced.

#### **Convenient Amenities**

Higher density also means convenience and close-knit communities. Shops, schools, parks, bus stops and MRT stations will be within walking distance. The increase in housing densities will depend on how people take to high-density living. Thus, the increase in housing densities will be done on a gradual basis.



#### **City Living**

More homes will be built in the city. There are currently 30,000 housing units in the city. In future, four times as many people can live in the city. Those who prefer the downtown buzz can look forward to having 90,000 more units to choose from, mostly in the New Downtown at Marina South. The average plot ratio for housing in the New Downtown can be increased to between 6.0 and 7.0. In this way, the proportion of population living in the city will be increased from the current 3% to 7%, thus providing more housing opportunities for all in the city.



This will build up a critical mass of population in the Central Area and add more buzz to the city. Those who choose to live here will be close to their place of work, thus making it convenient to travel to work. Care will be taken to ensure that the quality of the environment will not be compromised.

In the future, Central Park-style apartments which are a new type of high-density housing will be available.

#### Variety of Low, Medium and High

The Concept Plan will continue to provide a variety of housing, from low to medium and high-density housing.

What is low, medium and high-density housing? Low-density housing includes both low-rise housing that is 5 storeys or less and landed housing. Medium density housing has a gross plot ratio of 1.4 to 2.1, with heights varying up to 24 storeys. High-density housing has a plot ratio above 2.1.



#### Housing Density Mix

Housing Density	Low	Medium	High
Existing Mix	9%	13%	78%
Concept Plan 2001	8%	13%	79%

The proposed density mix is quite similar to the existing one. Even with a 5.5 million population, we can still enjoy a variety of living environments. Although the percentage of low-density housing will be slightly lower, there will be an overall increase of more than 50,000 low-density dwelling units beyond the current stock.

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# Concept Plan 2001

#### RECREATION

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Singapore will be a fun and exciting city. The Concept Plan aims to provide places for all of us to enjoy. There will be more sporting facilities to choose from, accessible green spaces with exciting activities to participate in, and more cultural facilities in convenient locations.



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#### **Green Spaces**

More green spaces will cater to the recreational needs of a larger population. Currently, we have 2,500 ha of open spaces. The Concept Plan aims to almost double the amount of green space to 4,500 ha. The additional open space to be provided is equivalent to another 34 Bishan parks. This increase will ensure that we will all have sufficient green space to enjoy and create the feel of a city in a garden.

Besides more green spaces, the Concept Plan aims to make these green spaces more accessible. The park connector network will be extended to link parks with town centres, sports complexes and homes. Residents will be able to jog from the town park to other gardens and nature areas, or pop over at the town centre, before heading for the local swimming complex.

In addition, existing and future parks will take on distinct characters and looks coupled with exciting activities. One of the parks could be a Maze Park, much like the one from 'Alice in Wonderland', while another could be an Adventure Park complete with an obstacle course



#### **Opening Up the Central Catchment**

Nature lovers can look forward to the opening up of more areas within the Central Catchment for lowimpact recreational uses, such as hiking and cycling. Visitors can take a tree-top walk, breathe in the fresh jungle air and discover the myriad species of flora and fauna in our very own Central Catchment Nature Reserve (see plan).



Lookout points will be set up at suitable locations within the Catchment for visitors to stop and take in the scenic views, or have a picnic. There are also plans to create scenic drives so that families can enjoy outings around the Central Catchment.



#### **Keeping Rustic Areas**

Unlike the 1991 Concept Plan that envisaged new towns at Pulau Ubin and Lim Chu Kang, the Concept Plan 2001 aims to keep these and other areas rustic for as long as possible. Other areas such as Sungei Khatib Bongsu at Simpang and Sungei China Mangrove at Woodlands will be integrated within parks so that more will be able to enjoy them.



#### Sports & Arts

The Concept Plan aims to provide a variety of sports facilities. Land will be set aside for a wide range of recreational activities, from swimming pools and badminton courts to public golf courses and marinas, depending on future demand.

Reservoirs like Bedok, Pandan, MacRitchie and Lower Seletar will be opened for organised nonmotorised water activities such as canoeing, rowing and sailing.



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# Concept Plan 2001

#### **BUSINESS**

The vision is for Singapore to be an economically vibrant city. A city driven by cutting-edge technology, high value-added industries and services, a global financial centre with strong infrastructure. A city empowered to compete in the international arena.



#### **High Value-added Industries**

The Concept Plan makes provisions for high value-added industries which contribute significantly to our economic growth. These industries include electronics, chemicals, pharmaceuticals, biomedical sciences and engineering.

Some of these industries take up a lot of land but contribute substantially to our GDP growth. The chemicals industry, for example contributed 20% of the total manufacturing sector's output in the year 2000. Hence, even though these industries occupy a lot of land, the plan is still to set aside sufficient land for them.



#### **Global Business Centre**

A majority of the financial and services sectors will be concentrated within the Central Area for greater synergy and critical mass.

To support the increase in activities in the Central Area, there will be a denser and more comprehensive rail network. MRT stations will be within easy walking distance.

#### **Greater Flexibility for Businesses**

Boundaries between businesses and services are blurring. Hence, we need new flexibility for businesses. One of the key new ideas in the Concept Plan 2001 is to have a new



zoning system in future (<u>New Business Zone</u> and New White Zone).

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#### **More Intensification**

Industries and businesses close to MRT stations will be able to build higher to optimise the use of land around these important transport nodes. This will allow more people to enjoy the convenience of working near an MRT station.

#### The Concept jobs close to

The Concept Plan will continue to provide jobs close to homes. More jobs will be provided in the North, North-East and East regions. In addition, there will be more housing in the West and in the city so that more can live close to their workplace.

More Jobs Closer to Homes

We will also continue to build on the 3 regional centres. They are Tampines, Woodlands and Jurong East, which are already under various stages of development. To position Singapore as a global financial hub, more commercial activities will be concentrated within the Central Area. Therefore, 3 regional centres will be sufficient to provide for the needs of commercial space outside the Central Area. The Seletar Regional Centre, which was proposed in the Concept Plan 1991, is no longer needed.

People staying in the north-east can easily travel to the regional centres at Woodlands and Tampines via a future MRT line.

#### **Extensive Rail Network**

The Concept Plan plans for new orbital and radial lines in future. Radial lines will enable you to travel to the city directly. Orbital lines



will enable you to get from one place to another outside the Central Area more quickly. The existing 93 km of rail lines will increase to about 500 km in future.

For drivers, rides will be faster and smoother ride in future. There will be more capacity on expressways.

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# **Concept Plan 2001**

#### IDENTITY

The Concept Plan 2001 captures the vision of Singapore in the new century. The broad directions set out in the plan will be translated into more detailed plans as part of the review of the Master Plan 2003.





#### Focus on Identity

A new focus of the Concept Plan 2001 is identity. As Singapore develops, we want to retain a sense of identity in our physical landscape and encourage a sense of rootedness to our country.

Identity means different things to different people. On an individual level, we relate to everyday experiences, favourite haunts and people we talk to.

On a regional and local level, specific buildings and areas are significant to us. Neighbourhood playgrounds, schools, markets and shopping centres add colour to our experiences.

On a national level, we share common memories and events of national pride and significance.

Our identity is made up of a diversity of people, cultures, places, buildings and memories. Old ethnic enclaves like Chinatown, Kampong Glam and Little India illustrate Singapore's historical and cultural mosaic. The life and buzz of central areas like Orchard and City Hall paint another facet of our character.

#### **Our Built Heritage**

Buildings and places are part of Singapore's built heritage. They are an important element in identity. To date, more than 5,600 buildings have been conserved. In future, more buildings will be conserved to preserve the character and collective memory of

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places.



#### **Identity in New Towns**

New towns and new developments can add to Singapore's overall identity. Where possible, our plans in future will integrate existing features that are unique, significant landmarks and natural elements as part of new developments. Different planning and development guidelines can be applied to facilitate diverse factors and experiences.

Size

New towns of the future will be smaller, more compact and personal. Residents will feel a greater sense of ownership and identity.



#### Natural Elements and Landmarks

To make towns more distinct, existing pockets of natural features and man-made landmarks can be retained and integrated as part of the new towns. Such unique features and landmarks can give residents a sense of identity, history and continuity.

One example is Little Guilin. Its presence has given much character to Bukit Batok Town. For future new towns such as Simpang, existing features like rivers, mangrove swamps, trees and its unique coastal profile can be selectively retained and integrated. The road network can also be planned to follow the swing of the coastal profile (e.g. Simpang).



#### **Town Centres at Unique Locations**

Town centres are important gathering places where residents interact. For added character, town centres can be planned at locations which include exciting natural and built features.

For Simpang, the town centre can be located



on an existing unique coastal 'peninsular' feature.

#### **Identity in Familiar Places**

To build regional identity, an identity map will be incorporated into each development guide plan.

The identity map will show icons, activity nodes, focal points, essential routes and gathering places, which are landmarks in our social landscape (e.g. Siglap area). Such landmarks could be anchors amid change and renewal. Retaining and integrating them into the new plans for the area can reinforce such places.

Heritage roads, rich in memory and lined with mature trees, will also be identified for protection. These include parts of Upper Thomson Road and Mount Pleasant Road.

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# Concept Plan 2001

#### CONCLUSION

The Concept Plan 2001 captures the vision of Singapore in the new century. The broad directions set out in the plan will be translated into more detailed plans as part of the review of the Master Plan 2003.



The Concept Plan is not just about building an efficient city. It is also about building a home for Singaporeans. As we continue to plan for our future, let us see what each of us can do today to make a difference to the quality of living in future.

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http://www.ura.gov.sg/conceptplan2001/conclusion.html



# THE PLANNING ACT MASTER PLAN WRITTEN STATEMENT 2008

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#### PREFACE

The Master Plan for the Republic of Singapore was first formulated during 1952-1955, and approved by the Government in August 1958. The Master Plan has since undergone eight reviews and various amendments have been made to it.

In the current planning system, the Concept Plan maps out the long term land use strategies for Singapore. The Concept Plan is reviewed regularly. The intentions of the Concept Plan are translated into detailed land use plans for the different planning areas to form the Master Plan.

In the current review of the Master Plan, the detailed land use plans for the different planning areas were amended and updated where necessary to reflect the land use intentions of the latest Concept Plan. After incorporating relevant feedback from the public exhibitions, these amended plans are formalised as the Master Plan 2008.

The contents and provisions of the Master Plan are applied to guide physical development through development control. These contents and provisions, do not confer development rights nor should they be taken as the basis for determining the liability for payment of development charge or temporary development levy. Application for permission to develop must comply with detailed development control, conservation and preservation requirements, where applicable. In addition, a development charge or temporary development levy may be payable pursuant to the provisions of Part V or Part VA, as the case may be, of the Planning Act and the applicable subsidiary legislation.



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#### **SECTION I**

#### PRELIMINARY

#### 1.0 Definition of Terms

- 1.1 In this Master Plan Written Statement 2008 ("this Written Statement", which expression shall include any supplement, amendment or variation made to it from time to time), the following expressions shall have the meanings assigned to them below:
  - 1.1.1 "amendment" in relation to the Master Plan has the same meaning as defined in Section 2 of the Planning Act.
  - 1.1.2 "Amendment Plan" means any plan or plans included in an amendment to the Master Plan made on or after 27<sup>th</sup> November 2008.
  - 1.1.3 "application" means:
    - (i) an application for planning permission as defined in Section 2 of the Planning Act or
    - (ii) an application for conservation permission as defined in Section 2 of the Planning Act, and shall include any such aforesaid application with regard to a monument.
  - 1.1.4 "competent authority" has the same meaning as defined in Section 2 of the Planning Act.
  - 1.1.5 "conservation area" has the same meaning as defined in Section 2 of the Planning Act.
  - 1.1.6 "demarcated area" means the area demarcated on the Amendment Plan as being the area to which the Amendment Plan shall apply.
  - 1.1.7 "existing use" means the use to which a building or land was put on 1st February 1960 or a use authorised or permitted under the Planning Act or the repealed Act.
  - 1.1.8 "floor area" has the same meaning as defined in the Planning (Development Charges) Rules 2000.
  - 1.1.9 "monument" means a monument for which there is in force a preservation order under the Preservation of Monument Act (Cap. 239); a list of such monuments as at 15 February 2008 is shown in Table 2.
  - 1.1.10 "national park" means any area of land designated as a National Park in Part I of the Schedule under the Parks and Trees Act (Cap. 216), a list of such national parks is shown in Table 3.
  - 1.1.11 "nature reserve" means any area of land designated as a Nature Reserve in Part II of the Schedule under the Parks and Trees Act (Cap.216), a list of such nature reserves is shown in Table 3.

- 1.1.12 "Planning Act" means the Planning Act (Cap. 232).
- 1.1.13 "plot ratio" means the ratio between the floor area of the building and site area.
- 1.1.14 "repealed Act" means the repealed Planning Act (Cap. 232, 1990 Ed).
- 1.1.15 "site area" means the area of a development site unless otherwise defined in the Amendment Plan.

#### 2.0 Applicability

- 2.1 This Written Statement shall apply to any Amendment Plan unless otherwise expressly stated therein.
- 2.2 From the effective date (being the date of the Minister's approval) of the amendment to the Master Plan, all applications in respect of land within the demarcated area to which the Amendment Plan applies, including pending applications on which the competent authority has not made a decision, shall be considered in accordance with the Amendment Plan and this Written Statement and not the Master Plan prior to the effective date of the amendment.
- 2.3 Where however in any case Section 14(2) of the Planning Act applies, an application need not be considered in accordance with the Amendment Plan and this Written Statement, it shall instead be determined in such manner as the Minister may approve.
- 2.4 Where there is any contradiction, discrepancy or inconsistency between a map comprised in the Amendment Plan and this Written Statement, this Written Statement shall prevail.
- 2.5 The planning intentions in the Amendment Plan are subject to interpretation and elaboration by the competent authority. The competent authority may for this purpose from time to time publish development control plans, which include envelope control, building height, street block and urban design plans.

#### 3.0 Development Charges and Temporary Development Levy

- 3.1 The contents and provisions of the Amendment Plan and this Written Statement are intended to guide and control the physical development of the demarcated area. The Amendment Plan and this Written Statement are not the basis for the calculation and payment of development charges or temporary development levy.
- 3.2 Any development within the demarcated area approved by the competent authority shall where applicable be subject to payment of development charge or temporary development levy as provided under Part V or Part VA, as the case may be, of the Planning Act and the applicable subsidiary legislation.

#### SECTION II ZONING AND PLOT RATIO

#### 4.0 Zoning And Plot Ratio

The zoning and plot ratio parameters referred to in the Amendment Plan prescribe the land use and development intensity permissible within the demarcated area.

#### 5.0 Zoning Interpretation

- 5.1 The zoning notations in the Amendment Plan reflect the permissible predominant use of land within the demarcated area, subject however to the following:
  - (i) Areas shown on the Amendment Plan for use as minor roads shall despite the zoning for the respective area be deemed to be zoned for Road use.
  - (ii) Areas shown on the Amendment Plan for use as park connectors shall despite the zoning for the respective area be deemed to be zoned for Park use.
  - (iii) Areas shown on the Amendment Plan for use as:
    - (a) drains
    - (b) utilities (such as electric substations and septic tanks)
    - (c) rapid transit system structure, or
    - (d) at grade or above ground structures of any underground road system or road tunnel, shall despite the zoning for the respective area be used for such specified uses unless otherwise allowed by the competent authority.
- 5.2 The competent authority may consider and approve uses (other than those permissible for the zoning) which are ancillary, related or compatible with the permissible predominant use. The type and quantum of uses that may be regarded as compatible with the predominant use shall be determined by the competent authority. The type and quantum of all ancillary or related uses that may be allowed for the support or management of the predominant use shall be determined by the competent authority not the nature and scale of the development.
- 5.3 Where the existing use for the land is not consistent with the zoning for the land as depicted in the Amendment Plan, the competent authority may despite such zoning for the land consider and approve an application in respect of the land for:
  - (i) change in use to a use which would be permissible under the same zone as that under which the existing use is; and
  - (ii) additions, alterations and improvements to the existing buildings on the land.
- 5.4 Where the land is located within the designated historic conservation districts of Chinatown, Kampong Glam, Little India or Boat Quay and is zoned for Commercial use in the Amendment Plan, the competent authority may despite such zoning consider and approve an application in respect of the land for institutional or residential use.

- 5.5 The interpretations of zonings are given in Table 1.
- 5.6 Within the zones indicated in the Amendment Plan, the competent authority shall control developments in such a manner as to preserve or promote the character of the area as indicated by the notations in the Amendment Plan and any development control plans as may be published by the competent authority from time to time.
- 5.7 For the purpose of paragraph 5(i), "minor road" shall include backlanes but exclude:
  - (i) any stratum of space on or within any land required and approved by the competent authority for use as public road and which is vested or to be vested to the State;
  - (ii) any road tunnel or underground road.

#### 6.0 Plot Ratio Interpretation

- 6.1 Subject to paragraph 8, the plot ratios indicated in the Amendment Plan prescribe the maximum permissible intensity for developments within the demarcated area. The actual intensity to be permitted for any development shall be determined by the competent authority subject to the prescribed maximum permissible plot ratio and having regard to the intensity of the surrounding developments.
- 6.2 The intensity to be permitted for any development is also subject to compliance with all other requirements imposed by the competent authority for the development as provided in paragraph 10.1(ii). The resultant intensity to be permitted for a development may therefore be below the maximum permissible plot ratio prescribed.
- 6.3 For areas without any prescribed intensity, the plot ratio to be allowed shall be determined by the competent authority at his discretion.
- 6.4 Subject to paragraph 6.4A, where a development on any land within the demarcated area is approved for:
  - (i) a use or uses consistent with the zoning of the land in the Amendment Plan; and
  - (ii) an intensity higher than the prescribed maximum permissible intensity,

such approved intensity of the development shall, subject to the provisions of Part V and Part VA of the Planning Act, be deemed to be the prescribed maximum intensity for the land.

- 6.4A Paragraph 6.4 shall not apply in the following circumstances:
  - (i) the competent authority has in the grant of planning permission or conservation permission for the development on the land expressly imposed a term or condition to the effect that the approved intensity of the development shall not be deemed to be the prescribed maximum intensity for the land;
  - (ii) the development on the land is approved for landed dwelling house or houses and the land is zoned for Residential purpose with a maximum permissible plot ratio prescribed.

- 6.4B For the purpose of paragraph 6.4A, a "landed dwelling house" means any detached, semi-detached, linked or terrace house used wholly or mainly for the purpose of human habitation and includes a dwelling-house governed by the provisions of the Land Titles (Strata) Act (Cap. 158).
- 6.5 For the purpose of paragraph 6.4, the competent authority may require the approved intensity of a development to be calculated and determined based on such method and requirements as the competent authority may specify.
- 6.6 Subject to Paragraphs 6.7 and 7, where land proposed for development includes land zoned or shown on the Amendment Plan for use as road or waterbody, the maximum permissible floor area for the development shall be determined as follows:

Area of the land proposed	The prescribed plot ratio for the part of the land not zoned	
for development	Х	or shown for use as road or waterbody

- 6.7 Paragraph 6.6 shall apply only if the part of the land zoned or shown on the Amendment Plan for use as road or waterbody:
  - (i) is not the subject of an acquisition under the Land Acquisition Act (Chapter 152); and
  - (ii) has not been vested in the State

# 7.0 Zoning and Plot Ratio Interpretation for land zoned or shown for use as Road or Waterbody

- 7.1 Subject to paragraph 7.2, where land proposed for development includes land zoned or shown on the Amendment Plan for use as road or waterbody ("the road or waterbody land") and the part of the land not zoned for use as road or waterbody comprises of areas with different zonings and/or different prescribed plot ratios, the competent authority shall, at his discretion, determine and assign:
  - (i) one or more of the said zonings to different parts of the road or waterbody land;
  - (ii) one or more of the said prescribed plot ratios to different parts of the road or waterbody land.
- 7.2 Paragraphs 7.1 shall apply only if the part of the land zoned or shown on the Amendment Plan for use as road or waterbody satisfies the conditions set out in paragraph 6.7.

#### 8.0 Bonus Plot Ratio

- 8.1 The plot ratios indicated with a "+" sign ("the base plot ratio") on the Amendment Plan for the following demarcated areas prescribe the maximum permissible intensity for developments within the area to which the base plot ratio applies:
  - (i) Downtown Core Planning Area;
  - (ii) Museum Planning Area; and
  - (iii) Orchard Planning Area

In addition, the competent authority may allow increases in plot ratio over and above the base plot ratio in the manner and circumstances described in Table 4. The actual intensity to be permitted for any development shall be determined by the competent authority subject to the prescribed maximum permissible plot ratio and allowable increases.

- 8.2 The percentage of increase set out in Table 4 shall be computed with reference to the base plot ratio.
- 8.3 If a development within an area designated with a base plot ratio has already been approved beyond the base plot ratio, any increase in plot ratio that is to be allowed pursuant to paragraph 8.1 shall be computed with reference to the base plot ratio and not the higher approved plot ratio. Any such increase in plot ratio that is to be allowed shall not result in the intensity of the development exceeding the total of the base plot ratio plus all increases in plot ratio mentioned in paragraph 8.1.
- 8.4 The provisions of paragraph 8.1 with regards to increases in plot ratio shall not apply in the following circumstances:
  - (i) A development which has already been approved with a plot ratio higher than the total of the base plot ratio plus all increases in plot ratio as mentioned in paragraph 8.1.
  - (ii) Unless in exceptional circumstances where the competent authority otherwise decides, a development on land sold by either the State or a Statutory Board.
  - (iii) Where the land has existing buildings which are to be retained, the new buildings are not physically connected and integrated with the existing buildings as a single development in accordance with the guidelines issued by the competent authority.
- 8.5 The intensity to be permitted for any development is also subject to compliance with all other requirements imposed by the competent authority for the development as provided in paragraph 10.1(ii). The resultant intensity to be permitted for a development may therefore be below the permissible plot ratio allowed under paragraph 8.1.
- 8.6 Where a development on any land within the demarcated area has already been approved beyond the base plot ratio and allowable increases, such approved intensity shall, subject to the provisions of Part V and Part VA of the Planning Act, be deemed to be the prescribed maximum intensity for the land, and paragraph 8.1 shall not apply.

#### 9.0 Incentive Plot Ratio

9.1 The competent authority may in accordance with and subject to any planning guidelines or incentive scheme approved by the Minister, allow an increase or increases in plot ratio over and above the maximum permissible intensity prescribed for developments within the demarcated area. The actual intensity to be permitted for a development shall be determined by the competent authority subject to the prescribed maximum permissible intensity and the allowable increase or increases in plot ratio under the planning guideline or incentive scheme. If the purpose for which the floor area attributable to any such increase in plot ratio may be used is specified in the planning guidelines or incentive scheme, such floor area shall be used only for the specified purpose unless otherwise allowed by the competent authority. Such floor area shall not be taken into consideration for the purpose of paragraph 6.4 unless otherwise allowed under the planning guidelines or incentive scheme.

#### 10.0 Development Control And Other Requirements

- 10.1 In addition to the contents and provisions of the Amendment Plan, the competent authority in determining an application in respect of land within the demarcated area:
  - (i) Will take into consideration:
    - (a) all applicable planning guidelines (e.g. guidelines pertaining to the control of building height, building set back and spacing, detailed land use, building use, building form, urban design, plot size, etc.) and relevant conservation guidelines that may be issued by the competent authority;
    - (b) any relevant preservation guidelines that may be issued by the Preservation of Monuments Board; and
    - (c) any relevant guidelines for nature reserves and national parks that may be issued by the National Parks Board.
  - (ii) May impose such development control and/or conservation and/or preservation requirements as well as requirements with regard to nature reserves and national parks as the competent authority may deem expedient or necessary.

### TABLE 1 - Zoning Interpretation

S/No	Zoning	Uses	Examples Of Developments	Remarks
1	Residential	These are areas used or intended to be used mainly for residential development. Serviced apartments and student hostels may be allowed subject to evaluation by the competent authority.	<ul> <li>Residential developments for:</li> <li>1. Flats</li> <li>2. Condominium</li> <li>3. Townhouse</li> <li>4. Terrace House</li> <li>5. Semi-Detached House</li> <li>6. Detached House</li> <li>7. Strata-Landed Housing</li> <li>8. Retirement Housing</li> <li>9. Serviced Apartments</li> <li>10. Student Hostel</li> </ul>	The developments in this zone are subject to controls on building form and building height as determined by the competent authority. The quantum of all ancillary or non-residential uses needed for support or management of a residential estate such as a condominium development are to be determined by the competent authority according to the scale of the residential development.
2	Residential with commercial at 1st storey	These are areas used or intended to be used mainly for residential development with commercial use at the 1st storey only. Residential developments, without any commercial use, may be allowed subject to evaluation by the competent authority.	<ol> <li>Flats with commercial uses at 1<sup>st</sup> storey</li> <li>Shophouse</li> <li>Residential Developments (e.g. Flats)</li> </ol>	Commercial areas are normally restricted to the 1st storey. Commercial areas may be allowed above and/or below the 1st storey subject to evaluation by the competent authority. Where the competent authority allows commercial areas above and/or below the 1st storey, the total quantum of the floor area of commercial uses in the 1st and other storeys shall not exceed the maximum allowable floor area at the 1st storey.
3	Commercial & Residential	These are areas used or intended to be used mainly for mixed residential and commercial purposes. Hotels may be allowed subject to evaluation by the competent authority.	<ol> <li>Mixed Commercial &amp; Residential development (e.g. Shopping/Office &amp; Residential)</li> <li>Hotel</li> </ol>	Commercial areas shall not be located above residential areas. The minimum quantum for commercial and related uses shall be determined by the competent authority with regard to the locality concerned. The commercial quantum shall not, unless otherwise allowed by the competent authority exceed 40% of the maximum allowable floor area.

#### TABLE 1 - Zoning Interpretation

S/N	Zoning	Uses	Examples Of Developments	Remarks
4	Commercial	These are areas used or intended to be used mainly for commercial development. Hotels and Recreation Clubs may be allowed subject to evaluation by the competent authority.	<ul> <li>Developments for:</li> <li>1. Offices</li> <li>2. Mixed Uses <ul> <li>(e.g. Office/Shopping/Cinema/Hotel/Flat)</li> </ul> </li> <li>3. Convention/Exhibition Centre</li> <li>4. Commercial School</li> <li>5. Bank</li> <li>6. Market/Food Centre/Restaurant</li> <li>7. Cinema</li> <li>8. Entertainment</li> <li>9. Foreign Trade Mission/Chancery</li> <li>10. Hotel</li> <li>11. Recreation Club</li> <li>12. Medical suite</li> <li>13. Clinic</li> </ul>	The developments in this zone are subject to controls on the type and quantum of commercial uses as determined by the competent authority.
5	Hotel	These are areas used or intended to be used mainly for hotel development.	<ol> <li>Hotel</li> <li>Backpackers' Hostel</li> <li>Boarding House</li> </ol>	At least 60% of the total floor area shall be used for hotel room floors and hotel related uses as defined in the Planning (Development Charges) Rules. Commercial and residential uses may be considered by the competent authority subject to control on the use quantum as determined by the competent authority and they shall not exceed 40% of the total floor area.
6	White	These are areas used or intended to be used for commercial, hotel, residential, sports & recreational and other compatible uses, or a combination of two or more of such uses as a mixed use development.	<ul> <li>A development for any one or more of the following uses:</li> <li>1. Residential</li> <li>2. Office</li> <li>3. Shop</li> <li>4. Hotel</li> <li>5. Serviced Apartments</li> <li>6. Recreation Club</li> <li>7. Association</li> <li>8. Convention/ Exhibition Centre</li> <li>9. Entertainment</li> </ul>	To realise the overall planning intention for an area, specific controls on quantum and types of uses may be imposed in some areas.
#### S/N Uses Zoning **Examples Of Developments** Remarks At least 85% of the total These are areas used or **Business Park** 1. 7 **Business** intended to be used 2. Science Park floor area shall be used for Park mainly for business any combination of park operations. business park operations (as may be defined and set out in guidelines issued by the competent authority on Business Park) and other permitted ancillary uses. Not more than 40% of the total floor area comprised in this 85% shall be used for other permitted ancillary uses. Not more than 15% of the total floor area shall be used for uses permissible under White zone. 8 Business These are areas used or 1. Mixed Business Park and The quantum for the uses Park - White intended to be used commercial, residential, permissible under White mainly for business hotel (or other zone shall not exceed the park operations and compatible uses) percentage of the total floor uses permissible under development. area specified in the White zone as a mixed 2. Mixed Science Park and Amendment Plan. For use development. commercial, residential, example, for a site zoned as hotel (or other BP-W[40], the total compatible uses) quantum of permissible development. White use shall not exceed 40% of the total floor area of the development. The Business Park use quantum shall be used for any combination of business park operations (as may be defined and set out in guidelines issued by the competent authority on Business Park) and other permitted ancillary uses. Not more than 40% of the total floor area of the Business Park use quantum shall be used for other permitted ancillary uses.

S/N	Zoning	Uses	Examples Of Developments	Remarks
9	Business 1 (B1)	These are areas used or intended to be used mainly for clean industry, light industry, warehouse, public utilities, and telecommunication uses and other public installations for which the relevant authority does not impose a nuisance buffer greater than 50m. Certain general industrial uses that are able to meet the nuisance buffer requirements of not more than 50m imposed by the relevant authority may be allowed in the B1 zones, subject to evaluation by the relevant authority and the competent authority.	<ul> <li>Developments for:</li> <li>1. Computer software development</li> <li>2. Distribution services</li> <li>3. Assembly and repair of computer hardware and electronic equipment</li> <li>4. Printing, publishing and allied industries</li> <li>5. Packing of dried foodstuff</li> <li>6. Warehouse except for storage of chemicals</li> </ul>	The quantum of permitted ancillary uses shall not exceed 40% of the total floor area. The types of B1 and ancillary uses that may be allowed are subject to the evaluation of the competent authority and other relevant authorities.
10	Business 2 (B2)	These are areas used or intended to be used for clean industry, light industry, general industry, warehouse, public utilities and telecommunication uses and other public installations. Special industries such as manufacture of industrial machinery, shipbuilding and repairing, may be allowed in selected areas subject to evaluation by the competent authority.	<ul> <li>Developments allowed under B1 and for the following:</li> <li>1. Biotechnology</li> <li>2. Manufacture of electrical apparatus and supplies</li> <li>3. Vehicle repair and servicing</li> <li>4. Manufacture of furniture and fixtures</li> <li>5. Warehouse</li> <li>6. Electric Substation</li> <li>7. Industry/power generation plant</li> <li>8. Gas Installation</li> </ul>	The quantum of permitted ancillary uses shall not exceed 40% of the total floor area. The types of B2 and ancillary uses that may be allowed are subject to the evaluation of the competent authority and other relevant authorities.

S/N	Zoning	Uses	Examples Of Developments	Remarks
11	Business 1 - White	These are areas used or intended to be used mainly for uses permissible under B1 zone and White zone as a mixed use development.	A development for any one or more uses that may be allowed under B1 zone and White zone.	A minimum plot ratio must be achieved for the B1 uses before White uses can be allowed. For example, for a site zoned as "4.2 [B-2.5] W", the permissible B1 uses must achieve a minimum plot ratio of 2.5 before White uses can be allowed subject to the maximum prescribed plot ratio of 4.2 for the whole development.
				ancillary uses shall not exceed 40% of the total floor area for B1 uses.
				The types of B1, White and ancillary uses that may be allowed are subject to the evaluation of the competent authority and other relevant authorities.
12	Business 2 - White	These are areas used or intended to be used mainly for uses permissible under B2 zone and White zone as a mixed use development.	A development for any one or more uses that may be allowed under B2 zone and white zone.	A minimum plot ratio must be achieved for the B2 uses before White uses can be allowed. For example, for a site zoned as "4.2 [B-2.5] W", the permissible B2 uses must achieve a minimum plot ratio of 2.5 before White uses can be allowed subject to the maximum prescribed plot ratio of 4.2 for the whole development. The quantum of permitted ancillary uses shall not exceed 40% of the total floor area for B2 uses. The types of B2, White and ancillary uses that may be
				allowed are subject to the evaluation of the competent authority and other relevant authorities.

S/N	Zoning	Uses	Examples Of Developments	Remarks
13	Residential/ Institution	These are areas used or intended to be used mainly for residential purpose, community institution facilities or other similar purposes.	<ol> <li>Residential Developments (e.g. Flat)</li> <li>Community Institutions uses (excluding funeral parlour and workers' dormitory)</li> </ol>	The type of community institution uses and other similar developments that may be allowed are subject to evaluation by the competent authority.
14	Health & Medical Care	These are areas used or intended to be used mainly for medical services.	<ol> <li>Hospital</li> <li>Polyclinic</li> <li>Clinic/Dental Clinic</li> <li>Veterinary Clinic</li> <li>Nursing Home</li> </ol>	Hospitals shall only be allowed subject to evaluation by the competent authority.
15	Educational Institution	These are areas used or intended to be used mainly for educational purposes including tertiary education.	<ol> <li>Kindergarten</li> <li>Primary School</li> <li>Secondary School</li> <li>Junior College</li> <li>Institute of Technical Education</li> <li>Polytechnic</li> <li>University</li> <li>Religious School/ Institute</li> <li>Foreign School</li> <li>Special Education School (e.g. School</li> </ol>	Nil
16	Place of Worship	These are areas used or intended to be used mainly for religious buildings.	<ol> <li>Church</li> <li>Mosque</li> <li>Temple</li> </ol>	Praying area shall be the predominant use and shall be at least 50% of the total floor area of the development.
17	Civic & Community Institution	These are areas used or intended to be used mainly for civic, community or cultural facilities or other similar purposes.	Civic Institutions1. Courts2. Police Station3. Fire Station4. Prison5. Drug Rehabilitation Centre/Halfway House6. Reformative CentreCommunity Institutions7. Association premises8. Community Centre/ Club9. Community Hall10. Welfare Home11. Child Care Centre12. Home For The Aged13. Home For The Disabled14. Funeral Parlour15. Workers' DormitoryCultural Institutions16. Television/Filming StudioComplex17. Performing Arts Centre18. Library19. Museum20. Arts Centre/Science Centre21. Concert Hall	The specific institutional use that may be allowed for a site is subject to evaluation by the competent authority.

S/N	Zoning	Uses	Examples Of Developments	Remarks
18	Open Space	These are areas used or intended to be used as open space.	<ol> <li>Wooded Area</li> <li>Swamp Area</li> <li>Natural Open Space</li> <li>Public Promenades</li> <li>Outdoor Pedestrian Malls</li> <li>Landscaped Plazas</li> </ol>	Where additional sites for open space are deemed necessary, they may be secured by the competent authority.
19	Park	These are areas used or intended to be used mainly for parks or gardens for the enjoyment of the general public and includes pedestrian linkages.	<ol> <li>National Park</li> <li>Regional Park</li> <li>Community Park/ Neighbourhood Park</li> <li>Park Connectors</li> <li>Zoological Gardens, Botanic Gardens, etc</li> </ol>	Where additional sites for parks are deemed necessary, they may be secured by the competent authority. The notations used to delineate the park connectors may not show their precise boundaries which are subject to interpretation and determination by the competent authority.
20	Beach Area	These are areas used or intended to be used for coastal recreational purposes for the enjoyment of the general public.	Nil	The notation used to delineate the beach areas may not show their precise boundaries. The extent of a beach area is subject to survey.
21	Sports & Recreation	These are areas used or intended to be used mainly for sports and recreational purposes.	<ol> <li>Sports Complex/ Indoor Stadium</li> <li>Swimming Complex</li> <li>Golf Course</li> <li>Golf Driving Range</li> <li>Recreation Club</li> <li>Campsite</li> <li>Chalet</li> <li>Marina</li> <li>Water Sports Centre</li> <li>Outward Bound School</li> <li>Theme Park</li> </ol>	Nil
22	Waterbody	These are areas used or intended to be used for drainage purposes and water areas such as reservoirs, ponds, rivers and other water channels.	<ol> <li>River</li> <li>Major Drain &amp; Canal</li> <li>Reservoir</li> <li>Pond</li> </ol>	The notations used to delineate the drainage reserves may not show their precise alignment which is subject to interpretation and determination by the competent authority and other relevant authorities. Additional drainage reserves may be secured by the competent authority for any locality as may be deemed necessary.

S/N	Zoning	Uses	Examples Of Developments	Remarks
23	Road	These are areas used or intended to be used for existing and proposed roads.	<ol> <li>Expressway</li> <li>Semi-Expressway</li> <li>Major Arterial Road</li> <li>Arterial Road</li> <li>Primary Access Road</li> <li>Local Access Road</li> <li>Service Road &amp; Backlane</li> </ol>	The notations used to delineate the route of the roads may not show their precise alignment, which is subject to interpretation and determination by the competent authority and other relevant authorities. All roads including their junctions are subject to widening and improvement, as may be determined by the competent authority. Buffers along and adjoining roads may be required to be set aside where deemed necessary by the competent authority. Additional road reserves may be secured by the competent authority for any locality as may be deemed necessary.
24	Transport Facilities	These are areas used or intended to be used mainly for the parking of vehicles and transport facilities including garages. Other uses under an elevated road may be allowed subject to evaluation by the competent authority.	<ol> <li>Car Park</li> <li>Heavy Vehicle Park</li> <li>Trailer Park</li> <li>Bus Depot/Terminal</li> <li>Transport Depot</li> <li>MRT/LRT Marshalling Yard/Depot</li> <li>Driving Circuit/Test Centre</li> <li>Petrol Station/Kiosk</li> </ol>	Petrol Station/Kiosk shall only be allowed subject to evaluation by the competent authority.
25	Rapid Transit	These are areas used or intended to be used mainly for Rapid Transit purposes.	1. MRT/LRT Station	The notations used to denote the MRT/LRT lines and the locations of stations are diagrammatic. The precise alignment of the MRT/LRT lines and the locations of stations are subject to interpretation and determination by the competent authority and other relevant authorities.

S/N	Zoning	Uses	Examples Of Developments	Remarks
26	Utility	These are areas used or intended to be used mainly for public utilities and telecommunication infrastructure, including water works, sewage disposal works and other public installations such as electric substations.	<ol> <li>Electric Substation</li> <li>Power Station</li> <li>Gas Installation</li> <li>Natural Gas Receiving Terminal</li> <li>Gas Takeoff/Regulator Stations</li> <li>Water Treatment Plant</li> <li>Water Reclamation Plant</li> <li>Service Reservoir</li> <li>Water Pump House</li> <li>Sewage Pumping Station</li> <li>Incineration Plant</li> <li>Desalination Plant</li> <li>Transmitting Station/ Receiving Station</li> <li>Earth Satellite Station</li> </ol>	Additional sites for such purposes for any locality may be secured by the competent authority, where deemed necessary.
27	Cemetery	These are areas used or intended to be used for burial grounds, crematoria and columbaria.	<ol> <li>Cemetery</li> <li>Crematorium</li> <li>Columbarium</li> </ol>	Nil
28	Agriculture	These are areas used or intended to be used mainly for agricultural purposes and includes plant nursery.	<ol> <li>Agrotechnology Park</li> <li>Aquaculture Farm         <ul> <li>(e.g. Aquarium fish)</li> </ul> </li> <li>Plant Nursery</li> <li>Hydroponics Farm</li> <li>Agriculture research/         experimental station</li> </ol>	Nil
29	Port/ Airport	These are areas used or intended to be used for airport/airfield or dock/ port purposes.	<ol> <li>Airport</li> <li>Port Area</li> <li>Port/Airport Related Facilities</li> <li>Ferry Point/Terminal</li> <li>Cruise Centre</li> <li>Landing Sites</li> <li>Fishing Port</li> </ol>	Nil
30	Reserve Site	These are areas the specific use of which has yet to be determined. Interim uses that are compatible with the uses in the locality may be allowed subject to evaluation by the competent authority.	Nil	Nil
31	Special Use	These are areas used or intended to be used for special purposes.	Nil	Nil

S/No	Name of Monument	Location
1	Old Thong Chai Medical Institution (1892)	Eu Tong Sen Street
2	Armenian Church (1835-36)	Hill Street
3	St Andrew's Cathedral (Rebuilt 1856-61)	Coleman Street
4	Telok Ayer Market (now Lau Pa Sat) (1890-94)	Raffles Quay
5	Thian Hock Keng (1839-42)	Telok Ayer Street
6	Sri Mariamman Temple (Rebuilt 1843)	South Bridge Road
7	Hajjah Fatimah Mosque (1845-46)	Beach Road
8	Cathedral of the Good Shepherd (1843-47)	Queen Street
9	Nagore Durgha (Shrine) (1828-30)	Telok Ayer Street
10	Al-Abrar Mosque (1850-55)	Telok Ayer Street
11	House of Tan Yeok Nee (The Old Salvation Army HQ) (1885)	Clemenceau Avenue
12	Tan Si Chong Su (1876-78)	Magazine Road
13	Jamae Mosque (Rebuilt 1830-35)	South Bridge Road
14	Sultan Mosque (Rebuilt 1924-28)	North Bridge Road
15	St George's Church (1910-13)	Minden Road
16	Hong San See (1908-13)	Mohammed Sultan Road
17	Sri Perumal Temple (1855)	Serangoon Road
18	Abdul Gafoor Mosque (1907)	Dunlop Street
19	Siong Lim Temple (1898-1912)	Jalan Toa Payoh
20	Raffles Hotel (1887-1907)	Beach Road
21	Telok Ayer Chinese Methodist Church (1924)	Telok Ayer Street
22	Goodwood Park Hotel (Tower Block) (1900)	Scotts Road
23	Old Convent of Holy Infant Jesus Chapel (now Chijmes Hall) (1903) and Caldwell House (1840-41)	Victoria Street
24	Istana and Sri Temasek (1867-69)	Orchard Road
25	City Hall (1926-29)	St Andrew's Road

# **TABLE 2 - List of Monuments subject to a Preservation Order** under the Preservation of Monument Act as at 15 February 2008

S/No	Name of Monument	Location
26	Victoria Theatre (1856-62) and Concert Hall (1902-05)	Empress Place
27	Parliament House and Annex Building (1826-27)	High Street
28	Supreme Court (1937-39)	St Andrew's Road
29	Empress Place Building (1864-67)	Empress Place
30	National Museum (1884-87)	Stamford Road
31	Old St Joseph's Institution - Main Building (1855-67), Chapel (1911-12) and Classroom (1906-07) (now Singapore Art Museum)	Bras Basah Road
32	Old Attorney-General's Chambers (Rebuilt c.a. 1906)	High Street
33	Sun Yat Sen Villa (now Sun Yat Sen Nanyang Memorial Hall) (1900-02)	Tai Gin Road
34	Yueh Hai Ching Temple (Rebuilt 1895)	Philip Street
35	Old Tao Nan School (now Asian Civilisations Museum I) (1910-1912)	Armenian Street
36	Old Ministry of Labour Building (1928)	Havelock Road
37	Maghain Aboth Synagogue (1878)	Waterloo Street
38	Old Hill Street Police Station (1934)	Hill Street
39	Chesed-El Synagogue (1905)	Oxley Rise
40	Ying Fo Fui Kun (1881-82)	Telok Ayer Street
41	Central Fire Station (1908-09)	Hill Street
42	Old Nanyang University Library & Administration Building, Old Nanyang University Memorial and Old Nanyang University Arch (1954-56)	Nanyang Drive Upper Jurong Road
43	Chinese High School Clock Tower Building (1925)	Bukit Timah Road
44	Prinsep Street Presbyterian Church (1930)	Prinsep Street
45	Tan Teck Guan Building (1911)	College Road
46	College of Medicine Building (1926)	College Road
47	Old Admiralty House (1939)	Old Nelson Road
48	Cathay Building (1939)	Handy Road
49	Church of Sts Peter and Paul (1846)	Queen Street
50	MacDonald House (1949)	Orchard Road

S/No	Name of Monument	Location
51	RC Church of St Joseph (1904 - 1912)	Victoria Street
52	Church of Our Lady of Lourdes (1888)	Ophir Road
53	Church of Nativity of the Blessed Virgin Mary (1901)	Upper Serangoon Road
54	Tou Mu Kung Temple (1921)	Upper Serangoon Road
55	Old Ford Factory (1941)	Upper Bukit Timah Road

	List of designated National Parks in Part I of the Schedule under the Parks and Trees Act (Cap. 216)			
S/No	Name of National Parks	Location		
1	Singapore Botanic Gardens	Cluny Road		
2	Fort Canning Park	Fort Canning Road		
List of designated Nature Reserves in Part II of the Schedule under the Parks and Trees Act (Cap. 216)         S/No       Name of Nature Reserves				
1	Bukit Timah Nature Reserve	Upper Bukit Timah Road		
2	Central Catchment Nature Reserve	Upper Bukit Timah Road		
3	Sungei Buloh Wetland Reserve	Neo Tiew Crescent		
4	Labrador Nature Reserve	Labrador Villa Road		

### **TABLE 3 -** List of National Parks and Nature Reserves

	For sites within Downtown Core, Museum and Orchard with "+" sign	l Planning Areas
S/No	Criterion	Percentage (%) Increase Above Base Plot Ratio
1	MRT RADIUS	
1.1	Less than 50% of the site is within the demarcated boundary shown on page 22	5
1.2	50% or more of the site is within the demarcated boundary shown on page 22	10
2	LAND AREA (sq m)	
2.1	For sites within Downtown Core Planning Area	
(i)	3,000 to 5,500	5
(ii)	5,501 to 8,000	10
(iii)	8,001 and above	15
2.2	For sites within Museum & Orchard Planning Areas	
(i)	10,000 to 15,000	5
(ii)	15,001 to 20,000	10
(iii)	20,001 and above	15

# **TABLE 4 -** Permitted Increases in Plot Ratio above Base Plot Ratio

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# **PLANS** - Areas within the Demarcated Boundary around MRT Stations



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# PREFACE

The Urban Redevelopment Authority (URA) is the national planning and conservation authority for Singapore. Its active involvement in conservation started as early as the 1970s with the rehabilitation of some state-owned properties for adaptive reuse. Since then, a variety of buildings – from shophouses to institutions and bungalows to local landmarks – have been conserved to retain the different memories of Singaporeans from all walks of life. Buildings from different periods of Singapore's history – from the days when we were a migrant settlement to our post independence years – are also conserved to capture the depth of Singapore's history and roots.

Conservation of our built heritage is an integral part of urban planning and development in Singapore. The restoration of our historic areas adds variety to our streetscapes and modulates the scale of our urban fabric, creating the visual contrast and excitement within the city while protecting the important reminders and representations of our past. In addition, it adds to the distinctive character and identity of our city, giving it a sense of history and memory of place.

As part of URA's on-going efforts to facilitate the conservation of our built heritage, a set of conservation guidelines has been put in place to inform and guide the public on restoration works. A comprehensive review of the conservation guidelines is carried out regularly in consultation with professional bodies and interest groups. The latest edition is dated December 2011.

#### ABOUT THE CONSERVATION GUIDELINES

This document provides the conservation principles, planning parameters and restoration guidelines for conserved shop house and bungalow building typologies, as well as planning parameters and envelope control guidelines for new buildings within conservation areas. Owners, architects and engineers intending to carry out restoration works or development within conservation areas are required to comply with the guidelines accordingly. For other building types, which do not conform to the standard shop house or bungalow typology, these will be evaluated on a case by case basis in accordance with conservation principles<sup>1</sup>.

This document is to be read in conjunction with the **Specific Facade Restoration Guidelines** for the subject building, available on-line through URA's website at <a href="http://spring.ura.gov.sg/cudd/facade/overview.cfm">http://spring.ura.gov.sg/cudd/facade/overview.cfm</a>.

For enquiries on the conservation guidelines, please call the Conservation Hotline at 63293355 or email ura\_cons@ura.gov.sg.

These publications are recommended as important references:

- OBJECTIVES, PRINCIPLES AND STANDARDS FOR PRESERVATION AND CONSERVATION (1993)
- PUBLICATIONS ON CHINATOWN, KAMPONG GLAM AND LITTLE INDIA HISTORIC DISTRICTS (1995)
- CONSERVATION TECHNICAL LEAFLETS (1993)
- TECHNICAL SUPPLEMENTS TO CONSERVATION GUIDELINES (1998)
  - <u>Understanding the Roofs</u>
  - Understanding the Doors, Windows & Vents
  - Understanding the Timber Floors & Staircases
  - Understanding the Ornamental Plasterworks
  - Understanding the First Storey : Five-foot Way & Front Facades
  - Understanding the Party Walls
  - Understanding the Mechanical & Electrical Services
- VCD ON "RESTORING THE SINGAPORE SHOPHOUSE" (1990)
- ARCHITECTURAL HERITAGE SINGAPORE (2004)
- CONSERVING THE PAST, CREATING THE FUTURE: URBAN HERITAGE IN SINGAPORE (2011)

To view or purchase these publications, please click here.

<sup>&</sup>lt;sup>1</sup> The conservation guidelines for shop houses and bungalows will generally be applied by URA in the consideration of a development application. However, if the circumstances or planning considerations relevant to a case warrant it, URA may in its discretion decide to depart from these general guidelines. The guidelines, principles and illustrations found in the guidelines are not exhaustive in covering all possible site conditions and variations in building type. Persons intending to carry out a development are advised to take this into consideration and check with URA through enquiries or development applications to confirm if their proposals can be allowed.

### PART 1: **OVERVIEW**

#### 1 **INTRODUCTION**

Historic buildings provide a valuable link to Singapore's heritage and conserving them is an important part of Singapore urban planning. So far, over 7,000 buildings have been gazetted for conservation. They are located mainly in the city centre and around its fringes, and comprise largely shophouses and bungalows.

#### **CONSERVATION AREAS AND GUIDELINES**

The majority of conservation areas in Singapore fall into four distinct categories, and the conservation guidelines vary for each of these categories. <u>See Key Conservation Area Map</u>. The four main categories are as follows:

#### **Historic Districts**

The Historic Districts, which include Boat Quay, Chinatown, Kampong Glam and Little India, are among the city's oldest areas. Most of the buildings in these areas are still intact, and the entire building has to be retained and restored.

#### **Residential Historic Districts**

The Residential Historic Districts at Blair Plain, Cairnhill and Emerald Hill are residential areas which developed close to the city centre. A new rear extension lower than the main roof can be built for greater flexibility in adapting the building for modern living.

#### **Secondary Settlements**

The Secondary Settlements such as Geylang and Joo Chiat are areas which developed later when people started to move out of the crowded city to live at the fringe. These are typically areas where there are already many new developments so emphasis is placed on retention of the streetscape. In these areas, a new rear extension up to the maximum height allowed for the area can be built.

#### Bungalows

The bungalows are detached buildings which come in a variety of architectural styles and are predominantly for residential use. For bungalows, only the main house needs to be kept. The outhouse can be demolished to make way for new extensions to the main house. Large sites can be subdivided for additional new developments. For a site where flat or condominium housing development can be built, the bungalow can be used for residential purpose or as a clubhouse to serve the development.

#### FACILITATING RESTORATION EFFORTS

The Government provides various forms of assistance to encourage private owners to restore their buildings. They include:

- waiver of development charge and car park deficiency charge, where applicable; and
- waiver of the need to provide car park lots where applicable.

Technical guidelines and standards are also drawn up to guide owners and professionals in restoring their buildings. Publications on conservation are produced to assist private owners to better understand the conservation principles and guidelines.

In addition, the government builds infrastructure and utilities to improve the environment of the conservation areas. Examples of these include pedestrian malls at Boat Quay to allow spillover of activities from the conserved buildings to liven up the areas.

#### 2 **CONSERVATION PRINCIPLES**

Singapore's architectural history is the story of skilled craftsmen and architects who have invested in quality places for work and play. Old and new skills, past knowledge and current technologies all combine to bring the past back to productive life.

Quality restoration is more than just preserving a facade or the external shell of a building. It retains the inherent spirit and original ambience of historic buildings. It requires an appreciation and understanding of the architecture and structure of historic buildings, good practice and management.

#### 2.1 **THE "3R" PRINCIPLE**

The fundamental principle of conservation applicable to all conserved buildings, irrespective of scale and complexity, is **maximum Retention**, **sensitive Restoration and careful Repair - the "3R"s**. Selective replacement should be considered only when absolutely necessary. Total reconstruction goes against accepted international conservation practices.

Conserved buildings are to be restored in accordance with the conservation guidelines. All original structural and architectural elements are to be retained and restored. In the event that such elements have to be repaired or replaced, their features are to be retained.

When upgrading and adapting a building to new uses, the existing structure is to be retained by strengthening and repairing the structural elements. Any alteration or strengthening to structural elements is to be done in the most sympathetic and unobtrusive way, using original methods and materials wherever possible.

Before any conservation work commences, a thorough research and documentation is to be carried out on the conserved building to ensure that

restoration work is faithfully carried out. At every stage of the conservation work, the technical aspects and process of the various activities are to be documented.

#### 2.2 **APPLICATION TO THE VARIOUS CONSERVATION AREAS**

In the Singapore context, conservation guidelines are applied in different degrees to the different groups of conservation areas taking into consideration their historical significance, the context of the surrounding developments and the long-term planning intention for each area. The extent of the building to be conserved and the degree of adaptation allowed are shown in <u>Figure1</u>.

The four main groups of conservation areas are:

- \* The Historic Districts of Boat Quay, Chinatown, Kampong Glam and Little India;
- \* The Residential Historic Districts of Blair Plain, Cairnhill and Emerald Hill;
- \* The Secondary Settlements of Balestier, Beach Road, Geylang, Jalan Besar, Jalan Jurong Kechil, Joo Chiat, Mount Sophia, River Valley, Tanjong Katong, Upper Circular Road and Tiong Bahru; and
- \* The Bungalow Areas of the Good Class Bungalow Areas and Fringe (Chatsworth Park Conservation Area, Holland Park/Ridout Road Conservation Area and Nassim Road/Whitehouse Park Conservation Area) and the Mountbatten Road Conservation Area.
- 2.2.1 In the **Historic Districts**, the entire building is to be conserved. Change of use to commercial or residential use is permitted in these historic districts. The strictest form of conservation is practised in these districts.
- 2.2.2 The **Residential Historic Districts** are smaller areas mainly for residential use. In view of the restriction in building uses, an extension at the rear lower than the main roof is permitted to make the terrace houses more attractive and liveable to suit the needs of the individual owners.
- 2.2.3 Conservation within the **Secondary Settlements** is on a streetscape basis as the conserved buildings are adjacent to new developments. In these areas, the owners may choose to conserve the entire building or have a new rear extension up to the maximum height allowable for the area.
- 2.2.4 Conservation of bungalows is on a highly selective basis. They represent the architectural styles of different eras.

For conserved bungalows located within a site which is allowed for flat or condominium development, the bungalow may be strata-subdivided into apartment units or converted to a clubhouse. In these areas, the owner may choose to conserve the entire building, including the outhouse, or just the main building to suit his needs and to optimise the use of land.

#### 3 ADAPTIVE REUSE OF SHOPHOUSES

Traditionally, shophouses are designed to provide for business premises on the ground floor and residential accommodation on the upper storeys; terrace houses and bungalows are designed purely for residential use. Structurally speaking, the original use is always the best use for a conserved building.

However, old buildings may often have to be restored and upgraded to meet modern living needs or to accommodate new uses. In restoring and adapting a conserved building to new uses, it is important to adhere to the conservation principle in order to retain the intrinsic character and historical value of the building. Alterations or strengthening of the building structure is to be done in the most sympathetic and unobtrusive way, using the original methods and materials wherever possible.

The restoration and adaptation of conserved buildings to new uses require an understanding of the behaviour of traditional buildings, traditional building construction methods, and how the buildings hold themselves together by the intricate interaction of the various elements.

#### 4 **UNDERSTANDING THE SHOPHOUSE**

#### 4.1 **KEY ELEMENTS OF THE SHOPHOUSE**

The conservation guidelines for shophouses and terrace houses relate to the key elements of the typology of the building. Constructed between 1840 and 1960, these simple buildings are two- to three-storeys high, built in contiguous blocks with common party walls.

The design and material of the shophouses and terrace houses vary according to the architectural style of the building. Singapore shophouses fall into six styles. They are the Early Shophouse, the First Transitional Shophouse, the Late Shophouse, the Second Transitional Shophouse, the Art Deco Shophouse and the Modern Shophouse.

In conserving a shophouse, the key elements to be respected are <u>(See Figure 2 and Figure 3)</u>:

#### (a) **Roofs**

Roofs are pitched and finished with overlapping V-profile or flat natural colour unglazed clay tiles, laid on timber battens and bonded with mortar. Where the tiles end at the edge of the front and rear shophouse roofs, they are often covered with a timber fascia complete with galvanised iron gutters and downpipes. Roofs are waterproofed using bituminous asphalt, galvanised iron flashing and copings.

#### (b) Party Walls

Party walls are principal load-bearing walls which demarcate one shophouse from its neighbour. The party walls normally protrude

approximately 30cm above the roof of the shophouse and break the continuous length of the shophouses into individual lots.

Party walls are constructed of bricks laid out in continuous stretcher bond courses. The internal surfaces of the party walls are usually unpierced and unadorned. To ensure structural stability, the base of the party wall is thickened to transfer the dead-load to the base of the foundation.

#### (c) **Timber Structural Members**

The timber structural members include the main timber beams, the secondary timber beams, the timber floor boards and the timber rafters. The main timber beams are key horizontal structural members that run parallel to the facade, spanning from one party wall to the other. They are usually made of chengal, a hardwood timber which is resistant to the dead-load transferred from upper floors.

The secondary timber beams supporting the timber floor boards for the upper floors serve as horizontal structural members to evenly distribute the dead and live load from the upper floors to the party walls. The timber floor boards are thin horizontal structural members laid horizontally on the secondary beams and joined to one another by the traditional tongue and groove method. Timber rafters are inclined structural members supporting the pitched roof. They are in turn supported by timber purlins or roof beams spanning between the party walls.

#### (d) Airwells

Airwells are positioned between sections of the tiled roofs. They open directly to the sky to provide natural ventilation and lighting to the interior. The airwells lend interest to the spatial experience of shophouses by offering alternating naturally-lit spaces.

#### (e) Rear Court

The rear court is an open space at the back of the shophouse bounded by the rear boundary wall, the service block, the rear facade of the main part of the shophouse and the party wall. The juxtaposition of these elements produces several different rear court configurations.

The windows in the walls facing the rear court allow light to penetrate into the interior of the shophouse. They are normally casement windows of a design compatible with the windows on the front facade. The existing doors on the rear facade are either timber doors or original metal (mild steel) doors.

#### (f) **Timber Windows**

Shophouse windows include the timber windows of a French or casement design. French windows, found on the upper storey facade, are full-height, side-hung and double-shuttered, and may feature transom windows or fanlights above them. The timber post and rail or cast iron balustrades are part of the original design of the French windows. Casement windows are only half the height of French windows, with openings starting at the balcony rail height. Casement

windows on the first storey, unlike those on the upper storeys that swing outwards, always open inwards and are recessed to allow for installation of security devices.

#### (g) **Timber Staircase**

Internal staircase arrangements vary between shophouses and range from straight and dog-leg designs to curved quarter and half-turn designs. Balusters and newel posts are often ornately detailed and reflect early Dutch influences. Handrails are made of polished hardwood. The retention and restoration of the original staircase is encouraged.

#### (h) Front Facade

The shophouse facade has five distinct elements:

The **Upper Floor** that projects over the five-foot way to form a covered pedestrian arcade.

The **Columns** at the front of the building that form the five-foot way colonnades and support the upper floors.

The **Five-foot Way** which serves as a sheltered space for social activities and for circulation. It is an important element that contributes to the experience of walking through a conservation area. The elements that contribute to the experience are the floor, colonnade, residential or shopfront and the ceiling. In order to retain the traditional character of the five-foot way, the original height of the covered walkway, the design and size of the columns are to be retained.

The retention or reintroduction of the traditional materials and finishes of the five-foot way is encouraged. Traditional finishes for the five-foot way floors include cement screed, terra cotta tiles, clay tiles, cement terrazzo, mosaic, marble-chip terrazzo or granite slab. The five-foot way often features granite edging parallel to the road side drain and granite steps. Tile patterns used on the five-foot way are sometimes repeated on the front wall of the shophouse either ending as a skirting or under the window to form a decorative wall.

Where the existing floor finishes are not original, traditional materials are to be considered. The selection of the floor finishes preferably matches the architectural style of the shophouses. For instance, it is common for Early Style shophouses to have red-coloured cement screed with gridded rope indentations and granite edge slabs. Art Deco shophouses may have marble-chip terrazzo finish in a variety of colours or mosaic finish. It is untraditional for five-foot ways to be finished in ceramic tiles or slate.

The **Timber Windows** on the upper storeys are evenly spaced across the facade and are either French windows or casement windows with timber shutters, louvred shutters are hinged on the timber window frames. The **Roof** is finished with natural colour unglazed V-profile or flat clay tiles complete with a timber fascia and galvanised iron gutters and downpipes. The pitched roofs are supported by timber purlins which are set onto the load-bearing party walls.

The Shophouse Styles comprise the Early Shophouse Style, First Transitional Shophouse Style, Late Shophouse Style, Second Transitional Shophouse Style and the Art Deco Shophouse Style. The shophouse facade features one of these five basic styles. Within each of these styles, the first storey may be a residential front or an open shopfront.

Shophouses with residential fronts at first storey level are characterised by a double-leafed timber door flanked on both sides by timber casement windows, or by two double-leafed timber doors and a timber casement window. The main door often has a pair of half-doors, known as 'pintu pagar', which are often intricately carved. The timber-framed windows usually have timber-panelled shutters, which open inwards and vertical iron security bars.

Shophouses with shopfronts at the first storey level have a range of traditional features including demountable timber shutter boards, timber or metal sliding and folding doors, or glass display cases. Access doors are incorporated into the shopfronts and these may be single or double-leafed, glazed or timber-panelled, louvred or of rail and stile design. In restoring the shopfront, the use of one of these traditional options is encouraged.

Some residential terrace houses also feature a **Forecourt**. The forecourt is an important feature that gives spatial and green relief to the usual narrow street that is lined with traditional houses. Where it exists, it is to be retained and restored. The proportion and ornamentation of the wall and gate of the forecourt are preferably to be restored to their original expression. These include the coping, lamps, gate posts and entrance canopy.

The conservation guidelines advocate retention, restoration and repair of these main features so as to retain the key characteristics of the traditional shophouse. In adapting the building to suit modern day needs, in some areas, the rear of the building has to be set back for the reinstatement or introduction of the rear service lane and a new rear extension may be permitted.

#### 5 **UNDERSTANDING THE BUNGALOW**

#### 5.1 **KEY ELEMENTS OF THE BUNGALOW**

The conservation guidelines for bungalows are directly related to the typology of the building.

Large bungalows, the majority of which were built prior to World War II, are a significant part of Singapore's heritage. Bungalows are independent dwelling units which are usually one- or two-storeys high. They were first introduced into Singapore and Malaya by the British in the 1830s. They tend to be located in serene and wooded environments away from the hustle and bustle of the city.

Quality restoration of a bungalow requires an appreciation and understanding of the architecture of the building.

Bungalows in Singapore normally consist of the main building which houses the main living and dining areas and the bedrooms. An outhouse is normally part of the original design. It is linked back to the main building and houses the kitchen, toilets and servants' quarters.

In conserving a bungalow, the key elements to be respected are as follows:

- (a) **Roofs**
- (b) Structural Members
- (c) The Facades of the Building
- (d) **Doors and Windows**
- (e) Significant Interior Features Including Staircases, Decorative Mouldings, Double Volume Spaces, etc

The design and material of the bungalows vary according to the architectural style of the building. Singapore bungalows fall into five styles. They are <u>the</u> <u>Early Bungalow</u>, <u>the Victorian Bungalow</u>, <u>the Black & White Bungalow</u>, <u>the Art</u> <u>Deco Bungalow</u> and <u>the Modern Bungalow</u>.

The conservation guidelines relate to the main features of each bungalow type with the intention of retaining the key characteristics of the conserved bungalow. In adapting the building to suit present day needs, the outhouse may be demolished and new extensions may be permitted for additional floor area and greater flexibility of use of the building and the site.

### PART 2: PLANNING PARAMETERS AND RESTORATION GUIDELINES

### 2.1 **HISTORIC DISTRICTS**

The Historic Districts of Boat Quay, Chinatown, Kampong Glam and Little India are characterized by predominantly two- and three-storey shophouses, ranging from the Early Shophouse Style to the Art Deco Shophouse Style.

#### • BOAT QUAY

The Boat Quay Historic District, bounded by South Bridge Road, Circular Road, Lorong Telok and North Canal Road, was traditionally the centre of trading activities along the Singapore River.

Located next to the Downtown Core, its shophouses and warehouses, which lined the river, give it a unique charm and character. Today, it is an area with predominantly commercial premises of retail and eating establishments.

#### • CHINATOWN

The Chinatown Historic District, located south of Singapore River, is the original settlement of the Chinese community in Singapore. It is a largely intact area of shophouses with original texture and fabric, depicting the simple lifestyles of the early immigrant community. The District comprises 4 sub-districts, each with a distinctive character. They are:

- \* Kreta Ayer, bounded by New Bridge Road, Park Road, Upper Cross Street, South Bridge Road, Sago Street, Trengganu Street and Smith Street, is known for its bustling street atmosphere and festive events.
- \* Telok Ayer, bounded by South Bridge Road, Cross Street, Boon Tat Street, Stanley Street, McCallum Street, Amoy Street, Ann Siang Road and Erskine Road, is associated with long rows of shophouses and religious buildings along Telok Ayer Street, and hilly residential and club houses at Ann Siang Hill.
- \* Bukit Pasoh, bounded by New Bridge Road, Keong Saik Road, Kreta Ayer Road, Neil Road and Cantonment Road, provides the setting for a mixture of residential, association and commercial activities.
- \* Tanjong Pagar, bounded by Neil Road, Maxwell Road, Peck Seah Street, Wallich Street, Tanjong Pagar Road and Craig Road, features winding streets and a mixture of residential and commercial activities.

There are altogether five national monuments within the Chinatown Historic District. They are the Sri Mariamman Temple and Jamae Mosque in Kreta Ayer, and the Thian Hock Keng Temple, Nagore Durgha Shrine and Al-Abrar Mosque in Telok Ayer.

#### • KAMPONG GLAM

The Kampong Glam Historic District, bounded by Ophir Road, Victoria Street, Jalan Sultan and Beach Road, was traditionally a Malay residential area with ethnic-based activities at the periphery and along Arab Street. Its unique characteristic lies in the contrast between its streetscape, with its low and uniform scale, and the large open spaces of the palace grounds.

It is largely an area of shophouses with original texture and fabric. The presence and influence of the Arabs in the early 1910s were registered by the names allocated to its streets.

The Sultan Mosque, a national monument, is located within the Kampong Glam Historic District.

#### • LITTLE INDIA

The Little India Historic District, bounded by Serangoon Road, Sungei Road and Jalan Besar, is recognised as the hub of Indian community life in Singapore. It is well patronised by local Indians and people of other ethnic origins, and Indians from abroad. It was once used for agriculture and later for cattle trade.

The District's historical value lies in its rich variety of buildings, streetscape and urban texture of its main streets, side roads, backlanes and open spaces. Most of its built fabric of the late 19th century or early 20th century is still largely intact.

The Abdul Gaffoor Mosque, a national monument, is located within the Little India Historic District.

#### 2.1.1 PLANNING PARAMETERS

#### 2.1.1.1 **Conservation Plan**

The plans (<u>Appendix II</u>) show the boundary of the conservation areas, the core areas, the buildings to be conserved, the residential fronts to be retained/restored, national monuments to be preserved and the envelope control sites. For buildings to be conserved, the entire building is to be restored in accordance with the conservation guidelines. Vacant lands and buildings not designated for conservation can be redeveloped subject to envelope control guidelines.

#### 2.1.1.2 **Building Use**

The use shall follow the Master Plan intention for the respective areas. Residential and institutional use can be considered for sites zoned Commercial.

Hotel use may be considered provided that clearance is also obtained from the Fire Safety and Shelter Department (FSSD), or other relevant agency.

Predominant storage use is not allowed. Storage use on part of a floor is allowed if it is an ancillary function.

In Chinatown, Kampong Glam and Little India, certain streets are located within the designated core area. The core area is the part of the historic district where the focal point of ethnic activities are located. It is, therefore, important that the ethnic ambience is retained.

The first storey in the core area has to be for shops or eating establishments. Certain trades are not permitted in the Historic Districts and the core areas. (See <u>Appendix IA</u> for Incompatible Uses and <u>Appendix IB</u> for Location of Core Areas).

#### 2.1.1.3 **Plot Ratio**

The allowable plot ratio shall be the resultant of the building envelope.

#### 2.1.1.4 **Building Height**

The original building height is to be retained.

#### 2.1.1.5 **Building Profile**

The original building profile is to be retained. If it has undergone unauthorised alterations, the original profile is to be reinstated.

#### 2.1.1.6 **Development Charge**

Under the Planning Act, development charge, equivalent to the difference between the Development Baseline and the Development Ceiling for that land, is payable in respect of any development of the land or when there is a change in the use of the land or building.

Exemption from payment of development charge, if applicable, is given in respect of the value enhancement arising from the proposed use or use changes on the gross floor area for the building or part thereof on the land to be conserved provided that such conservation is carried out in accordance with the approved plans and completed within a period of 2 years from the date of conservation permission.

#### 2.1.1.7 **Carparking**

Provision of car parks or payment of car park deficiency charge for a conserved building is waived if the conservation guidelines are fully complied with and the conservation works are completed in accordance with the approved plans.

#### 2.1.1.8 Strata Subdivision

Modern conserved buildings in the Historic Districts can be strata subdivided if the buildings meet the following criteria:

- (a) Original purpose-built compartmentalized common staircase designed to serve different floors;
- (b) Staircase forms part of the external architectural expression; and
- (c) Original reinforced concrete floors and structures.

To ensure that the building will continue to be properly maintained by the multiple owners, there must be at least three strata units so that a Management Corporation will be formed under the Land Titles (Strata) Act to oversee the maintenance of the building.

#### 2.1.2 **RESTORATION GUIDELINES**

#### **Key Elements Subject To Mandatory Compliance**

The following tables specify the design, location and material for all key elements. The fundamental principle, the "**3R**", is **maximum Retention, sensitive Restoration and careful Repair**. Replacement, if any, is to follow the original design and materials. New installation/addition must not drastically affect the intrinsic character of the building.

#### **IMPORTANT NOTE:**

Where applicable, the requirements of the relevant technical departments are to be complied with. Owners are also required to obtain the consent of the relevant parties for roof eaves, canopies and projections of any nature beyond the site boundary.

RESTORATION GUIDELINES				
	HISTORIC DISTRICTS			
Кеу	External Elements	Design / Location / Material		
А.	Roofs			
A1.	Structure	The majority of conserved shophouses have a pitched clay tile roof supported by timber roof structure.		
		Structural strengthening or supports like steel or reinforced concrete roof beams, if required to be added, are to be sensitively designed to minimise visual impact on the traditional timber system which is to be retained.		
A2.	Main Roof and Rear Secondary Roof	<ul> <li>The original profile, pitch, height, party wall and eaves projection are to be retained and restored.</li> <li>Traditional roofing material of small size, V-profile, unglazed, natural colour clay roof tile is to be used. Flat, interlocking clay roof tile and reinforced concrete can only be used if the existing roof is of those materials.</li> <li>The underside of roof eaves can be exposed or covered with plasterboard.</li> <li>For units with existing ornamental roof ridge, the ridge profile and ornamentation is to be kept. New jackroof is not allowed for such units. To refer to "Specific Facade Restoration Guidelines" of the subject building.</li> </ul>		
		For units with existing ornamental roof ridge, the ridg profile and ornamentation is to be kept. New jackroof not allowed for such units. To refer to "Specific Facad Restoration Guidelines" of the subject building.		

RESTORATION GUIDELINES				
HISTORIC DISTRICTS				
Key External Elements	Design / Location / Material			
A3. Jackroof	Existing jackroof, if any, can be retained or removed.			
	New jackroof can be added subject to compliance with the positioning, setbacks and maximum allowable dimensions.			
	See Figure 1			
	Roof tile is to be identical to that of the main roof.			
	Sidewall is to be solid and finished with plaster or timber/plasterboard.			
	Front and rear openings can be fixed or openable of any infill material. If metal is used, it is to be anodised or colour coated.			
A4. Skylight	New skylight can be added on the rear slope of the main pitched roof and on secondary pitched roof.			
	The area of the skylight cannot exceed 30% of the subject slope of the pitched roof.			
	New skylight can also be added on a conserved building with flat roof. While the design, treatment and materials used can vary, the height cannot exceed 1m, which is the typical roof parapet height, so that the skylight is not visible from the street level. The skylight area is to be computed as part of the 35% coverage allowable for new single storey structure on the flat roof (see item A7).			
	Skylight is to be of transparent or translucent material on framework of timber or metal - painted or anodised or colour coated. The design, treatment and material used can vary. It can consist of glass louvres, retractable panels or even solar panels laid on the same plane as the roof.			
	To minimise disruption to the roofscape, the skylight cannot be an opening or void without cover.			
A5. Dormer Window	Dormer window is not allowed.			

RESTORATION GUIDELINES					
HISTORIC DISTRICTS					
Key External Elements		Design / Location / Material			
A6.	Use of Existing Flat Roofs	Existing flat roof can be landscaped to add interest to the roofscape. It can also be converted into usable space as an extension of the existing building. For example, if the building is used as a restaurant, the rooftop can be for outdoor dining. Conservation Permission must be obtained for the change of use. To meet technical agencies' requirements, railings of compatible design and material can be added.			
A7.	Structures on Existing Flat Roofs	New structures can be added on the existing flat roof, subject to the following guidelines:			
		(a) Material, Roof Form & Storey Height			
		The structure can be of reinforced concrete or lightweight material with flat roof and single-storey in height not exceeding 3600mm. The design and treatment are to be compatible with the architecture of the conserved building.			
		(b) <u>Coverage</u>			
		The total coverage of all existing and new structures on the flat roof, including skylight but excluding moveable cover like umbrella structure and retractable awnings, cannot exceed 35% of the flat roof area of the unit. All service installations on the roof are to be grouped together and included in the 35% allowable coverage for structure on flat roof.			
		(c) <u>Setback</u>			
		The new structure is to be set back a minimum of 3m from the front and side street elevations so that it is not visually obvious from the street. Setback is not required from party wall and backlane.			
		See Figure 2			
В.	Forecourt				
B1.	Enclosure	The original size and ornamentation of the wall and gate are to be retained and restored. To refer to "Specific Facade Restoration Guidelines" of the subject building.			
		should be kept.			

RESTORATION GUIDELINES					
HISTORIC DISTRICTS					
Design / Location / Material					
·					
Design and material can vary except for selected street blocks where the original shopfront is to be retained, such as the 32 units at Bussorah Street in Kampong Glam Conservation Area as shown in <u>Appendix II</u> . However, it must not be a blank wall as it gives a passive character to the streetscape. Existing original ornamental transom panels above the shop front, are to be retained. To refer to "Specific Facade Restoration Guidelines" of the subject building.					
<ul> <li>The original residential front is to be retained for selected street blocks as shown in <u>Appendix II</u>. To refer to "Specific Facade Restoration Guidelines" of the subject building.</li> <li>The following guidelines are applicable to a conserved building allowed for non-residential use: <ul> <li>(a) The original 2 windows and 1 door first storey residential front can be changed to 2 doors and 1 window. The design and material of the new door are to match those of the original one.</li> <li>(b) If the original infill panel of the first storey casement windows and doors are plain without any design features, they can be replaced with clear glass. However, if the infill panels are carved with decorations, they are to be retained and cannot be replaced with clear glass. To refer to "Specific Facade Restoration Guidelines" of the subject building.</li> </ul> </li> <li>(c) Alternatively, fixed frameless or timber framed glazed panels can be added instead of secondary windows, and frameless glass doors can be added as secondary doors while the original timber windows and doors are retained and restored.</li> <li>This gives owners another option to keep the original architecture of the conserved building while achieving greater transparency and climatic control of the internal space.</li> </ul>					

RESTORATION GUIDELINES					
HISTORIC DISTRICTS					
Key External Elements	Design / Location / Material				
C3. Window Screen/Security Bars	For units under Residential Front Control, existing traditional window screen, if any, is to be retained. To refer to "Specific Facade Restoration Guidelines" of the subject building.				
	New window screen can be added and the design is to be traditional. The frame is to be timber and the infill may be timber or obscure glass.				
	Security bars at windows and doors, if any, can be retained or removed. New security bars of traditional design and material can be added.				
C4. Pintu Pagar	For units under Residential Front Control, existing pintu pagar, if any, is to be retained. To refer to "Specific Facade Restoration Guidelines" of the subject building.				
	New pintu pagar can be added and the design is to be traditional. The frame is to be timber and the infill is to be of traditional materials i.e. timber and obscure glass.				
C5. Dado Tiles	The following guidelines are applicable to a conserved building with dado tiles:				
	(a) If the tiles are intact, the original tile panel is to be retained.				
	(b) If there are cracked or missing tiles,				
	<ul> <li>(i) Replace the missing tiles with tiles matching the original tiles,</li> </ul>				
	(ii) Leave the tile panel as it is, or				
	(iii) Patch the gaps with colour cement to match the colour of the tiles.				
	(c) If the majority of the tiles are damaged or missing,				
	(i) Replace the tile panel completely with tiles of the same genre as the original tiles, or				
	(ii) Remove the tile panel if tiles of matching design cannot be found.				

RESTORATION GUIDELINES				
HISTORIC DISTRICTS				
Key External Elements	Design / Location / Material			
C6. Fanlights, Windows, Doors and Vents, Balconies and Verandahs	The original fanlights, windows, doors, vents, balconies and verandahs are to be retained and restored. To refer to "Specific Facade Restoration Guidelines" of the subject building.			
	The balcony or verandah is to be kept open and not enclosed with window or fixed glazing. The inner facade behind the balcony or verandah is also to be retained and restored. The windows of the inner facade can be changed to doors for better access to the balcony or verandah. The design and material of the new door are to match those of the original one.			
	New internal elements such as staircase landing, wall, and partition cannot abut the original window or door openings and vents and are to be sufficiently set back.			
	Existing mild steel frames of doors, windows and vents can be changed to powder coated aluminium frames of similar appearance as the mild steel frames.			
	Existing coloured glass in doors, windows, fanlights and vents cannot be replaced with clear glass.			
C7. Balustrades for French Window	The original balustrade for French window is to be retained and restored. To refer to "Specific Facade Restoration Guidelines" of the subject building.			
C8. Secondary Windows and Doors	New secondary casement, French or sliding window and door can be added subject to the design being compatible with those of the main window and door.			
	The frame can be of any material. If metal is used, it is to be anodised or colour coated. However, owners are encouraged to use timber frames as they are more compatible with the architecture of the conserved buildings.			
	The infill can be of timber or glass. Tinted, coloured and obscure glass can be used.			
	Frameless fixed glass panels can be installed at the first storey windows. However, they cannot be used in place of secondary windows on the upper storeys of a conserved building as they will lead to difficulty in accessing and maintaining the original windows.			
	See Figure 3			

RESTORATION GUIDELINES						
HISTORIC DISTRICTS						
Key	ey External Elements		Design / Location / Material			
C9.	Decorative Features	The original decorative features, if any, are to be retained and restored. To refer to "Specific Facade Restoration Guidelines" of the subject building.				
C10.	Canopy and Awnings	Original tile canopy, if any, is to be retained and restored. To refer to "Specific Facade Restoration Guidelines" of the subject building.				
		New tile canopy can be added at 2nd storey floor level.				
		Traditional roofing material of small size, V-profile, unglazed, natural colour clay tiles identical to those of the main roof or green glazed Chinese clay tiles can be used.				
		See Figure 4				
		Retractable awning can be added at 2nd storey floor level. It is to be sensitively installed under the main beam, and not cover or block any key architectural features.				
		See Figure 5				
		They are subject to relevant technical agencies' requirements, e.g. Singapore Land Authority (SLA), Land Transport Authority (LTA), Fire Safety and Shelter Department (FSSD).				
C11.	Finishes	(a)	<u>Timber Surfaces</u> Timber surfaces can be either painted or stained.			
		(b) <u>s</u> F F	<u>Shanghai Plaster Finish</u> For a building with existing unpainted Shanghai plaster finish, the finish is to be retained and restored.			
		l t F	If the Shanghai plaster finish is already painted over, then the building can be repainted although the owner is strongly encouraged to remove the paint work and revert to the original Shanghai plaster finish.			
		(c) <u> </u>     	Fair-faced Brickwalls For a building with existing unpainted fair-faced brickwalls, the fair-faced brickwalls are to be retained and restored.			
		l c t f	If the fair-faced brickwalls are already painted over, then the walls can be repainted although the owner is strongly encouraged to remove the paint work and revert to the original fair-faced finish.			
RESTORATION GUIDELINES						
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HISTORIC DISTRICTS						
Key External Elements	Design / Location / Material					
C12. Building Colours	Traditional paint schemes and colours are to be used to recall the historic streetscape.					
	Generally the base colour of shophouses has a pastel hue. Where necessary, strong colours can be used to highlight selected features or decorative ornamentations.					
	Original painted murals and cut-tile decorations are not to be removed or painted over.					
	For buildings with distinctive colour, e.g. the "Gedung Kuning" (Yellow Mansion) in Kampong Glam, the same colour should remain. To refer to the "Specific Restoration Guidelines" for the subject building.					
D. Five-Foot Way						
D1. Floors	<ul> <li>Traditional materials and finishes of the five-footway contribute to the overall character of the conservation area. They include cement screed, terracotta tiles, clay tiles, cement terrazzo, mosaic, marble chip terrazzo or granite slab. Owners are strongly encouraged to keep the original floor finish, if existing. Where the existing floor finishes are not original, owners are strongly encouraged to reintroduce traditional floor finishes.</li> <li>The tiling material is to be non-slip for the safety of pedestrians. Highly polished gloss finish is not allowed.</li> <li>The level of the five-foot way is to match the adjacent units and open walkway where possible. Where the difference in level is not more than 175mm, a ramp is to be provided.</li> <li>The gradient of the ramp cannot be steeper than 1:10.</li> <li>As shophouses are typically under different ownership and restored at different times, an owner has the following options:</li> <li>(a) Liaise with neighbours to level the ramp.</li> <li>(b) Provide gradual ramps.</li> <li>(c) Keep the existing step if the adjacent units are not restored.</li> </ul>					

RESTORATION GUIDELINES		
HISTORIC DISTRICTS		
Key	External Elements	Design / Location / Material
D2.	Ceiling	Exposed upper floor structure of timber boards and timber joists is preferred. Existing exposed reinforced concrete floor above, if any, can remain.
		False ceiling of timber frame and plaster /timber board, not lower than the front facade beam, can be added.
		Variations in design and use of alternative compatible material can also be added at the main entrance.
E.	End Gable Wall	L
E1.	Windows, Doors and Vents	Existing openings such as casement windows, doors and vents, if any, can be retained or sealed up.
		New openings, casement windows, doors and vents can be added subject to retention of the solid and void expression of the end gable wall, i.e. the wall space between the windows should have a minimum dimension equal to the new window opening width. They should align with the existing windows, if any, and the proportion should follow the existing windows.
		The design and material of the new windows and doors are to match the original windows at the end gable wall, or those of the front facade upper storey windows. To refer to "Specific Facade Restoration Guidelines" of the subject building for the front facade windows.
		Vents can be of any material. If metal is used, it is to be anodised or colour coated.
		See Figure 7
		New internal elements such as staircase landing, wall and partition cannot abut the window or door openings and vents, and are to be sufficiently setback.
E2.	Canopies	New canopies over doors and windows with a projection of not more than 450mm can be added. The frame is to be timber and the roof material, similar to that of the main roof.
		See Figure 7
		They are subject to relevant technical agencies' requirements, e.g. Singapore Land Authority (SLA), Land Transport Authority (LTA), Fire Safety and Shelter Department (FSSD)

RESTORATION GUIDELINES		
HISTORIC DISTRICTS		
Key	External Elements	Design / Location / Material
F.	Rear Facade Of Main Buil	ding
F1.	Window Facing Rear Court	The original windows facing the rear court can be retained and restored, or changed to French windows subject to the design and material matching those of the front facade.
		<u>See Figure 8</u>
		New internal elements such as staircase landing, wall and partition cannot abut the window openings and vents, and are to be sufficiently setback.
F2.	Vents	Existing vents, if any, can be retained or removed. New vents of any material can be added. If metal is used, it is to be anodised or colour coated.
F3.	Canopies	New canopies over doors and windows with a projection of not more than 450mm can be added.
		The frame is to be timber and the roof material, similar to that of the main roof.
G.	Rear Service Block	
G1.	Windows and Openings Facing Rear Court	Existing windows and openings, if any, can be retained and restored. New casement and French windows with or without brickwall between windows, can be added subject to the design and material matching those of the front facade upper storey windows. Existing openings can also be infilled with grilles. If metal is used, it is to be anodised or colour coated.
		See Figure 9
		New internal elements such as staircase landing, wall and partition cannot abut the original window openings and vents, and are to be sufficiently setback.
G2.	Vents	Existing vents, if any, can be retained or removed.
		New vents of any material can be added. If metal is used, it is to be anodised or colour coated.
G3.	Canopies	New canopies over doors and windows with a projection of not more than 450mm can be added.
		The frame is to be timber and the roof material similar to that of the main roof.

RESTORATION GUIDELINES		
HISTORIC DISTRICTS		
Key	External Elements	Design / Location / Material
Н.	Rear Court	
H1.	Roof	A new roof of any profile can be added over the rear court, provided the roof is not higher than the 2nd storey floor level.
		Jackroof and skylight can be introduced in the new roof which can be reinforced concrete, light weight material or same roof material as the main roof. If metal is used, it is to be anodised or colour coated.
		Reinforced concrete flat roof can be used as a roof garden and landscape furniture can be considered. The rear boundary wall can be raised up to the sill height of the 2nd storey windows to form a parapet, not exceeding 1m in height. The space along the parapet can be used to house condensing units. Any screening above is to be kept minimal in height and is to be effective screening in the form of simple grilles or louvres. If metal is used, it should be anodised or colour-coated.
		<u>See Figure 10</u>
H2.	External Staircase	External staircases within rear courts are distinctive architectural features of the conserved buildings.
		For selected streetblocks, the intact external staircases are to be kept and used as secondary access routes.
		These street blocks are Nos. 15 to 43 (odd nos. only) Tanjong Pagar Road in the Tanjong Pagar Conservation Area.
		In other areas, owners are encouraged to keep the existing external staircase so as to contribute to the charm and character of the area.
		New external staircase of any material can be added. If metal is used, it is to be anodised or colour coated.
I.	Rear/Side Boundary Wall	
11.	Wall Height	The original height of the wall is to be retained, except
		<ul> <li>(a) when the rear court is to be roofed over and the wall has to be raised up to the 2nd storey floor level to give sufficient headroom, and</li> </ul>
		(b) if it is required to meet the minimum parapet height for roof terrace over the rear court or for screening of condensing units (refer to item H1).

RESTORATION GUIDELINES		
HISTORIC DISTRICTS		
Key	External Elements	Design / Location / Material
12.	Windows and Vents	At upper storeys, new vents and casement windows can be added subject to the design and material matching those of the front facade upper storey windows.
		At the 1st storey, only vents and high level windows can be added.
		Vents can be of any material. If metal is used, it is to be anodised or colour coated. The frames of high level windows are to match those of the upper storey front facade windows and the infill can be glass.
		New internal elements such as staircase landing, wall and partition cannot abut the window openings and vents.
13.	Doors	Existing door position can be retained or changed. The doorway can be enlarged subject to a width of not more than 1800mm.
		Timber or metal can be used. If metal is used, it is to be anodised or colour coated.
14.	Canopy	New canopies over doors and windows with a projection of not more than 450mm can be added.
		The frame is to be timber and the roof material, similar to that of the main roof.
		They are subject to relevant technical agencies' requirements, e.g. Singapore Land Authority (SLA), Land Transport Authority (LTA), Fire Safety and Shelter Department (FSSD).
J.	Airwell	
J1.	Size	The original size and location is to be retained and restored.
J2.	Roof	A new roof of any profile can be added over the airwell, provided the roof is lower than the eave of the main roof. No other above ground structure or slab is to be added within the airwell space.
		Light weight transparent or translucent roof covering is to be used. If metal framework is used, it is to be anodised or colour coated. The cover can be retractable or fixed. <u>See Figure 11</u>

RESTORATION GUIDELINES	
HISTORIC DISTRICTS	
Key External Elements	Design / Location / Material
J3. Windows	The original windows are to be retained and restored. New casement/French windows can be added subject to the design and material matching those of the front facade upper storey windows. To refer to "Specific Facade Restoration Guidelines" of the subject building. New internal elements such as staircase landing, wall and partition cannot abut the window openings and
	vents.
J4. Enclosure	Original decorative or ornamental features, if any, at the airwell are to be retained and restored.
	The existing windows/openings in only one of the three sides of the airwell, excluding the existing party wall, can be fully walled up.

RESTORATION GUIDELINES		
HISTORIC DISTRICTS		
Key	Internal Elements	Design / Location / Material
к.	Floors	
K1.	Structure	The majority of conserved buildings have timber floor boards on timber structure.
		Horizontal and/or vertical structural supports, if required to be added, are to abut the party walls to minimise impact on the existing structural system which is to be retained.
		For original reinforced concrete framed buildings, the original structural grids are to be retained. New columns, if required to be added, are to align with and respect the original grids.
		Provided the structural integrity of the building is not compromised, flexibility to shift some columns to meet the specific operational/ functional requirements can be considered on a need-to basis.
K2.	Upper Storey Levels	The existing level, timber floor and structural system are to be retained and restored. If the existing floors are reinforced concrete, the same material can be retained.
		Voids up to 25% of the floor area of each floor of the unit, can be introduced.
		For wet areas e.g. toilets and kitchen, reinforced concrete floor can be used.
К3.	1st Storey Level	The existing floor level can be raised to meet the minimum platform level required by the relevant technical agency.
		Part of the existing level can be lowered for landscaping/ponds.
К4.	Basement	New basement is not allowed.

RESTORATION GUIDELINES	
HISTORIC DISTRICTS	
Key Internal Elements	Design / Location / Material
L. Party Wall	·
L1. Structure	Party walls are principal load-bearing walls. Horizontal and/or vertical structural supports, if required to be added, are to abut the party walls to minimise impact on the existing structural system which is to be retained.
L2. Openings	The first 3-metre length of the load-bearing party wall perpendicular to the 1st storey shopfront is to be retained to keep the fine-grained character of the shophouses.
	Slight reductions or variations within the first 3m can be considered on a need-to basis.
	Openings in the load-bearing party walls can be introduced, provided the total width of the openings is less than 50% of the total length of the party wall within the building envelope.
	For original reinforced concrete framed buildings, there is no control on party wall openings and the first 3- metre length of the party wall perpendicular to the 1st storey shopfront need not be retained.
M. Staircase	Existing staircase can be retained, removed or relocated.
	If the building has timber floors, new staircase to replace or supplement the existing one is to be constructed in timber or metal. The layout and railing design of the new staircase can vary. Only existing reinforced concrete staircase can be retained.
	New staircase cannot abut any door or window openings or vents at the front, side and rear facades, airwell, rear service block or end gable wall.

	RESTO	ORATION GUIDELINES
HISTORIC DISTRICTS		
Key Internal Elements Design / Location / Material		Design / Location / Material
N.	Roof Mezzanine	New roof mezzanine can be added within the building envelope. The new floor structure is to be set back:
		(a) A minimum of 1500mm from the inner face of the front facade wall if it is not lower than the top of the window/fanlight at the front facade of the uppermost storey.
		(b) A minimum of 2500mm from the inner face of the front facade wall if it is lower than the top of the window/fanlight at the front facade of the uppermost storey.
		If the front facade has an existing balcony, it is not necessary to set back the new floor. The floor cannot abut any window/door or transom/fanlight.
		Minimum headroom and floor area are subject to compliance with the requirements of relevant technical agencies.
		Traditional material of timber floor boards on timber joists are to be used.
		Reinforced concrete can be used only if the original uppermost floor is of the same material.
		See Figure 12
Ο.	Ceiling	<u>Uppermost Floor</u> Typically, the false ceiling is at or above the springing line. If the ceiling is lowered below the springing line, it is to be setback 1500mm or 2500mm following the roof mezzanine guidelines [refer to Item N(a) and (b)].
		Lower Floors Exposed upper floor structure of timber boards and timber joists is preferred.
		If required, new false ceilings not lower than the original window openings or transom/fanlight/vents can be added.

	RESTC	RATION GUIDELINES
HISTORIC DISTRICTS		
Mech	nanical & Electrical and Others	Design / Location / Material
Ρ.	Flue	Existing masonry flue, if any, can be retained, repositioned or removed. New flue can be added.
		Repositioned or new flue is to be neatly located in either the rear slope of the main roof or the rear secondary roofs or abutting the wall of rear facade/rear service block within the rear court. It can also abut the rear service block wall of the adjacent unit.
		The roof of the flue can be pitched or flat and is to be lower than the ridge of the main roof. <u>See Figure 13</u>
		All external walls are to be of plastered brick or plaster board, and the pitched roof to be unglazed natural colour clay tiles of profile identical to the main roof or of reinforced concrete.
		Alternatively, metal flues can be exposed and painted the same colour as the background wall.
		The use of electrostatic air cleaning system is encouraged.
Q.	Exhaust Fan	Exhaust fan is to be placed at the rear facade or rear service block facing the rear court.
		Any material can be used. If metal is used, it is to be anodised or colour coated.
R.	Lift Shaft	Lifts can be added. However, if the shaft protrudes beyond the roof, it must be located at the rear slope of the main roof or on the secondary roof and lower than the roof ridge of the main roof.
S.	Conduits and Pipes	Rainwater downpipes, gas pipes and air-condensing conduit pipes can be mounted on the surface of the rear wall. The air-condensing conduit pipes are to be properly encased and neatly laid out.
		Rainwater downpipes including gutters, if provided, are not to be in stainless steel.
		All other utility/conduit pipes are not to be mounted on the surface of the external walls, unless specifically required by the relevant technical agencies.
		Exposed lightning tape and conductor are to be installed at a location least obtrusive from the front exterior.

RESTORATION GUIDELINES	
HISTORIC DISTRICTS	
Mechanical & Electrical and Others	Design / Location / Material
T. Air Conditioning System	Condensing units are to be integrated within the building envelope at the rear in a recess created within the rear boundary wall, or an opening created within the roof of the rear service block. The opening is to be properly screened. If metal is used for the screening, it is to be anodised or colour coated.
	See Figure 14
	However, due to practical constraints in integrating the units within the building envelope and the differing needs of tenants and users, the condensing units can be neatly or compactly placed at the rear and lined along the parapet, party walls or rear service block walls. The units are to be screened unless they are small and not visible from the street level.
	See Figure 15
	Other locations for placing the condensing units can be considered on the merits of each case if there are particular site constraints, e.g. when the conserved building is "back-to-back" with another building.
U. Rooftop Mechanical & Electrical Plants and Services	Mechanical & electrical plants and rooftop services are to be visually screened from the top and all sides. If metal is used for the screening, it is to be anodised or colour coated.
	The spacing of trellises, louvres or other similar types of construction used for screening are to be equal or less than the depth of its individual members.
	The screening elements are to be orientated to cut off views of the services from the street level and surrounding buildings.
	If perforated panels are used, the porosity (i.e. percentage of void-to-solid) of the perforated panels is to be equal or less than 25% and the size of openings cannot exceed 30mm in diameter.
V. Letterboxes	The placement and design of letter boxes along the public five-footway should take into account pedestrian safety. Preferably, they should be integrated into the shop front or residential front.
	See Figure 16



### 2.1.3 DRAWINGS & ILLUSTRATIONS

(Click <u>here</u> to see Figure 1 to Figure 16)

- Figure 1: Jackroof
- Figure 2: Allowable Structures on Existing Flat Roofs
- Figure 3: Secondary Windows
- Figure 4: Canopy
- Figure 5: Retractable Awning
- Figure 6: Five-Foot Way Floors
- Figure 7: End Gable Wall
- Figure 8: Rear Façade of Main Building
- Figure 9: Rear Service Block
- Figure 10: Rear Court and Rear Boundary Wall
- Figure 11: Airwell
- Figure 12: Roof Mezzanine
- Figure 13: Flue
- Figure 14: Condensing Units Integrated within Building Envelope
- Figure 15: Condensing Units Placed at Rear Parapet and Walls
- Figure 16: Letterbox

# 2.2 **RESIDENTIAL HISTORIC DISTRICTS**

The historic buildings in Blair Plain, Cairnhill and Emerald Hill Conservation Areas are predominantly two-and three-storey terrace houses which stand in contrast to the neighbouring new and modern high-rise developments. Their low-rise urban form coupled with their narrow streets and architectural significance gives a streetscape not commonly found in Singapore.

#### • BLAIR PLAIN

The Blair Plain Residential Historic District, located to the west of the Downtown Core, is still an attractive residential area with some commercial activities along Kampong Bahru Road. It is a compact cluster of two-and three-storey shophouses and residential terrace houses of the Early, Transitional, Late Shophouse and Art Deco Styles.

#### • CAIRNHILL

The Cairnhill Residential Historic District, located to the north-west of the Downtown Core, is a quiet residential area of predominantly two-storey terrace houses built in the Late Shophouse and Art Deco Styles. Today, though the area is surrounded by high-rise buildings of varying scale, the charm of the pre-war terrace houses is still retained.

#### EMERALD HILL

The Emerald Hill Residential Historic District located to the north-west of the Downtown Core, is an attractive and quiet residential area. It has some commercial premises in the shopping zone along Orchard Road. The predominantly two-storey terrace houses showcase a variety of architectural styles ranging from Transitional to Art Deco Styles built over ninety years. There are some modern high-rise buildings towards the northern end of Emerald Hill Road.

# 2.2.1 PLANNING PARAMETERS

#### 2.2.1.1 **Conservation Plan**

The plans (<u>Appendix II</u>) show the boundary of the conservation areas, the buildings to be conserved, the residential fronts to be retained/restored, and the envelope control sites. For buildings to be conserved, the entire building is to be restored in accordance with the conservation guidelines. Vacant lands and buildings not designated for conservation can be redeveloped subject to envelope control guidelines.

### 2.2.1.2 Building Use

The use shall follow the Master Plan intention for the respective areas which are predominantly for residential use. The exceptions are as follows:

Blair Plain:	House Nos. 1 to 89 (Odd Nos.)
	Kampong Bahru Road are zoned Commercial.
	House No. 167 Neil Road, House Nos. 52 and 54 Blair Road and House Nos. 63, 64, 68 & 69 Spottiswoode Park Road are zoned Residential with Commercial at the 1st storey. As they are within a residential area, it is preferable that they are used for residential purpose.
Cairnhill:	House No. 56 Cairnhill Road is zoned Commercial.
Emerald Hill:	House No. 180 Orchard Road (Peranakan Place), House No. 202 Orchard Road, House Nos. 2, 3, 5, 7 and 9 Emerald Hill Road and House Nos. 17 to 49 (Odd Nos.) Cuppage Road are zoned Commercial.

### 2.2.1.3 **Plot Ratio**

The allowable plot ratio shall be the resultant of the building envelope.

### 2.2.1.4 **Building Height**

The original building height is to be retained.

### 2.2.1.5 **Building Profile**

The original building profile is to be retained. If it has undergone unauthorised alteration, the original profile is to be reinstated.

# 2.2.1.6 **Rear Extension**

The predominant use in these areas is residential. In view of the restriction on use, all units can have extension at the rear of the main conserved building. The rear extension is to be lower than the main roof and not to exceed the allowable number of storeys for landed housing development i.e. 3 storeys.

# 2.2.1.7 **Development Charge**

Under the Planning Act, development charge, equivalent to the difference between the Development Baseline and the Development Ceiling for that land, is payable in respect of any development of the land or when there is a change in the use of the land or building

However, exemption from payment of development charge, if applicable, is given in respect of the *value enhancement arising from the proposed use or use changes on the gross floor area for the building or part thereof on the land to be conserved* provided that such conservation is carried out in accordance with the approved plans and completed within a period of 2 years from the date of conservation permission.

# 2.2.1.8 **Carparking**

Provision of car parks or payment of car parks deficiency charge for a conserved building is waived if the conservation guidelines are fully complied with and the conservation works are completed in accordance with the approved plans.

### 2 **RESTORATION GUIDELINES**

#### **Key Elements Subject To Mandatory Compliance**

The following tables specify the design, location and material for all key elements. The fundamental principle, the "**3R**", is **maximum Retention, sensitive Restoration and careful Repair**. Replacement, if any, is to follow the original design and materials. New installation/addition must not drastically affect the intrinsic character of the building.

#### **IMPORTANT NOTE:**

Where applicable, the requirements of the relevant technical agencies are to be complied with. Owners are also required to obtain the consent of the relevant parties for roof eaves, canopies and projections of any nature beyond the site boundary.

RESTORATION GUIDELINES		
<b>RESIDENTIAL HISTORIC DISTRICTS</b>		
Key External Elements		Design / Location / Material
Α.	Roofs	
A1.	Structure	The majority of conserved shophouses have a pitched clay tile roof supported by timber roof structure.
		Structural strengthening or supports like steel or reinforced concrete roof beams, if required to be added, is to be sensitively designed to minimise visual impact on the traditional timber system which is to be retained.
A2.	Main Roof and Rear Secondary Roof	The original profile, pitch, height, party wall and eaves projection is to be retained and restored.
		Traditional roofing material of small size, V-profile, unglazed, natural colour clay roof tile is to be used. Flat, interlocking clay roof tile and reinforced concrete are allowed only if the existing roof is of those materials.
		The underside of roof eaves can be exposed or covered with plasterboard.
		For units with existing ornamental roof ridge, the ridge profile and ornamentation is to be kept. New jackroof is not allowed for such units. To refer to "Specific Facade Restoration Guidelines" of the subject building.

RESTORATION GUIDELINES		
RESIDENTIAL HISTORIC DISTRICTS		
Key External Elements	Design / Location / Material	
A3. Jackroof	Existing jackroof, if any, can be retained or removed.	
	New jackroof can be added subject to compliance with the positioning, setbacks and maximum allowable dimensions.	
	See Figure 1	
	Roof tile is to be identical to that of the main roof.	
	Sidewall is to be finished with plaster or timber/ plasterboard or glazed panels.	
	Front and rear openings can be fixed or openable of any infill material. If metal is used, it is to be anodised or colour coated.	
A4. Skylight	New skylight can be added on the rear slope of the main pitched roof, on secondary pitched roof and on the rear slope of new jackroof. Skylight on the jack roof is to be located beyond the first quarter of the rear slope of the jackroof to keep the character of a typical jackroof.	
	See Figure 1	
	The total area of the skylight cannot exceed 30% of the subject slope of the pitched roof.	
	New skylight can also be added on a conserved building with flat roof. While the design, treatment and materials used can vary, the height cannot exceed 1m, which is the typical roof parapet height, so that the skylight is not visible from the street level. The skylight area is to be computed as part of the 35% coverage allowable for new single storey structure on the flat roof.	
	<u>See item A7</u>	
	The skylight is to be of transparent or translucent material on framework of timber or metal - painted or anodised or colour coated. The design, treatment and material used can vary. It can consist of glass louvres, retractable panels or even solar panels laid on the same plane as the roof.	
	To minimise disruption to the roofscape, the skylight cannot be an opening or void without cover.	

RESTORATION GUIDELINES		
RESIDENTIAL HISTORIC DISTRICTS		
<b>Key External Elements</b>	Design / Location / Material	
A5. Dormer Window	Dormer window is not allowed.	
A6. Use of Existing Flat Roof	Existing flat roof can be landscaped to add interest to the roofscape.	
	To meet technical agencies' requirements, railings of compatible design and material can be added.	
A7. Structure on Existing Flat Roof	New structures can be added on the existing flat roof, subject to the following guidelines:	
	(a) <u>Material, Roof Form &amp; Storey Height</u>	
	The structure can be of reinforced concrete or lightweight material with flat roof and single-storey in height not exceeding 3600mm. The design and treatment are to be compatible with the architecture of the conserved building.	
	(a) <u>Coverage</u>	
	The total coverage of all existing and new structures on the flat roof, including skylights but excluding moveable covers eg umbrella structures and retractable awnings, cannot exceed 35% of the flat roof area of the unit. All service installations on the roof are to be grouped together and included in the 35% allowable coverage for structure on flat roof.	
	(a) <u>Setback</u>	
	The new structure is to be set back a minimum of 3m from the front and side street elevations so that it is not visually obvious from the street. Setback is not required from party wall and backlane.	
	See Figure 2	

RESTORATION GUIDELINES		
RESIDENTIAL HISTORIC DISTRICTS		
Key External Elements		Design / Location / Material
В.	Forecourt	
B1.	Enclosure	The original size and ornamentation of the wall and gate are to be retained and restored. To refer to "Specific Facade Restoration Guidelines" of the subject building.
		should be kept.
C.	Front / Side Facade	
C1.	<b>Shopfront</b> (only for units where commercial use is allowed)	Design and material can vary. However, it must not be a blank wall as it gives a passive character to the streetscape. Existing original ornamental transom panels above the shop front, are to be kept. To refer to "Specific Facade Restoration Guidelines" of the respective building.
C2.	Residential Front	The original residential fronts are to be retained for residential conserved buildings. To refer to "Specific Facade Restoration Guidelines" of the subject building.
		The following guidelines are applicable to a conserved building allowed for non-residential use:
		(a) The original 2 windows and 1 door first storey residential front can be changed to 2 doors and 1 window. The design and material of the new door are to match those of the original one.
		(b) If the original infill panel of the first storey casement windows and doors are plain without any design features, they can be replaced with clear glass. However, if the infill panels are carved with decorations, they are to be retained and cannot be replaced with clear glass. To refer to "Specific Facade Restoration Guidelines" of the subject building.
		(c) Alternatively, fixed frameless or timber framed glazed panels can be added instead of secondary windows, and frameless glass doors can be added as secondary doors while the original timber windows and doors are retained and restored.
		This gives owners another option to keep the original architecture of the conserved building while achieving greater transparency and climatic control of the internal space.

RESTORATION GUIDELINES		
RESIDENTIAL HISTORIC DISTRICTS		
<b>Key External Elements</b>	Design / Location / Material	
C3. Window Screen / Security Bars	For units under Residential Front Control, existing traditional window screen, if any, is to be retained. To refer to "Specific Facade Restoration Guidelines" of the subject building.	
	New window screen can be added and the design is to be traditional. The frame is to be timber and the infill may be timber or obscure glass.	
	Security bars at windows and doors, if any, can be retained or removed. New security bars of traditional design and material can be added.	
C4. Pintu Pagar	The existing pintu pagar, if any, is to be retained. To refer to "Specific Facade Restoration Guidelines" of the subject building. New pintu pagar can be added and the design is to be traditional. The frame is to be timber and the infill is to be of traditional materials i.e. timber and obscure glass.	
C5. Dado Tiles	The following guidelines are applicable to a conserved building with dado tiles:	
	(a) If the tiles are intact, the original tile panel is to be retained.	
	(b) If there are cracked or missing tiles,	
	(i) Replace the missing tiles with tiles matching the original tiles,	
	(ii) Leave the tile panel as it is, or	
	(iii) Patch the gaps with colour cement to match the colour of the tiles.	
	(c) If the majority of the tiles are damaged or missing,	
	(i) Replace the tile panel completely with tiles of the same genre as the original tiles, or	
	(ii) Remove the tile panel if tiles of matching design cannot be found.	

RESTORATION GUIDELINES		
RESIDENTIAL HISTORIC DISTRICTS		
Key External Elements	Design / Location / Material	
C6. Fanlights, Windows, Doors and Vents, Balconies and Verandahs	The original fanlights, windows, doors, vents, balconies and verandahs are to be retained and restored. To refer to "Specific Facade Restoration Guidelines" of the subject building.	
	The balcony or verandah is to be kept open and not enclosed with window or fixed glazing. The inner facade behind the balcony or verandah is also to be retained and restored. The windows of the inner facade can be changed to doors for better access to the balcony or verandah. The design and material of the new door are to match those of the original one.	
	New internal elements such as staircase landing, wall and partition cannot abut the original window or door openings and vents and are to be sufficiently set back.	
	Existing mild steel frames of doors, windows and vents can be changed to powder coated aluminium frames of similar appearance as the mild steel frames.	
	Existing coloured glass in doors, windows, fanlights and vents cannot be replaced with clear glass.	
C7. Balustrades for French Window	The original balustrade for French window is to be retained and restored. To refer to "Specific Facade Restoration Guidelines" of the subject building.	
C8. Secondary Windows & Doors	New secondary casement, French or sliding window and door can be added subject to the design being compatible with those of the main window and door.	
	The frame can be of any material. If metal is used, it is to be anodised or colour coated. However, owners are encouraged to use timber frames as they are more compatible with the architecture of the conserved buildings.	
	The infill can be of timber or glass. Tinted, coloured and obscure glass can be used.	
	Frameless fixed glass panels can be installed at the first storey windows. However, they cannot be used in place of secondary windows on the upper storeys of a conserved building as they will lead to difficulty in accessing and maintaining the original windows.	
	See Figure 3	

RESTORATION GUIDELINES		
RESIDENTIAL HISTORIC DISTRICTS		
Key	External Elements	Design / Location / Material
C9.	Decorative Features	The original decorative features, if any, are to be retained and restored. To refer to "Specific Facade Restoration Guidelines" of the subject building.
C10.	Canopy & Awnings	Original tile canopy, if any, is to be retained and restored. To refer to "Specific Facade Restoration Guidelines" of the subject building.
		New tile canopy can be added at 2nd storey floor level.
		Traditional roofing material of small size, V-profile, unglazed, natural colour clay tiles identical to those of the main roof or green glazed Chinese clay tiles can be used.
		<u>See Figure 4</u>
		Retractable awning can be added at 2nd storey floor level. It is to be sensitively installed under the main beam, and not cover or block any key architectural features.
		See Figure 5
		They are subject to relevant technical agencies' requirements, e.g. Singapore Land Authority (SLA), Land Transport Authority (LTA), Fire Safety and Shelter Department (FSSD).
C11.	Finishes	(a) <u>Timber Surfaces</u> Timber surfaces can be either painted or stained.
		(b) <u>Shanghai Plaster Finish</u> For a building with existing unpainted Shanghai plaster finish, the finish is to be retained and restored.
		If the Shanghai plaster finish is already painted over, then the building can be repainted although the owner is strongly encouraged to remove the paint work and revert to the original Shanghai plaster finish.
		(c) <u>Fair-faced Brickwalls</u> For a building with existing unpainted fair-faced brickwalls, the fair-faced brickwalls are to be retained and restored.
		If the fair-faced brickwalls are already painted over, then the walls can be repainted although the owner is strongly encouraged to remove the paint work and revert to the original fair-faced finish.

RESTORATION GUIDELINES		
RESIDENTIAL HISTORIC DISTRICTS		
Key External Elements		Design / Location / Material
C12.	Building Colors	Traditional paint schemes and colours are to be used to recall the historic streetscape.
		Generally the base colour of shophouses has a pastel hue. Where necessary, strong colours can be used to highlight selected features or decorative ornamentations.
		Original painted murals and cut-tile decorations are not to be removed or painted over.
		For buildings with distinctive colour, e.g. the "Gedung Kuning" (Yellow Mansion) in Kampong Glam, the same colour should remain. To refer to the "Specific Restoration Guidelines" for the subject building.
D.	Five-Foot Way	
D1.	Floors	<ul> <li>Traditional materials and finishes of the five-footway contribute to the overall character of the conservation area. They include cement screed, terracotta tiles, clay tiles, cement terrazzo, mosaic, marble chip terrazzo or granite slab. Owners are strongly encouraged to keep the original floor finish, if existing. Where the existing floor finishes are not original, owners are strongly encouraged to reintroduce traditional floor finishes.</li> <li>The tiling material is to be non-slip for the safety of pedestrians. Highly polished gloss finish is not allowed.</li> <li>The level of the five-foot way is to match the adjacent units and open walkway where possible. Where the difference in level is not more than 175mm, a ramp is to be provided.</li> <li>The gradient of the ramp cannot be steeper than 1:10.</li> <li>As shophouses are typically under different ownership and restored at different times, an owner has the following options:</li> <li>(a) Liaise with neighbours to level the ramp.</li> <li>(b) Provide gradual ramps.</li> </ul>
		<ul><li>(c) Keep the existing step if the adjacent units are not restored.</li><li>See Figure 6</li></ul>

RESTORATION GUIDELINES		
<b>RESIDENTIAL HISTORIC DISTRICTS</b>		
Key External Elements		Design / Location / Material
D2.	Ceiling	Exposed upper floor structure of timber boards and timber joists is preferred. Existing exposed reinforced concrete floor above, if any, can remain.
		False ceiling of timber frame and plaster timber board, not lower than the front facade beam, can be added.
		Variations in design and use of alternative compatible material can also be added at the main entrance of the building.
Е.	End Gable Wall	
E1.	Windows, Doors & Vents	Existing openings such as casement windows, doors and vents, if any, can be retained or sealed up.
		New openings, casement windows, doors and vents can be added subject to retention of the solid and void expression of the end gable wall, i.e. the wall space between the windows should have a minimum dimension equal to the new window opening width. They should align with the existing windows, if any, and the proportion is to follow the existing.
		The design and material of the new windows and doors are to match the original windows at the end gable wall, or those of the front facade upper storey windows. To refer to "Specific Facade Restoration Guidelines" of the subject building for the front facade windows.
		Vents can be of any material. If metal is used, it is to be anodised or colour coated.
		See Figure 7
		New internal elements such as staircase landing, wall and partition cannot abut the window or door openings and vents, and are to be sufficiently setback.
E2.	Canopies	New canopies over doors and windows with a projection of not more than 450mm can be added. The frame is to be timber and the roof material, similar to that of the main roof.
		See Figure 7
		They are subject to relevant technical agencies' requirements, e.g. Singapore Land Authority (SLA), Land Transport Authority (LTA), Fire Safety and Shelter Department (FSSD).

RESTORATION GUIDELINES		
RESIDENTIAL HISTORIC DISTRICTS		
Key	External Elements	Design / Location / Material
F.	Rear Facade Of Main Bu	ilding
F1.	Window Facing Rea Court	If the existing rear court is kept, the original windows can be retained and restored, or replaced with new French or casement windows. The frames are to be timber and the infill can be timber or glass.
		See Figure 8
		New internal elements such as staircase landing, wall and partition cannot abut the window openings and vents, and are to be sufficiently setback.
F2.	Vents	Existing vents, if any, can be retained or removed. New vents of any material can be added. If metal is used, it is to be anodised or colour coated.
F3.	Canopies	New canopies over doors and windows with a projection of not more than 450mm, can be added.
		The frame is to be timber and the roof material similar to that of the main roof.
G.	Rear Service Block	
G1.	Windows and Openings Facing Rear Court	If the existing rear service block is kept, existing windows and openings, if any, can be retained and restored.
		New casement and French windows with or without brickwall between windows can be added. The frames are to be timber and the infill can be timber or glass. Existing openings can also be infilled with grilles.
		See Figure 9
		New internal elements such as staircase landing, wall and partition cannot abut the window or door openings and vents, and are to be sufficiently setback.
G2.	Vents	Existing vents, if any, can be retained or removed.
		New vents of any material can be added. If metal is used, it is to be anodised or colour coated.
G3.	Canopies	New canopies over doors and windows with a projection of not more than 450mm can be added.
		The frame is to be timber and the roof material similar to that of the main roof.

RESTORATION GUIDELINES		
RESIDENTIAL HISTORIC DISTRICTS		
Key	External Elements	Design / Location / Material
Н.	Rear Court	
H1.	Roof	A new roof of any profile can be added over the rear court, provided the roof is not higher than the 2nd storey floor level.
		Jackroof and skylight can be introduced in the new roof which can be reinforced concrete, light weight material or same roof material as the main roof. If metal is used, it is to be anodised or colour coated.
		Reinforced concrete flat roof can be used as a roof garden and landscape furniture can be considered. The rear boundary wall can be raised up to the sill height of the 2nd storey windows to form a parapet, not exceeding 1m in height. The space along the parapet can be used to house condensing units. Any screening above is to be kept minimal in height and is to be effective screening in the form of simple grilles or louvres. If metal is used, it should be anodised or colour-coated.
		<u>See Figure 10</u>
H2.	External Staircase	External staircases within rear courts are distinctive architectural features of the conserved buildings. Owners are encouraged to keep the existing external staircase so as to contribute to the charm and character of the area.
		However, existing external staircase, if any, can be retained or removed and new external staircase of any material can be added.
		If metal is used, it is to be anodised or colour coated
I.	Rear/Side Boundary Wall	
11.	Wall Height	The original height of the wall is to be retained, except
		(a) when the rear court is to be roofed over and the wall has to be raised up to the 2nd storey floor level to give sufficient headroom, and
		(b) if it is required to meet the minimum parapet height for roof terrace over the rear court or for screening of condensing units (refer to item H1).
		See Figure 10

RESTORATION GUIDELINES		
RESIDENTIAL HISTORIC DISTRICTS		
<b>Key External Elements</b>	Design / Location / Material	
I2. Windows & Vents	At upper storeys, new vents and casement windows can be added.	
	At the 1st storey, only vents and high level windows can be added.	
	Vents can be of any material. If metal is used, it is to be anodised or colour coated. Casement and high level windows are to be timber frame and the infill can be timber/ glass.	
	New internal elements such as staircase landing, wall and partition cannot abut the window openings and vents.	
I3. Doors	Existing door position can be retained or changed. The doorway can be enlarged subject to a width of not more than 1800mm.	
	Timber or metal can be used. If metal is used, it is to be anodised or colour coated.	
I4. Canopy	New canopies over doors and windows with a projection of not more than 450mm can be added.	
	The frame is to be timber and the roof material, similar to that of the main roof.	
	They are subject to relevant technical agencies' requirements, e.g. Singapore Land Authority (SLA), Land Transport Authority (LTA), Fire Safety and Shelter Department (FSSD).	

RESTORATION GUIDELINES		
<b>RESIDENTIAL HISTORIC DISTRICTS</b>		
Key External Elements		Design / Location / Material
J.	Airwell	
J1.	Size	The original size and location is to be retained and restored.
J2.	Roof	A new roof of any profile can be added over the airwell, provided the roof is lower than the eave of the main roof. No other above ground structure or slab is to be added within the airwell space.
		Light weight transparent or translucent roof covering is to be used. If metal framework is used, it is to be anodised or colour coated. The cover can be retractable or fixed.
		See Figure 11
J3.	Windows	The original windows are to be retained and restored. New casement /French windows can be added subject to the design and material matching those of the front facade upper storey windows. To refer to "Specific Facade Restoration Guidelines" of the subject building.
		New internal elements such as staircase landing, wall and partition cannot abut the original window openings and vents.
J4.	Enclosure	Original decorative or ornamental features, if any, at the airwell are to be retained and restored.
		The existing windows/openings in only one of the three sides of the airwell, excluding the existing party wall, can be fully walled up.

RESTORATION GUIDELINES		
RESIDENTIAL HISTORIC DISTRICTS		
Key Internal Elements		Design / Location / Material
К.	Floors	
K1.	Structure	The majority of conserved buildings have timber floor boards on timber structure.
		Horizontal and/or vertical structural supports, if required to be added, are to abut the party walls to minimise impact on the existing structural system which is to be retained.
		For original reinforced concrete framed buildings, the original structural grids are to be retained. New columns, if required to be added, are to align with and respect the original grids.
		Provided the structural integrity of the building is not compromised, flexibility to shift some columns to meet the specific operational/ functional requirements can be considered on a need-to basis.
K2.	Upper Storey Levels	The existing level, timber floor and structural system is to be retained and restored. If the existing floors are reinforced concrete, the same material can be retained.
		Voids up to 25% of the floor area of each floor of the unit, can be introduced.
		For wet areas e.g. toilets and kitchen, reinforced concrete floor can be used.
K3.	1st Storey Level	The existing floor level can be raised to meet minimum platform level required by the relevant technical agency.
		Part of the existing level can be lowered for landscaping/ ponds.
K4.	Basement	New basement is not allowed.
L.	Party Wall	<u> </u>
L1.	Structure	Party walls are principal load-bearing walls. Horizontal and/or vertical structural supports, if required to be added, are to abut the party walls to minimise impact on the existing structural system which is to be retained.

RESTORATION GUIDELINES		
RESIDENTIAL HISTORIC DISTRICTS		
Key Internal Elements	Design / Location / Material	
L2. Openings	The first 3-metre length of the load-bearing party wall perpendicular to the 1st storey shopfront is to be retained to keep the fine-grained character of the shophouses.	
	Slight reductions or variations within the first 3m can be considered on a need-to basis.	
	Openings in the load-bearing party walls can be introduced provided the total width of the openings is less than 50% of the total length of the party wall within the building envelope.	
	For original reinforced concrete framed buildings, there is no control on party wall openings and the first 3- metre length of the party wall perpendicular to the 1st storey shopfront need not be retained.	
M. Staircase	Existing staircase can be retained, removed or relocated.	
	If the building has timber floors, new staircase to replace or supplement the existing one is to be constructed in timber or metal. The layout and railing design of the new staircase can vary. Only existing reinforced concrete staircase can be retained.	
	New staircase cannot abut any door or window openings or vents at the front, side and rear facades, airwell, rear service block or end gable wall.	

RESTORATION GUIDELINES		
RESIDENT		
Key Internal Elements	Design / Location / Material	
N. Roof Mezzanine	<ul> <li>New roof mezzanine can be added within the building envelope. The new floor structure is to be set back:</li> <li>(a) A minimum of 1500mm from the inner face of the front facade wall if it is not lower than the top of</li> </ul>	
	<ul><li>(b) A minimum of 2500mm from the inner face of the</li></ul>	
	front facade wall if it is lower than the top of the fanlight/window at the front facade of the uppermost storey.	
	If the front facade has an existing balcony, it is not necessary to set back the new floor. The floor cannot abut any window/ door or transom/ fanlight.	
	Minimum headroom and floor area are subject to compliance with the requirements of relevant technical agencies.	
	Traditional material of timber floor boards on timber joists is to be used.	
	Reinforced concrete can be used only if the original uppermost floor is of the same material.	
	See Figure 12	
O. Ceiling	<u>Uppermost Floor</u> Typically, the false ceiling is at or above the springing line. If the ceiling is lowered below the springing line, it is to be setback 1500mm or 2500mm following the roof mezzanine guidelines [refer to Item N(a) and (b)].	
	Lower Floors Exposed upper floor structure of timber boards and timber joists is preferred.	
	If required, new false ceilings not lower than the original window openings or transom/fanlight/vents can be added.	

PART2 PLANNING PARAMETERS AND RESTORATION GUIDELINES RESIDENTIAL HISTORIC DISTRICTS

RESTORATION GUIDELINES		
	RESIDENT	IAL HISTORIC DISTRICTS
	Key Elements	Design / Location / Material
Ρ.	New Rear Extension	
	If the rear of the main cons are applicable instead of ite	erved building is to be extended, the following guidelines ams F, G, H, I and J.
P1.	Roof	The new roof can be of any material and is to be lower than the eaves of the main conserved building. If metal is used, it is to be anodised or colour coated.
		If a pitched tile roof is proposed, it can be higher than the eaves of the main conserved building but lower than the ridge of the main roof. The material and pitch are to be the same as those of the main roof.
		The height of new rear extension shall be interpreted as the total height inclusive of the jackroof, if any. Thus, the secondary jackroof shall not be higher than the ridge of the main roof, even if the main roof has a jackroof.
		See Figure 13
P2.	Windows, Doors and Vents	Design and material can vary.
P3.	Canopy	Canopies, if any, are to have projection of not more than 450mm.
P4.	Rear Boundary Wall	If the rear boundary wall abuts the adjacent lot boundary ie without a backlane, the rear boundary wall height is to be retained and a minimum rear setback of 3m is to be provided for the extension.
P5.	Floors	Additional floors of any material can be constructed over the entire rear space. The new rear extension cannot exceed the allowable number of storeys for landed housing development ie 3 storeys.
		The new floor levels need not be the same as the original floor levels.
		New basement is not allowed.

RESTORATION GUIDELINES		
<b>RESIDENTIAL HISTORIC DISTRICTS</b>		
Mechanical & Electrical and Others	Design / Location / Material	
Q. Flue	Existing masonry flue, if any, can be retained, repositioned or removed. New flue can be added.	
	Repositioned or new flue is to be neatly located in either the rear slope of the main roof or the rear secondary roofs or abutting the wall of rear facade/rear service block within the rear court. It can also abut the rear service block wall of the adjacent unit.	
	The roof of the flue can be pitched or flat and is to be lower than the ridge of the main roof.	
	See Figure 14	
	All external walls are to be of plastered brick or plasterboard, and the pitched roof to be unglazed natural colour clay tiles of profile identical to the main roof or of reinforced concrete.	
	Alternatively, metal flues can be exposed and painted the same colour as the background wall.	
	The use of electrostatic air cleaning system is encouraged.	
R. Exhaust Fan	Exhaust fan is to be placed at the rear facade or rear service block facing the rear court.	
	Any material can be used. If metal is used, it is to be anodised or colour coated.	
S. Lift Shaft	Lifts can be added. However, if the shaft protrudes beyond the roof, it must be located at the rear slope of the main roof or on the secondary roof and lower than the roof ridge of the main roof.	

RESTO	ORATION GUIDELINES
RESIDENT	IAL HISTORIC DISTRICTS
Mechanical & Electrical and Others	Design / Location / Material
T. Conduits and Pipes	Rainwater downpipes, gas pipes and air-condensing conduit pipes can be mounted on the surface of the rear wall. The air-condensing conduit pipes are to be properly encased and neatly laid out.
	Rainwater downpipes including gutters, if provided, are not to be in stainless steel.
	All other utility/conduit pipes are not to be mounted on the surface of the external walls, unless specifically required by the relevant technical agencies.
	Exposed lightning tape and conductor are to be installed at a location least obtrusive from the front exterior.
U. Air Conditioning System	Condensing units are to be integrated within the building envelope at the rear in a recess created within the rear boundary wall, or an opening created within the roof of the rear service block. The opening is to be properly screened. If metal is used for the screening, it is to be anodised or colour coated.
	See Figure 15
	However, due to practical constraints in integrating the units within the building envelope and the differing needs of tenants and users, the condensing units can be neatly or compactly placed at the rear and lined along the parapet, party walls or rear service block walls. The units are to be screened unless they are small and not visible from the street level.
	See Figure 16
	Other locations for placing the condensing units can be considered on the merits of each case if there are particular site constraints, e.g. when the conservation building is "back-to-back" with another building.

RESTORATION GUIDELINES		
RESIDENTIAL HISTORIC DISTRICTS		
Mechanical & Electrical and Others	Design / Location / Material	
V. Rooftop Mechanical & Electrical Plants and Services	Mechanical & Electrical plants and rooftop services are to be visually screened from the top and all sides. If metal is used for the screening, it is to be anodised or colour coated.	
	of construction used for screening are to be equal or less than the depth of its individual members.	
	The screening elements are to be orientated to cut off views of the services from the street level and surrounding buildings.	
	If perforated panels are used, the porosity (i.e. percentage of void-to-solid) of the perforated panels is to be equal or less than 25% and the size of openings cannot exceed 30mm in diameter.	
W. Letterboxes	The placement and design of letter boxes along the public five-footway should take into account pedestrian safety. Preferably, they should be integrated into the shop front or residential front.	
	See Figure 17	



# 2.2.3 DRAWINGS & ILLUSTRATIONS

(Click here to see Figure 1 to Figure 17)

- Figure 1: Jackroof and Skylight on Jackroof
- Figure 2: Allowable Structures on Existing Flat Roofs
- Figure 3: Secondary Windows
- Figure 4: Canopy
- Figure 5: Retractable Awning
- Figure 6: Five-Foot Way Floors
- Figure 7: End Gable Wall
- Figure 8: Rear Facade of Main Building
- Figure 9: Rear Service Block
- Figure 10: Rear Court and Rear Boundary Wall
- Figure 11: Airwell
- Figure 12: Roof Mezzanine
- Figure 13: New Rear Extension
- Figure 14: Flue
- Figure 15: Condensing Units Integrated within Building Envelope
- Figure 16: Condensing Units Placed at Rear Parapet and Walls
- Figure 17: Letterbox
# 2.3 SECONDARY SETTLEMENTS

The Secondary Settlements in areas like Balestier, Beach Road, Geylang, Jalan Besar, Jalan Jurong Kechil, Joo Chiat, Mount Sophia, River Valley, Tanjong Katong, Upper Circular Road and Tiong Bahru were largely developed between the 1900s and the 1960s as a result of outward movement of the population from the city centre. Besides shophouses of various styles, some of the areas also have bungalows of the Early, Victorian and Art Deco Styles.

### • **BALESTIER**

The Balestier Conservation Area is located along Balestier Road, between Thomson Road and Moulmein Road. The street blocks comprise a mix of twostorey pre-war shophouses as well as more recent three- to six-storey shop / flat developments.

The buildings reflect the evolution of physical development since the 1840s and serve as reminders of the history of the area. The shophouses range from the Early Shophouse Style to the ornate Late Shophouse and the more streamlined Modern Style built after World War Two.

Of particular visual interest are the ornate Late Style shophouses at the junctions of Kim Keat Road and Jalan Kemanan.

Other key landmarks are the old Balestier Market from the 1920s and the Gochor Tua Pek Kong Temple and Wayang Stage with history which can be traced back to the 1840s.

### • BEACH ROAD

The Beach Road Conservation Area is located just north of the Downtown Core. It consists of buildings along Purvis Street, Liang Seah Street and Tan Quee Lan Street which are the roads linking the major thoroughfares of North Bridge Road and South Bridge Road.

The Beach Road Area was designated the European Town during the time of Raffles. It was located between the Commercial Quarter and Kampong Glam, and was the original seafront before reclamation. Its sea-frontage (which has since been reclaimed) made it the main European residential area as well as that of the wealthy Asians. The area is mainly dominated by two- and three-storey shophouses built in blocks of identical architectural features and ornamentations, with each block being different from the other.

### • GEYLANG

The Geylang Conservation Area is located 5km to the east of the city and stretches along Geylang Road and selected lorongs.

Historically, the area was probably a processing centre for local agricultural produce and fishing. Its history dates as far back as the 1840s when the British Government resettled the Malay floating village at the mouth of the Singapore River to this area. Today, the wide range of shophouses along Geylang Road; the combination of the low-rise bungalows and rows of shophouses along the lorongs provide a gentle contrast, giving this area a rich architectural heritage.

### • JALAN BESAR

The Jalan Besar Conservation Area is located just outside the boundaries of the Little India Historic District and stretches along Jalan Besar and Foch Road, the upper portions of Tessensohn Road, Race Course Road and Tyrwhitt Road, along Cavan Road and Hamilton Road, parts of Serangoon Road, Lavender Street, Kitchener Road, Sam Leong Road, Maude Road, Desker Road and Rowell Road. It also includes the ornate row of terrace houses along Petain Road and a short stretch of Syed Alwi Road.

The area was originally an estate of over six acres extending from Serangoon Road to Jalan Besar, where historically, sireh and nipah were extensively cultivated. The area is significant for its historic streetscapes created by buildings with a variety of vernacular architecture of the late 19th and early 20th centuries, a period in Singapore's history when the elaborately decorated shophouses flourished.

### • JALAN JURONG KECHIL

The Jalan Jurong Kechil Conservation Area is situated at the junction of Upper Bukit Timah Road and Jalan Jurong Kechil. It consists of ten two-storey Transitional style shophouses and three Art Deco Style single-storey terraces which contribute to the streetscape experience of the Anak Bukit area.

Their pre-war architecture make the remaining row of shophouses stand out as an important landmark located at the entrances to the Anak Bukit area.

### • JOO CHIAT

The Joo Chiat Conservation Area stretches along the entire main Joo Chiat Road, the upper portion of Onan Road, parts of Joo Chiat Terrace, Joo Chiat Place, Everitt Road, Koon Seng Road and Tembeling Road. It also includes the stretch of East Coast Road from Marshall Road to Telok Kurau Road.

The area was originally part of a coconut plantation which stretched inland from the coast to what is Geylang Serai today. The area is not only rich in architecture and history but is also a thriving commercial and residential node today. Joo Chiat, with rich historical links to the Peranakan culture, is a renowned food paradise. A wide variety of shophouses and bungalow styles which reflect the prevailing architecture at the turn of the century can be found within this area.

### • MOUNT SOPHIA

The Mount Sophia Conservation Area, located between the historically important areas of Fort Canning / Bras Basah, the Little India and Jalan Besar Conservation Areas, is an important part of the old inner city of Singapore since the turn of the 19th century.

The different shophouse styles which chart the evolution of developments along Selegie Road gave this important trunk road its signature streetscape. The largely intact terrace houses along Niven Road present a charming intimate streetscape while the shophouses along Mackenzie Road remain vibrant after many years. Marking the entrance to Mount Sophia are the Church of Christ of Malaya and Sophia Flats, both established landmarks of the area.

### • **RIVER VALLEY**

The River Valley Conservation Area is adjacent to the Robertson Quay area to the south of River Valley Road. It consists of buildings lining Mohamed Sultan Road from its junction with River Valley Road up to its junction with Kim Yam Road. The area also includes stretches of Tong Watt Road and Kim Yam Road near Mohamed Sultan Road and a group of buildings located at the junction of Kim Yam Road and River Valley Road.

The shophouses within this area played an important role in the early trading activities of Singapore which was centred on the Singapore River. These shophouses catered to the owners and workers of the godowns and warehouses along the river. The shophouses are mainly of the Late Shophouse and Transitional Shophouse Styles.

### • TANJONG KATONG

The Tanjong Katong Conservation Area is located along Tanjong Katong Road, between Dunman Road and Mountbatten Road.

The ornate Late Style and the more geometric Art Deco Style shophouses together with the more streamlined Modern Style shophouses built after the World War Two provide the critical mass that gives this historic road its sense of place and help anchor the social memory for both residents and visitors. Other landmarks along the road are the former Tanjong Katong Girls School, built in 1954 by the then Public Works Department. The Tanjong Katong Post Office and the Telecom Exchange Building are also prominent markers.

### • UPPER CIRCULAR ROAD

The Upper Circular Conservation Area is bounded by Upper Circular Road, South Bridge Road, North Canal Road and New Bridge Road. It contains mainly three- to five-storey buildings built mainly in the 1930s to the late 1960s and are of different Modern architectural styles. They serve as important markers of what "Modern" meant to each generation and how architectural taste has evolved with the passage of time.

### • TIONG BAHRU

The Tiong Bahru Conservation Area is bounded by Outram Road, Seng Poh Road, Yong Siak Street and the Central Expressway.

Tiong Bahru estate, the first public housing in Singapore, is well known and valued by Singaporeans. The flats built by the then Singapore Improvement Trust mark an important period of public housing in Singapore before the formation of Housing Development Board. The estate is a illustration of the distinctive planning and architectural ideas prevalent in British public housing of the same period.

The two rows of shophouses within the area and the single-storey building located within the streetblock along Outram Road are closely associated to Tiong Bahru estate, being very much a part of its physical fabric. Fronting Tiong Bahru and Outram Road, they are highly visible to those who pass through the area.

# 2.3.1 PLANNING PARAMETERS

## 2.3.1.1 **Conservation Plan**

The plans (<u>Appendix II</u>) show the boundary of the conservation areas, the buildings to be conserved, the residential fronts to be retained/restored, national monuments to be preserved and the envelope control sites. For buildings to be conserved, the entire buildings are to be restored in accordance with the conservation guidelines. Vacant lands and buildings not designated for conservation can be redeveloped subject to envelope control guidelines.

# 2.3.1.2 Building Use

The building use is to follow the Master Plan intention for the respective areas.

## 2.3.1.3 **Plot Ratio**

The plot ratio shall be the resultant of the building envelope of the conserved building or part thereof to be conserved, as well as that of the new extension(s) if any, and subject to the maximum prescribed permissible plot ratio in the Master Plan for the respective areas.

## 2.3.1.4 **Restoration/Development Options**

### Shophouse

The applicant can consider the following options:

i) to conserve the entire shophouse building.

OR

 to conserve the main shophouse building with a new rear extension as shown in Figure 1. The new rear extension is subject to Development Control guidelines and the requirements of relevant technical agencies. The number of storeys allowable for new rear extensions differ from area to area (See para 1.6 below).

For conserved buildings with asymmetrical main roofs where the rear slope is longer than the front slope, the length of rear slope can be adjusted to achieve a symmetrical main roof so that there is sufficient depth for a meaningful rear extension. The 600mm minimum gap between the main building and the new rear extension is still applicable.

For the Geylang Conservation Area, the new extensions are also subject to the Geylang Urban Design Guidelines.

For the Pre-war SIT flats at Blocks 55 to 59, 64 to 66 & 71 to 82 in the Tiong Bahru Conservation Area, the entire building is to be conserved. As such, option (ii) above does not apply.

For shophouses with 2 main buildings in the River Valley Conservation Area, both the main buildings are to be conserved. New rear extension

is to be located beyond the 2 main buildings. Except for 301 to 309 (Odd Nos) River Valley Road, option (ii) is applicable. <u>See Figure 1</u>.

### **Detached Building**

For detached building, please refer to Part 2.4 on "Bungalows".

## 2.3.1.5 **Building Profile**

For both shophouses and detached buildings, the original profile of the building or part thereof to be conserved is to be retained. If it has undergone unauthorised alteration, the original profile is to be reinstated.

## 2.3.1.6 **Building Height**

The original height of the building or part thereof to be conserved is to be retained. The allowable number of storeys that can be built up for new extensions are as follows:

Conservation Area	Allowable Number of Storeys for New Extensions*
Balestier	Up to 6 storeys
Beach Road	Up to 5 storeys
Geylang	Along main Geylang Road:
	Up to 5 storeys
	Up to 6 storeys (west of Kallang Paya Lebar Expressway)
	Along the Lorongs:up to 8 storeys
	Also subject to the Geylang Urban Design Guidelines (GUDG)
Jalan Besar	Up to 6 storeys
Jalan Jurong	Up to 4 storeys
Kechil	
Joo Chiat	Up to 5 storeys
Mount Sophia	Up to 36m AMSL
River Valley	Up to 10 storeys
Tanjong Katong	Up to 4 storeys
	For units no. 241-259 (odd nos. only): up to 5 storeys
Tiong Bahru	Shophouses: Up to 4 storeys
	Blocks 55-59, 64-66, 71-82: Not applicable ( <i>conservation of entire building</i> )
Upper Circular Road	Minimally, the front 7.5m of the conservation building must be conserved. The rear portion of the site can be built up to a maximum of 6 storeys.
	*The above is not applicable for units 27, 29, 31 & 33 New Bridge Road where the entire main pitched roof is to be conserved. For the other units, conservation of the entire main building or main pitched roof is encouraged.

**NOTE** \* The allowable number of storeys for new extensions is guided by the allowable storey height of the respective Planning Areas and the development type. For landed housing, it cannot exceed 3 storeys.

# 2.3.1.7 Service Lane

Under all restoration/development options, the rear is to be set back in compliance with the service lane widening requirements, where applicable.

# 2.3.1.8 **Development Charge**

Under the Planning Act, development charge, equivalent to the difference between the Development Baseline and the Development Ceiling for that land, is payable in respect of any development of the land or when there is a change in the use of the land or building.

However, exemption from payment of development charge, if applicable, is given in respect of the *value enhancement arising from the proposed use or use changes on the gross floor area for the building or part thereof on the land to be conserved* provided that such conservation is carried out in accordance with the approved plans and completed within a period of 2 years from the date of conservation permission.

Development charge, where applicable, shall be leviable to the new extension(s), as well as to any new floor areas e.g. roof mezzanines within the envelope of the building to be conserved.

# 2.3.1.9 **Carparking**

Provision of car parks or payment of car parks deficiency charge for a conserved building or any part thereof that is conserved is waived if the conservation guidelines are fully complied with and the conservation works are completed in accordance with the approved plans.

The requirement for provision of carparking spaces under the Parking Places (Provision of Parking Places and Parking Spaces) Rules and any statutory modifications or re-enactments thereof for the time being in force shall be complied with in full for the new extension(s).

# 2 **RESTORATION GUIDELINES**

## **Key Elements Subject To Mandatory Compliance**

Conservation in the Secondary Settlements is mainly on a streetscape basis. Owners are given the option to conserve the entire building or just the main building of the shophouse or detached building. New extensions to the sides and rear, if any, are subject to the controls herein, Development Control guidelines and the requirements of relevant technical agencies.

The fundamental principle, the "**3R**", is **maximum Retention, sensitive Restoration and careful Repair**. This principle applies to key elements which are significant to the conserved buildings and the streetscape. Replacement, if any, is to follow the original design and materials. New installation/addition does not drastically affect the intrinsic character of the building.

### **IMPORTANT NOTE:**

Where applicable, the requirements of the relevant technical agencies are to be complied with. Owners are also required to obtain the consent of the relevant parties for roof eaves, canopies and projections of any nature beyond the site boundary.

RESTORATION GUIDELINES		
SECONDARY SETTLEMENTS		
Key External Elements	Design / Location / Material	
A. Roofs		
A1. Structure	The majority of conserved shophouses have a pitched clay tile roof supported by timber roof structure.	
	Structural strengthening or supports like steel or reinforced concrete roof beams, if required to be added, are to be sensitively designed to minimise visual impact on the traditional timber system which is to be retained.	
A2. Main Roof and Rear Secondary Roof	The original profile, pitch, height, party wall and eaves projection is to be retained and restored.	
	Unglazed, natural colour clay roof tiles are to be used. They can be v-profile tiles or flat interlocking tiles.	
	Existing reinforced concrete roof can be retained.	
	The underside of roof eaves can be exposed or covered with plasterboard.	
	To facilitate the addition of a link or staircase and to reduce the fire-escape distance, a mono-pitched tile roof adjacent to the party wall can be added between the main conserved building and the new rear extension. The addition is akin to the typical roof form of a rear service block. As such, it is complementary to the architecture and character of a traditional shophouse. <u>See Figure 2.</u>	

RESTORATION GUIDELINES			
SECONDARY SETTLEMENTS			
Key External Elements	Design / Location / Material		
A3. Jackroof	Existing jackroof, if any, can be retained or removed.		
	New jackroof can be added subject to compliance with the positioning, setbacks and maximum allowable dimensions.		
	See Figure 3.		
	Roof tile is to be identical to that of the main roof.		
	Sidewall can be finished with plaster or timber/plasterboard or glazed panels.		
	Front and rear openings can be fixed or openable of any infill material. If metal is used, it is to be anodised or colour coated.		
A4. Skylight	New skylight can be added on the rear slope of the main pitched roof, on secondary pitched roof and on the rear slope of new jackroof.		
	Skylight on the jack roof is to be located beyond the first quarter of the rear slope of the jackroof to keep the character of a typical jackroof.		
	<u>See Figure 3</u> .		
	The total area of the skylight cannot exceed 30% of the subject slope of the pitched roof.		
	New skylight can also be added on a conserved building with flat roof. While the design, treatment and materials used can vary, the height cannot exceed 1m, which is the typical roof parapet height, so that the skylight is not visible from the street level. The skylight area is to be computed as part of the 35% coverage allowable for new single storey structure on the flat roof (see item A7).		
	The skylight is to be of transparent or translucent material on framework of timber or metal - painted or anodised or colour coated. The design, treatment and material used can vary. It can consist of glass louvres, retractable panels or even solar panels laid on the same plane as the roof.		
	To minimise disruption to the roofscape, the skylight cannot be an opening or void without cover.		
A5. Dormer Window	Not allowed.		

RESTORATION GUIDELINES			
SECONDARY SETTLEMENTS			
Key External Elements	Design / Location / Material		
A6. Use of Existing Flat Roofs	Existing flat roof can be landscaped to add interest and vibrancy to the roofscape. It can also be converted into usable space as an extension of the existing building. For example, if the building is used as a restaurant, the rooftop can be for outdoor dining. Conservation Permission must be obtained for the change of use. To meet technical agencies' requirements, railings of compatible design and material can be added.		
A7. Allowable Structures on Existing Flat Roofs	New structures can be added on the existing flat roof, subject to the following guidelines:		
	(a) Material, Roof Form & Storey Height		
	The structure can be of reinforced concrete or lightweight material with flat roof and single-storey in height not exceeding 3600mm. The design and treatment are to be compatible with the architecture of the conserved building.		
	(a) <u>Coverage</u>		
	The total coverage of all existing and new structures on the flat roof, including skylights but excluding moveable covers eg umbrella structures and retractable awnings, cannot exceed 35% of the flat roof area of the unit. All service installations on the roof are to be grouped together and included in the 35% allowable coverage for structure on flat roof.		
	(a) <u>Setback</u>		
	The new structure is to be set back a minimum of 3m from the front and side street elevations so that it is not visually obvious from the street. Setback is not required from party wall and backlane.		
	See Figure 4		

RESTORATION GUIDELINES		
SECONDARY SETTLEMENTS		
Key	External Elements	Design / Location / Material
В.	Forecourt	
B1.	Enclosure	The original size and ornamentation of the wall and gate are to be retained and restored. To refer to "Specific Facade Restoration Guidelines" of the subject building. To facilitate surface carparking provision, the entrance can be widened and the forecourt lowered to be at-grade with the road. The original ornamentation and design of
		wall and gate are to be restored. The original open spatial character of the forecourt should be kept.
C.	Front/Side Facade	
C1.	<b>Shopfront</b> (only for units where commercial use is allowed)	Design and material can vary. However, it must not be a blank wall as it gives a passive character to the streetscape. Existing original ornamental transom panels above the shop front, are to be kept. To refer to "Specific Facade Restoration Guidelines" of the respective building.
C2.	Residential Front	The original residential fronts are to be retained for residential conserved buildings. To refer to "Specific Facade Restoration Guidelines" of the subject building.
		The following guidelines are applicable to a conserved building allowed for non-residential use:
		(a) The original 2 windows and 1 door first storey residential front can be changed to 2 doors and 1 window. The design and material of the new door are to match those of the original one.
		(b) If the original infill panel of the first storey casement windows and doors are plain without any design features, they can be replaced with clear glass. However, if the infill panels are carved with decorations, they are to be retained and cannot be replaced with clear glass. To refer to "Specific Facade Restoration Guidelines".
		(c) Alternatively, fixed frameless or timber framed glazed panels can be added instead of secondary windows, and frameless glass doors can be added as secondary doors while the original timber windows and doors are retained and restored.
		This gives owners another option to keep the original architecture of the conserved building while achieving greater transparency and climatic control of the internal space.

RESTORATION GUIDELINES			
SECONDARY SETTLEMENTS			
Key External Elements	Design / Location / Material		
C3. Window Screen/Security Bars	For units under Residential Front Control, existing traditional window screen, if any, is to be retained. To refer to "Specific Facade Restoration Guidelines" of the subject building.		
	New window screen can be added and the design is to be traditional. The frame is to be timber and the infill may be timber or obscure glass.		
	Security bars at windows and doors, if any, can be retained or removed. New security bars of traditional design and material can be added.		
C4. Pintu Pagar	For units under Residential Front Control, existing pintu pagar, if any, is to be retained. To refer to "Specific Facade Restoration Guidelines" of the subject building.		
	New pintu pagar can be added and the design is to be traditional. The frame is to be timber and the infill is to be of traditional materials i.e. timber and obscure glass.		
C5. Dado Tiles	The following guidelines are applicable to a conserved building with dado tiles:		
	(a) If the tiles are intact, the original tile panel is to be retained.		
	(b) If there are cracked or missing tiles,		
	(i) Replace the missing tiles with tiles matching the original tiles,		
	(ii) Leave the tile panel as it is, or		
	(iii) Patch the gaps with colour cement to match the colour of the tiles.		
	(c) If the majority of the tiles are damaged or missing,		
	(i) Replace the tile panel completely with tiles of the same genre as the original tiles, or		
	(ii) Remove the tile panel if tiles of matching design cannot be found.		

RESTORATION GUIDELINES			
SECONDARY SETTLEMENTS			
Key External Elements	Design / Location / Material		
C6. Fanlights, Windows, Doors and Vents, Balconies and Verandahs	The original fanlights, windows, doors, vents, balconies and verandahs are to be retained and restored. To refer to "Specific Facade Restoration Guidelines" of the subject building.		
	The balcony or verandah is to be kept open and not enclosed with window or fixed glazing. The inner facade behind the balcony or verandah is also to be retained and restored. The windows of the inner facade can be changed to doors for better access to the balcony or verandah. The design and material of the new door are to match those of the original one.		
	New internal elements such as staircase landing, wall and partition cannot abut the original window or door openings and vents and are to be sufficiently set back.		
	Existing mild steel frames of doors, windows and vents can be changed to powder coated aluminium frames of similar appearance as the mild steel frames.		
	Existing coloured glass in doors, windows, fanlights and vents cannot be replaced with clear glass.		
C7. Balustrades for French Window	The original balustrade for French window is to be retained and restored. To refer to "Specific Facade Restoration Guidelines" of the subject building.		
C8. Secondary Windows and Doors	New secondary casement, French or sliding window and door can be added subject to the design being compatible with those of the main window and door.		
	The frame can be of any material. If metal is used, it is to be anodised or colour coated. However, owners are encouraged to use timber frames as they are more compatible with the architecture of the conserved buildings. The infill can be of timber or glass. Tinted, coloured and obscure glass can be used.		
	Frameless fixed glass panels can be installed at the first storey windows. However, they cannot be used in place of secondary windows on the upper storeys of a conserved building as they will lead to difficulty in accessing and maintaining the original windows.		
	<u>See Figure 5</u>		
C9. Decorative Features	The original decorative features, if any, are to be retained and restored. To refer to "Specific Facade Restoration Guidelines" of the subject building.		

RESTORATION GUIDELINES			
SECONDARY SETTLEMENTS			
Key	Key External Elements		Design / Location / Material
C10.	Canopy and Awnings	Orig To r the s	inal tile canopy, if any, is to be retained and restored. refer to "Specific Facade Restoration Guidelines" of subject building.
		New	tile canopy can be added at 2nd storey floor level.
		Root iden Chin	fing material of unglazed, natural colour clay tiles tical to those of the main roof or green glazed lese clay tiles can be used.
		<u>See</u>	Figure 6
		Retr level bear featu	actable awning can be added at 2nd storey floor I. It is to be sensitively installed under the main m, and not cover or block any key architectural ures.
		<u>See</u>	Figure 7
		They e.g. Auth (FSS	γ are subject to relevant technical agencies' approval, Singapore Land Authority (SLA), Land Transport ority (LTA), Fire Safety and Shelter Department SD).
C11.	Finishes	(a)	Timber Surfaces
			Timber surfaces can be either painted or stained.
		(b)	<u>Shanghai Plaster Finish</u>
			For a building with existing unpainted Shanghai plaster finish, the finish is to be retained and restored.
			If the Shanghai plaster finish is already painted over, then the building can be repainted although the owner is strongly encouraged to remove the paint work and revert to the original Shanghai plaster finish.
		(c)	Fair-faced Brickwalls
			For a building with existing unpainted fair-faced brickwalls, the fair-faced brickwalls are to be retained and restored.
			If the fair-faced brickwalls are already painted over, then the walls can be repainted although the owner is strongly encouraged to remove the paint work and revert to the original fair-faced finish.

RESTORATION GUIDELINES			
SECONDARY SETTLEMENTS			
Key External Elements	Design / Location / Material		
C12. Building Colours	Traditional paint schemes and colours are to be used to recall the historic streetscape.		
	Generally the base colour of shophouses has a pastel hue. Where necessary, strong colours can be used to highlight selected features or decorative ornamentations.		
	Original painted murals and cut-tile decorations are not to be removed or painted over.		
	For buildings with distinctive colour, e.g. the Red House at Katong, the same colour should remain. To refer to the "Specific Restoration Guidelines" for the subject building.		
D. Five-Foot Way			
D1. Floors	Traditional materials and finishes of the five-footway contribute to the overall character of the conservation area. They include cement screed, terracotta tiles, clay tiles, cement terrazzo, mosaic, marble chip terrazzo or granite slab. Where the existing floor finishes are not original, owners are strongly encouraged to reintroduce traditional floor finishes.		
	The tiling material is to be non-slip for the safety of pedestrians. Highly polished gloss finish is not allowed.		
	The level of the five-foot way is to match the adjacent units and open walkway where possible. Where the difference in level is not more than 175mm, a ramp is to be provided.		
	The gradient of the ramp cannot be steeper than 1:10.		
	As shophouses are typically under different ownership and restored at different times, an owner has the following options:		
	(a) Liaise with neighbours to level the ramp.		
	(b) Provide gradual ramps.		
	(c) Keep the existing step if the adjacent units are not restored.		
	<u>See Figure 8</u>		

RESTORATION GUIDELINES			
SECONDARY SETTLEMENTS			
Key Ext	ternal Elements	Design / Location / Material	
D2. Ce	iling	Exposed upper floor structure of timber boards and timber joists, reinforced concrete*, or false ceiling of timber frame and plaster timber board, not lower than the front façade beam, can be added.	
		variations in design and use of alternative compatible material can also be added at the main entrance of the building.	
* Fo rei	or Blocks 55 to 59, 64 to inforced concrete five-foot	62 and 71 to 82 in the Tiong Bahru Conservation Area, way ceiling can be used only if existing is the same.	
E. En	d Gable Wall		
E1. Wi Ve	indows, Doors and ents	Existing openings such as casement windows, doors and vents, if any, can be retained or sealed up.	
		New openings, casement windows, doors and vents can be added subject to retention of the solid and void expression of the end gable wall, i.e. the wall space between the windows should have a minimum dimension equal to the new window opening width. They should align with the existing windows, if any, and the proportion should follow the existing windows.	
		The design and material of the new windows and doors are to match the original windows at the end gable wall, or those of the front facade upper storey windows. To refer to "Specific Facade Restoration Guidelines" of the subject building for the front facade windows.	
		Vents can be of any material. If metal is used, it is to be anodised or colour coated.	
		See Figure 9	
		New internal elements such as staircase landing, wall and partition cannot abut the window or door openings and vents, and are to be sufficiently setback.	
E2. Ca	nopies	New canopies over doors and windows with a projection of not more than 450mm can be added.	
		The frame is to be timber and the roof material, similar to that of the main roof.	
		<u>See Figure 9</u>	
		They are subject to relevant technical agencies' approval, e.g. Singapore Land Authority (SLA), Land Transport Authority (LTA), Fire Safety and Shelter Department (FSSD).	

RESTORATION GUIDELINES				
SECONDARY SETTLEMENTS				
Key External Elements	Design / Location / Material			
F. Rear Facade of Main Building*	Existing openings can be retained or sealed up, and new ones can be added. The resultant solid and void expression of the rear facade is to be compatible with the subject building. Design and material of doors and windows are to preferably match those on the upper storeys of the front facade.			
	Metal vents are to preferably be anodised or colour coated. <u>See Figure 10</u>			
	New internal elements such as staircase landing, wall and partition cannot abut the window openings and vents, and are to be sufficiently setback.			
G. Rear Service Block*	If the existing rear service block is retained and restored, existing openings can be retained or sealed up, and new ones can be added. The resultant solid and void expression of the rear facade is to be compatible with the subject building. Design and material of doors and windows are to preferably match those on the upper storeys of the front facade.			
	Metal vents are to preferably be anodised or colour coated. <u>See Figure 11.</u>			
	New internal elements such as staircase landing, wall and partition cannot abut the window openings and vents and are to be sufficiently setback.			
* Blocks 55 to 59, 64 to 66 and 71 to 82 in the Tiong Bahru Conservation Area are to comply with the following:				
<u>Rear Facade of Main</u>	Building			
i Original windows faci material of windows a	ng rear court are to be retained and restored. Design and re to match those on the front facade.			
ii Existing vents can be can be fixed or openal	retained or sealed up and new vents can be added. Vents ble of any infill material.			
If metal is used, it is to	be anodised or colour coated.			
<u>Rear Service Block</u>				
i Original openings faci casement/French win openings can be adde of the subject facade.	ing rear court can be retained and restored or infilled with dows with or without brickwall between windows. New ed subject to the retention of the solid and void expression			
ii Design and material o	f new windows are to match those on the front facade.			
iii Existing vents can be can be fixed or openal	retained or sealed up and new vents can be added. Vents ble of any infill material.			
If metal is used, it is to be ar	nodised or colour coated.			

RESTORATION GUIDELINES			
SECONDARY SETTLEMENTS			
Key	External Elements	Design / Location / Material	
Н.	Rear Court		
H1.	Roof	A new roof of any profile can be added over the rear court, provided the roof is not higher than the 2nd storey floor level.	
		Jackroof and skylight can be introduced in the new roof which can be reinforced concrete, light weight material or same roof material as the main roof. If metal is used, it is to be anodised or colour coated.	
		Reinforced concrete flat roof can be used as a roof garden and landscape furniture can be considered. The rear boundary wall can be raised up to the sill height of the 2nd storey windows to form a parapet, not exceeding 1m in height. The space along the parapet can be used to house condensing units. Any screening above it should be in the form of simple grilles or louvres. If metal is used, it should be anodised or colour-coated.	
		See Figure 12	
H2. External Staircase	External staircases within rear courts are distinctive architectural features of the conserved buildings.		
		For selected streetblocks where the external staircases are intact, they will be required to be kept and their function as secondary access routes can be retained.	
		These street blocks are Blocks 55 to 59, 64 to 66 and 71 to 82 in the Tiong Bahru Conservation Area.	
		In other areas, owners are encouraged to keep the existing external staircase so as to contribute to the charm and character of the area.	
		New external staircase of any material can be added. If metal is used, it is to be anodised or colour coated.	

	RESTORATION GUIDELINES		
	SECONDARY SETTLEMENTS		
Key	External Elements	Design / Location / Material	
I.	Rear/Side Boundary Wall		
11.	Wall Height	The original height of the wall is to be retained, except	
		(a) when the rear court is to be roofed over and the wall has to be raised up to the 2nd storey floor level to give sufficient headroom, and	
		(b) if it is required to meet the minimum parapet height for roof terrace over the rear court or for screening of condensing units (refer to item H1).	
		See Figure 12	
12.	Openings*	New doors, windows and vent openings can be added. The resultant solid and void expression of the subject wall is to be compatible with the subject building. Design and material of doors and windows are to preferably match those on the upper storeys of the front facade.	
		Metal vents are to be preferably anodised or colour coated.	
		New internal elements such as staircase landing, wall and partition cannot abut the window or door openings and vents.	
*	Blocks 55 to 59, 64 to 66 a comply with the following:	and 71 to 82 in the Tiong Bahru Conservation Area are to	
	<u><b>Doors</b></u> Existing door position can subject to a width of not mol	be retained or changed. The doorway can be enlarged re than 1800mm.	
	<u>Windows</u> (i) At upper storeys, nev and material matching	v casement windows can be added subject to the design those on the front facade.	
	(ii) At the 1st storey, only timber framed with gla	high level windows can be added. The windows are to be ss or timber infill.	
	<u>Vents</u> Existing vents can be retain be fixed or openable of any coated.	ed or sealed up, and new vents can be added. Vents can y material. If metal is used, it is to be anodised or colour	

RESTORATION GUIDELINES		
SECONDARY SETTLEMENTS		
Key External Elements	Design / Location / Material	
I3. Canopy	New canopies over doors and windows with a projection of not more than 450mm, can be added.	
	The frame is to be timber and the roof material, similar to that of the main roof.	
	They are subject to relevant technical agencies' approval, e.g. Singapore Land Authority (SLA), Land Transport Authority (LTA), Fire Safety and Shelter Department (FSSD).	
J. Airwell *	·	
Applicable to shophouse retained. For shophouse wi	with 2 main buildings where the central airwell is to be th only 1 main building, the airwell need not be retained.	
J1. Size	The original size and location are to be retained and restored.	
J2. Roof	A new roof of any profile can be added over the airwell, provided the roof is lower than the eave of the main roof. No other above ground structure or slab can be added within the airwell space.	
	Light weight transparent or translucent roof covering is to be used. If metal framework is used, it is to be anodised or colour coated. The cover can be retractable or fixed.	
	See Figure 13	
J3. Windows**	Design and material of windows are to preferably match those on the upper storeys of the front facade.	
	New internal elements such as staircase landing, wall and partition cannot abut the window or door openings and vents.	
J4. Enclosure	Original decorative or ornamental features, if any, at the airwell are to be retained and restored.	
	The existing windows/openings in only one of the three sides of the airwell, excluding the existing party wall, can be fully walled up.	
** For Blocks 55 to 59, 64 to following are applicable:	66 and 71 to 82 in the Tiong Bahru Conservation Area, the	
(i) The original windows	around the airwell are to be retained and restored.	
(ii) New windows around	airwell are to match those on the front facade.	

L

RESTORATION GUIDELINES		
SECONDARY SETTLEMENTS		
Key Internal Elements		Design / Location / Material
K. F	Floors	
K1. L	Upper Storey Levels*	The existing level is to be retained.
		Voids are allowed up to 25% of the floor area of each floor of the unit, can be introduced.
		Existing timber floor with timber boards on timber joists is encouraged to be retained and restored.*
		Horizontal and/or vertical structural supports, if required to be added, are to abut the party walls to minimise impact on the existing structural system.
		For original reinforced concrete framed buildings, the original structural grids are to be retained. New columns, if required to be added, are to align with and respect the original grids.
		Provided the structural integrity of the building is not compromised, flexibility to shift some columns to meet the specific operational/ functional requirements can be considered on a need-to basis.
K2. 1	1st Storey Level	The existing floor level can be raised to meet minimum platform level required by relevant agencies.
		Part of the existing level can be lowered for landscaping/ponds.
K3. E	Basement	New basement is not allowed.
* F c r	For Blocks 55 to 59, 64 to original timber upper floors restored.	66 and 71 to 82 in the Tiong Bahru Conservation Area, with timber boards on timber joists are to be retained and
L. F	Party Wall	
L1. S	Structure	Party walls are principal load-bearing walls. Horizontal and/or vertical structural supports, if required to be added, are to abut the party walls to minimise impact on the existing structural system which is to be retained.

RESTORATION GUIDELINES		
SECONDARY SETTLEMENTS		
Key Internal Elements	Design / Location / Material	
L2. Openings	The first 3-metre length of the load-bearing wall perpendicular to the 1st storey shopfront is to be retained to keep the fine-grained character of the shophouses.	
	Slight reductions or variations within the first 3m can be considered on a need-to basis.	
	For the rest of the party wall, there is no control on the percentage of openings to be introduced in the party wall.	
	For original reinforced concrete framed buildings, there is no control on party wall openings and the first 3-metre length of the party wall perpendicular to the 1st storey shopfront need not be retained.	
M. Staircase*	Existing staircase can be retained or removed or relocated. New staircase to replace or supplement the existing one can be of any material. The layout and railing design of the new staircase can vary.	
	New staircase cannot abut any door or window openings or vents at the front, side and rear facades, airwell, rear service block or end gable wall.	
N. Roof Mezzanine	New roof mezzanine can be added within the building envelope. The new floor structure is to be set back:	
	(a) A minimum of 1500mm from the inner face of the front facade wall if it is not lower than the top of the fanlight/window at the front facade of the uppermost storey.	
	(b) A minimum of 2500mm from the inner face of the front facade wall if it is lower than the top of the fanlight/window at the front facade of the uppermost storey.	
	If the front facade has an existing balcony, it is not necessary to set back the new floor. The floor cannot abut any window/door or transom/fanlight.	
	See Figure 14	
	Minimum headroom and floor area are subject to compliance with the requirements of relevant technical agencies.	
	New mezzanine floors of timber boards on timber joists are encouraged if the original timber floors of the main building are retained**	

RESTORATION GUIDELINES		
SECONDARY SETTLEMENTS		
Key	Internal Elements	Design / Location / Material
Ο.	Ceiling	<u>Uppermost Floor</u> Typically, the false ceiling is at or above the springing line. If the ceiling is lowered below the springing line, it is to be setback 1500mm or 2500mm following the roof mezzanine guidelines [refer to Item N(a) and (b)].
		<u>Lower Floors</u> Exposed upper floor structure of timber boards and timber joists is preferred.
		If required, new false ceilings not lower than the original window openings or transom/fanlight/vents can be added.
*	For Blocks 55 to 59, 64 to traditional material of timbe concrete can be used only if	66 and 71 to 82 in the Tiong Bahru Conservation Area, er is to be used with timber or steel stringer. Reinforced the existing staircase is of the same material.
**	For Blocks 55 to 59, 64 to 6 floor of the roof mezzanine uppermost floor is of timber.	66 and 71 to 82 in the Tiong Bahru Conservation Area, the is to be of timber boards on timber joists if the existing

RESTORATION GUIDELINES			
	SECONDARY SETTLEMENTS		
	Key Elements	Design / Location / Material	
Ρ.	New Rear Extension* For New Rear Extension, t G, H, I and J. (* Not applicable for Blocks Conservation Area)	he following guidelines are applicable instead of items F, s 55 to 59, 64 to 66 and 71 to 82 in the Tiong Bahru	
P1.	Roof *	Design and material can vary.	
*	The new rear extensions to Area, the roof forms are also	the conservation shophouses in the Geylang Conservation subject to the Geylang Urban Design Guidelines.	
P2.	Front/Side Facade	Design and material can vary. The new rear extension that protrudes above the eaves of the main pitched roof is to be set back a minimum of 600mm clear from the main conserved building for articulation between the old and new buildings. To give greater design flexibility in the treatment of the new rear extension, facade articulations of the new rear extensions such as fins, ledges and planter boxes, can be considered within the 600mm set back.	
		<u>See Figure 15</u>	
P3.	End Gable Wall	Design and material can vary.	
P4.	Rear Facade	Design and materia can vary.	
P5.	New Rear Extensions for Corner Shophouse Units*	For corner units fronting two roads, the new rear extension can start from the pitched roof ridge of the corner block which is to be retained and restored, and from the eave of the main pitched roof of the conserved building. For corner units with end gable walls, the new rear extension can start from the eave of the main pitched roof of the conserved building with a minimum 600mm clear set back, similar to the guidelines for the rest of intermediate conserved buildings. For corner units with flat roofs, the new rear extension can start after the main conserved building and the side wall can be in line with the side facade or end gable wall. If there are distinctive architectural features such as staircores, they are to be retained and restored, and the new rear extension is to be adequately set back from these elements. <u>See Figure 16</u>	

PART2 PLANNING PARAMETERS AND RESTORATION GUIDELINES SECONDARY SETTLEMENTS

	RESTORATION GUIDELINES		
	SECONDARY SETTLEMENTS		
Key Elements Design / Location / Material		Design / Location / Material	
P6.	Floors *	Floor levels, including any basement and roof mezzanine, are to comply with Development Control guidelines. * The floors of the new extension can be of any material.	
*	For new rear extensions to Area, the floor levels are a	o conservation shophouses in the Geylang Conservation Iso subject to the Geylang Urban Design Guidelines.	
P7.	Car Parks	Carparking spaces, if required, are to be provided within the new rear extension. Ingress and egress are to be taken from existing/proposed rear service road.	

RESTORATION GUIDELINES			
	SECONDARY SETTLEMENTS		
Mechanical & Electrical and Others		Design / Location / Material	
Q.	Flue	Original masonry flue, if any, can be retained, repositioned or removed. New flue can be added.	
		Repositioned or new flue is to be neatly located in either the rear slope of the main roof or the rear secondary roofs or abutting the wall of rear facade/rear service block within the rear court. It can also abut the rear service block wall of the adjacent unit.	
		The roof of the flue can be pitched or flat and is to be lower than the ridge of the main roof.	
		<u>See Figure 17</u>	
		All external walls are to be of plastered brick or plasterboard and the pitched roof to be unglazed, natural colour clay tiles of profile identical to the main roof or of reinforced concrete.	
		Alternatively, metal flues can be exposed and painted the same colour as the background wall.	
		The use of electrostatic air cleaning system is encouraged.	
R.	Exhaust Fan	Exhaust fan is to be placed at the rear facade or rear service block facing the rear court.	
		Any material can be used. If metal is used, it is to be anodised or colour coated. *	
S.	Lift Shaft	Lifts can be added. However, if the shaft protrudes beyond the roof, it must be located at the rear slope of the main roof or on the secondary roof and lower than the roof ridge of the main roof.	
*	For Blocks 55 to 59, 64 to metal vents are to be anod	66 and 71 to 82 in the Tiong Bahru Conservation Area, lised or colour coated.	

RESTORATION GUIDELINES		
SECONDARY SETTLEMENTS		
Mechanical & Electrical and Others	Design / Location / Material	
T. Conduits and Pipes	Rainwater downpipes, gas pipes and air-condensing conduit pipes can be mounted on the surface of the rear wall. The air-condensing conduit pipes are to be properly encased and neatly laid out.	
	Rainwater downpipes including gutters, if provided, are not to be in stainless steel.	
	All other utility/conduit pipes are not to be mounted on the surface of the external walls, unless specifically required by relevant technical agencies.	
	Exposed lightning tape and conductor are to be installed at a location least obtrusive from the exterior.	
U. Air Conditioning System	Condensing units are to be integrated within the building envelope at the rear in a recess created within the rear boundary wall, or an opening created within the roof of the rear service block. The opening is to be properly screened. If metal is used for the screening, it is to be anodised or colour coated. See Figure 18	
	However, due to practical constraints in integrating the units within the building envelope and the differing needs of tenants and users, the condensing units can be neatly or compactly placed at the rear and lined along the parapet, party walls or rear service block walls The units are to be screened unless they are small and not visible from the street level.	
	See Figure 19	
	Other locations for placing the condensing units can be considered on the merits of each case if there are particular site constraints, eg when the conserved building is "back-to-back" with another building.	
	For Secondary Settlements within Central Area	
	For developments within the Central Area, all condensing units and rooftop M&E plants and services located on the new extensions or new developments are to comply with the screening requirements stipulated in the "Screening of Mechanical & Electrical Services and Car Parks, on Roofs and Building Facades Within the Central Area".	
	See URA's Circular to Professional Institutes dated 6 Sep 2004 (Circular No: URA /PB/2004/29-CUDD).	

	RESTORATION GUIDELINES		
	SECONDARY SETTLEMENTS		
Mech	nanical & Electrical and Others	Design / Location / Material	
v.	Rooftop Mechanical & Electrical Plants and Services	Mechanical & Electrical plants and rooftop services are to be visually screened from the top and all sides. If metal is used for the screening, it is to be anodised or colour coated.	
		The spacing of trellises, louvres or other similar types of construction used for screening are to be equal or less than the depth of its individual members.	
		The screening elements are to be orientated to cut off views of the services from the street level and surrounding buildings.	
		If perforated panels are used, the porosity (i.e. percentage of void-to-solid) of the perforated panels is to be equal or less than 25% and the size of openings cannot exceed 30mm in diameter.	
w.	Letterboxes	The design and placement of letter boxes along the public five-footway should take into account pedestrian safety. They can also be integrated into the design of the shop front or residential front.	
		<u>See Figure 20</u>	

PART 2 PLANNING PARAMETERS AND RESTORATION GUIDELINES SECONDARY SETTLEMENTS

## 2.3.3 DRAWINGS & ILLUSTRATIONS

(Click here to see Figure 1 to Figure 20)

- Figure 1: Development Options for Shophouses
- Figure 2: New Link
- Figure 3: Jackroof and Skylight on Jackroof
- Figure 4: Allowable Structures on Existing Flat Roofs
- Figure 5: Secondary Windows
- Figure 6: Canopy
- Figure 7: Retractable Awning
- Figure 8: Five-Foot Way Floors
- Figure 9: End Gable Wall
- Figure 10: Rear Façade of Main Building
- Figure 11: Rear Service Block
- Figure 12: Rear Court and Rear Boundary Wall
- Figure 13: Airwell
- Figure 14: Roof Mezzanine
- Figure 15: Rear Extension
- Figure 16: New Rear Extensions for Corner Shophouse Units
- Figure 17: Flue
- Figure 18: Condensing Units Integrated within Building Envelope
- Figure 19: Condensing Units Placed at Rear Parapet and Walls
- Figure 20: Letterbox

# 2.4 **BUNGALOWS**

Bungalows are independent dwelling units usually of one- or two-storeys. They tend to be located in serene and wooded environments away from the hustle and bustle of the city. Bungalows were first introduced into Singapore and Malaya by the British in the 1830s. The early versions of the bungalow were largely one-storey and had timber floors elevated on brick piers or timber posts to allow air circulation underneath.

The old bungalows in Singapore generally fall into five types. These are:

### 1 The Early Bungalow (1860s)

This bungalow is characterised by single storey buildings on stilts constructed either of timber or masonry.

### 2 The Victorian Bungalow (1870-1890s)

This bungalow is characterised by the heavy application of decorative ornamentation on the facade.

### 3 The Black and White Bungalow (1900-1920s)

This bungalow is characterised by its half-timber construction, broad, simple, over-hanging hipped roof and the sharp definition of openings in the plain white walls.

### 4 The Art Deco Bungalow (Late 1920s-1930s)

This bungalow is characterised by the simple, geometric streamlining of the classical motifs on its facade.

### 5 The Modern Bungalow (1950s-1960s)

This bungalow is characterised by its geometric, free-form approach.

For a detailed description of each type of bungalow, please refer to <u>Part 1</u> on "Understanding the Bungalows".

# 2.4.1 PLANNING PARAMETERS

## 2.4.1.1 **Conservation Plan**

The plans (Appendix II) show the boundary of the conservation areas and the buildings to be conserved. The different types of bungalows to be conserved are largely located within the following conservation areas:

### (a) Good Class Bungalow Areas

- i. Chatsworth Park
- ii. Holland Park & Ridout Road
- iii. Nassim Road & White House Park

### (b) Mountbatten Road

### (c) Southern Ridges

Some are located within gazetted Conservation Areas like Joo Chiat and Geylang while a few are stand-alone conserved bungalows.

## 2.4.1.2 **Building Use**

The use shall follow the Master Plan intention for the respective areas.

## 2.4.1.3 **Plot Ratio**

The plot ratio for the bungalows within the Good Class Bungalow Areas, Mountbatten Road and Southern Ridges shall be the resultant of the building envelope of the conservation building or part thereof to be conserved, as well as that of the new extension(s), if any, which are to comply with the development control and planning guidelines for the areas.

For the other bungalows, the plot ratio shall be the resultant of the building envelope of the conservation building or part thereof to be conserved, as well as that of the new extension(s) if any, and subject to the maximum prescribed permissible plot ratio in the Master Plan for the respective areas.

For bungalows located on sites with GPR control and gazetted for conservation after 7 Jun 2004, the GFA of the bungalows can be computed as additional GFA over and above the Master Plan GPR.

# 2.4.1.4 **Conserved bungalows and Intensification**

The applicant can consider the following options:

(a) To conserve the entire bungalow including the outhouse.

OR

(b) To conserve only the main building. If there is vacant land to the rear or sides, new extensions can be added subject to Development Control guidelines, the allowable building height of the area, and the requirements of relevant technical departments.

See Figure 1

### New Extensions

New extensions are not to adversely affect the visibility of the conserved bungalows. In other words, the conserved bungalows are to be clearly discernible from the new developments.

Setbacks and interfacing zones are to be maintained so that there is articulation between the old and the new.

### • Setback

To safeguard the prominence of the conserved bungalow, the new extensions are to be recessed from the front facade line of the conserved bungalow and restricted to the rear wherever possible. Exceptions can be considered based on merits of the case if extensions are located at a considerable distance away from the conserved bungalow.

The new extensions are also to comply with the prevailing Development Control guidelines such as boundary setback and buffer provisions.

### • Interfacing zone

An interfacing zone is to be provided around the conservation building to separate it from the new extensions. The new extensions generally cannot encroach onto the interfacing zone, although proposals to make use of the interfacing zone to integrate the old and new buildings may be allowed subject to evaluation on the effectiveness and suitability of such proposals from the architectural point of view.

### Linkage

Linkages can be added between the new extensions and the conserved bungalow. The new extensions are not to abut the conserved bungalow directly as this will obliterate the original features on the facades. The sketch in <u>Figure 2</u> can be used as a guide.

The design of the new extensions is to be compatible to the conserved bungalow. Compatibility need not, however, mean a direct replication of the conserved bungalow. These serve only as broad guidelines and are not meant to dictate developments on the sites. The detailed parameters and guidelines for each site will be established with the applicants at the planning application stage.

<u>See Annexure 1</u> and <u>Figures 3(a) to 3(e)</u> for the specific parameters and controls for new extensions for bungalows at Mountbatten Road.

## 2.4.1.4 SUBDIVISION OF LAND

For bungalows located on larger sites, the land can be subdivided to accommodate the conserved bungalow and for redevelopment of the remaining site.

In the Good Class Bungalow Areas, as a concession to facilitate the subdivision of land, one sub-standard plot size of not less than 1000 sq m can be considered provided the total land area together with the conserved bungalow plot is not less than 2800 sq m. Please refer to Figure 4 for illustration.

At Mountbatten Road, the balance land within the larger conserved bungalow lots can be subdivided into additional bungalow/semi-detached plots. The conserved bungalow and the new extensions can also be strata-subdivided into apartment units.

At other locations, the subdivision of the conserved bungalow lot and the new developments are subject to current planning and Development Control guidelines.

## 2.4.1.5 **Development Charge**

Under the Planning Act, development charge, equivalent to the difference between the Development Baseline and the Development Ceiling for that land, is payable in respect of any development of the land or when there is a change in the use of the land or building.

Exemption from payment of development charge, if applicable, is given in respect of the value enhancement arising from the proposed use or use changes on the gross floor area for the building or part thereof on the land to be conserved provided that such conservation is carried out in accordance with the approved plans and completed within a period of 2 years from the date of conservation permission.

Development charge, where applicable, shall be leviable to the new extension(s), as well as to any new floor areas e.g. roof mezzanines within the envelope of the building to be conserved.

# 2.4.1.6 **Carparking**

Provision of car parks or payment of car parks deficiency charge for a conservation building or any part thereof that is conserved is waived if the conservation guidelines are fully complied with and the conservation works are completed in accordance with the approved plans.

The requirement for provision of carparking spaces under the Parking Places (Provision of Parking Places and Parking Spaces) Rules and any statutory modifications or re-enactments thereof for the time being in force shall be complied with in full for the new extension(s).

# 2 **RESTORATION GUIDELINES**

### **Key Elements Subject To Mandatory Compliance**

The following tables specify the design, location and material for all key elements. The fundamental principle, the "**3R**", is **maximum Retention, sensitive Restoration and careful Repair**. Replacement, if any, is to follow the original design and materials. New installation/addition must not drastically affect the intrinsic character of the building. Items where design and material can vary are listed in <u>Appendix II</u>.

## **IMPORTANT NOTE:**

Where applicable, the requirements of the relevant technical departments are to be complied with. Owners are also required to obtain the consent of the relevant parties for roof eaves, canopies and projections of any nature beyond the site boundary.

RESTORATION GUIDELINES		
BUNGALOWS		
Key External Elements		Design / Location / Material
Α.	Roof	
A1.	Main Roof	The original profile, pitch, height and eaves projection are to be retained and restored.
		Owners may be required to keep the original roof tile material, colour and profile if it is a unique feature of the building. Please refer to the "Specific Facade Restoration Guidelines" of the subject bungalow.
		Otherwise, unglazed, natural colour clay roof tiles, of any size and profile, are to be used.
		Existing reinforced concrete roof can be retained.
		The underside of roof eaves can be exposed or covered with plasterboard.
		Structural strengthening or supports like steel or reinforced concrete roof beams, if required to be added, are to be sensitively designed to minimise visual impact on the traditional timber system to be retained.
A2.	Jackroof	New jackroof is not allowed.
A3.	Skylight	Subject to evaluation.
A4.	Dormer Windows	Subject to evaluation.

RESTORATION GUIDELINES		
BUNGALOWS		
Key External Elements	Design / Location / Material	
B. Building Facades		
B1. Architectural Features (Windows and doors, ornaments, etc)	The original fanlights, windows, doors and vents are to be retained and restored. To refer to "Specific Facade Restoration Guidelines" of the subject bungalow.	
	New internal elements such as staircase landing, wall and partition are not to abut the original window or door openings.	
	Security bars at windows and doors, if any, can be retained or removed. New security bars of traditional design and material can be added.	
	Existing mild steel frames of doors, windows and vents can be changed to powder coated aluminium frames of similar appearance as the mild steel frames.	
	Existing coloured glass in doors, windows, fanlights and vents cannot be replaced with clear glass.	
B2. Canopy / Porch / Verandah / Balcony / Balustrades	The original canopy, porch, verandah, balcony and balustrades are to be retained and restored. The inner facade behind the balcony or verandah is also to be retained and restored. To refer to "Specific Facade Restoration Guidelines" of the subject bungalow.	
	The balconies and verandahs can be enclosed with new windows subject to the design and material matching those of the respective facade. This is not applicable to terrace or open to sky balcony or verandah.	
	Frameless clear glass with sensitive installation details can be considered subject to the merits of the case.	
	However, owners are encouraged to keep the verandahs and balconies open as they add depth and facade articulation to the building.	
B3. Secondary Windows and Doors	New secondary casement, French or sliding window and door can be added subject to the design being compatible with those of the main window and door.	
	The frame can be of any material. If metal is used, it is to be anodised or colour coated.	
	The infill can be of timber or glass. Tinted, coloured and obscure glass can be used.	
B4. Timber Surfaces	Timber surfaces can be either painted or stained.	

RESTORATION GUIDELINES		
BUNGALOWS		
Key Internal Elements		Design / Location / Material
B5.	Shanghai Plaster Finish	For a building with existing unpainted Shanghai plaster finish, the finish is to be retained and restored.
		If the Shanghai plaster finish is already painted over, then the building can be repainted although the owner is encouraged to remove the paint work and revert to the original Shanghai plaster finish.
B6.	Fair-faced Brickwalls	For a building with existing unpainted fair-faced brickwalls, the fair-faced brickwalls are to be retained and restored
		If the fair-faced brickwalls are already painted over, then the walls can be repainted although the owner is encouraged to remove the paint work and revert to the original fair-faced finish.
C.	Outhouse	To refer to "Specific Facade Restoration Guidelines" of the subject bungalow. The applicant has the choice to keep or demolish the outhouse for new extension.
D.	Floors	
D1.	Structure	The existing structural system is to be retained and restored. Horizontal and/or vertical structural supports, if required to be added, are to abut the load-bearing walls to minimise impact on the existing structural system which is to be retained.
		For original reinforced concrete framed buildings, the original structural grids are to be retained. New columns, if required to be added, are to align with and respect the original grids. Provided the structural integrity of the building is not compromised, flexibility to shift some columns to meet the specific operational/ functional requirements can be considered on a need- to basis.
D2.	Upper Floors	The existing level, timber floor and structural system are to be retained and restored. If the existing floors are reinforced concrete, the same material can be retained.
		Voids up to 25% of the floor area of each floor, can be introduced. For wet areas e.g. toilets and kitchen, reinforced concrete floor can be used.
		The floor material can vary for new extension linked to the conserved bungalow.
/ Location / Material		
--	--	
/ Location / Material		
ows, which are raised more than 1m can have an additional floor below de design and material, and subject		
al stability of the bungalow is to be		
s of the additional floor is set back 45-degree control from the underside ig floor slab of the bungalow.		
nt storey height of the bungalow h the height control for the area.		
New basement are to be located only within the new extension. Basement is not allowed under the conserved bungalow.		
Owners may be required to keep the original staircase if it is a unique feature of the building.		
Otherwise, existing staircase can be retained, removed or relocated. New staircase to replace or supplement the existing one is to be constructed in timber or metal if the building has timber floors. The layout and railing design of the new staircase can vary.		
annot abut any door or window at the front, side and rear facades.		
ete staircase, only if existing, can be		
ave internal ceiling/wall/floor finishes ive character to the building. Owners b keep such original finishes.		
th distinctive colour, e.g. "Black and , the same colour should remain. To ific Restoration Guidelines" for the		

RESTORATION GUIDELINES			
	BUNGALOWS		
Mechanical & Electrical and Others	Design / Location / Material		
H. Exhaust Fan	Fan is to be placed behind vents. The design of the vent is to be compatible with the character of the conserved bungalow.		
	Opening for exhaust fan is to be timber framed fixed timber louvre/precast concrete/porcelain vents.		
I. Air-conditioning System	Air-conditioning units are to be located out of sight from public road and be least obtrusive from the exterior. The condensing units are to be screened unless they are small and not visible from the street levels.		
	See Figure 6		
	For developments within the Central Area, they are to comply with the screening requirements stipulated in the "Screening of Mechanical & Electrical Services and Car Parks on Roofs and Building Facades Within the Central Area".		
	See URA's Circular to Professional Institutes dated 6 Sep 2004 (Circular No: URA/PB/2004/29-CUDD)		

# 2.4.3 DRAWINGS & ILLUSTRATIONS

(Click here to see Figure 1 to Figure 6 and Annexure 1)

- Figure 1: Extent of Building to be Conserved
- Figure 2: New Extension to Conservation Bungalows
- Figures 3(a) to 3(e): Schematic Diagrams of New Extension
- Figure 4: Good Class Bungalow Area
- Figure 5: Additional Floor below Conservation Bungalows
- Figure 6: Air-Conditioning System
- <u>Annexure 1: Bungalows at Mountbatten Road</u>

# **ANNEXURE 1: BUNGALOWS AT MOUNTBATTEN ROAD**

The following are the parameters for the new extensions for bungalows at Mountbatten Road:

#### a) **Building Height**

The maximum building height of the new extensions is up to 2 storeys. Basement and attic are allowable subject to Development Control guidelines and the requirements of relevant technical departments.

#### b) Setbacks – <u>See Figures 3(a) to 3(e)</u>

Front	The new extensions are to be set back a distance equivalent to 40% of the depth of the conservation building from the front facade line of the conservation building.
	be considered for extensions that are located at a considerable distance away from the conserved bungalow. In such cases, the new extensions are to comply with the usual Development Control guidelines such as boundary setback and buffer provisions.
Sides	Minimum 2.0m from lot/plot boundary line.
Rear	Minimum 3.0m from lot/plot boundary line.

#### c) Site coverage

The site coverage is the resultant of the building envelope, inclusive of the conserved bungalow, and is subject to Development Control guidelines.

#### d) Interfacing zone

Interfacing zones of typically 2m to 6m wide are demarcated around the conserved bungalow to separate it from the new extension

See Figures 3(a) to 3(e)

#### e) **Other requirements**

The developments are to comply with other planning and Development Control requirements as well as the requirements of relevant technical departments, where applicable.

Based on the above controls for the setbacks and interfacing zones (items b and d), "new extension zones" have been demarcated as shown in Figures 3(a) to 3(e). These serve only as broad guidelines and are not meant to dictate developments on the sites. The detailed parameters and guidelines for each site will be established with the applicants at the planning application stage.

#### Note:

For House No. 738 Mountbatten Road on lot 2244 MK 25, the conserved bungalow is to be retained and restored in accordance with the controls and guidelines herein. The balance of the land within the lot can be developed up to the storey height allowable in the building height plan for the Planning Area.

# PART 3: ENVELOPE CONTROL GUIDELINES

Envelope control sites are vacant lands and buildings located within Conservation Areas, but not designated for conservation. The Conservation Plans in Appendix III show their location within each of the Historic Districts, Residential Historic Districts and Secondary Settlements. These sites can be redeveloped subject to envelope control guidelines. The envelope is defined by the front facade, the roof and rear facade. Envelope control sites in the Geylang Conservation Area are also subject to the Geylang Urban Design Guidelines (GUDG).

The Historic Districts and Residential Historic Districts have two types of envelope control sites:

#### a) Infill Development

Sites located between or adjacent to conserved buildings.

#### b) Independent Development

Stand-alone sites or sites located within a streetblock without any conserved building.

The Secondary Settlements have three types of envelope control sites:

#### a) Type I Infill Development

Sites located between or adjacent to conserved buildings. The total width of the site and adjacent envelope control sites, if any, is not more than the width of two typical shophouse units.

#### b) **Type II Infill Development**

Sites located between or adjacent to conserved buildings. The total width of the site and adjacent envelope control sites, if any, is more than the width of two typical shophouse units.

#### c) Independent Development

Stand-alone sites or sites located within a streetblock without any conserved building.

# 3.1 **PLANNING PARAMETERS**

# 3.1.1 **Building use**

## **Historic Districts**

The use shall follow the Master Plan intention of the respective areas. If the site is located within the core area, the first storey must be for shops or eating establishments. The Conservation Plans show the extent of the designated core areas in Chinatown, Kampong Glam and Little India. Certain trades are not permitted in the Historic Districts and the core areas. (See <u>Appendix IA</u> for Incompatible & Pollutive Trades and <u>Appendix IB</u> for Location of Core Areas).

## **Residential Historic Districts**

**Blair Plain**: Based on the Master Plan, the entire area is zoned Residential except for House Nos. 1 to 89 (Odd Nos.) Kampong Bahru Road which is for commercial use. House Nos. 167 Neil Road; 52 and 54 Blair Road; 63, 64, 68 and 69 Spottiswoode Park Road, are zoned Residential with Commercial at the first storey. As they are in a residential area, it is preferable that they are used for residential purpose.

**Emerald Hill**: Based on the Master Plan, the entire area is zoned Residential except for House Nos. 180 Orchard Road (Peranakan Place), House No. 202 Orchard Road, House Nos. 2, 3, 5, 7 and 9 Emerald Hill Road and House Nos. 17 to 49 (Odd Nos.) Cuppage Road which are zoned Commercial.

#### **Secondary Settlements**

The use shall follow the Master Plan intention of the respective areas.

# 3.1.2 **Plot Ratio**

#### **Historic Districts & Residential Historic Districts**

The plot ratio shall be the resultant of the building envelope following the envelope control guidelines and, where applicable, subject to the maximum permissible plot ratio determined by the Competent Authority.

#### **Secondary Settlements**

The plot ratio shall follow the prescribed maximum permissible plot ratio in the Master Plan for the respective areas.

#### 3.1.3 **Development Charge**

Under the Planning Act, development charge, equivalent to the difference between the Development Baseline and the Development Ceiling for that land, is payable in respect of any development of the land or when there is a change in the use of the land or building.

# 3.1.4 **Carparking**

Car parks shall be provided in accordance with the Parking Places (Provision of Parking Places and Parking Spaces) Rules and any statutory modifications or re-enactments thereof for the time being in force.

# 3.2 ENVELOPE CONTROL GUIDELINES

# 3.2.1 New Building

The objective of the envelope control guidelines is to ensure that new buildings will continue to respect:

- a) The characteristics of the existing street, such as the provision of covered walkways and the continuity of the streetscape, and
- b) The overall scale and character of the area.

# 3.2.2 **Items/Key Elements For Compliance**

The guidelines for the envelope control sites within the Historic Districts and Residential Historic Districts, and the Secondary Settlements are listed in the following tables. Where applicable, the requirements of the relevant technical departments are to be complied with.

# 3.3 STRUCTURAL STABILITY OF ADJACENT CONSERVED BUILDINGS

A professional engineer is to be engaged to ensure that the structural stability of the adjacent conserved buildings are not adversely affected by the new building. This is particularly essential when a new basement is to be constructed next to a conserved building. All reasonable care and protection are to be accorded to the adjacent conserved buildings to ensure retention of their structural integrity.

ENVELOPE CONTROL GUIDELINES			
HISTORIC DISTRICTS AND RESIDENTIAL HISTORIC DISTRICTS			
Key Elements	Infill Development	Independent Development	
A. Building Height	The allowable number of storeys is shown in the Conservation Plans in <u>Appendix</u>	The allowable number of storeys is shown in the Conservation Plans in <u>Appendix</u>	
	The overall scale of the building, in terms of the springing line, roof ridge or top of the roof parapet where applicable, is to match that of the adjacent conserved buildings. If the adjacent conserved buildings have different heights, the higher building forms the basis of the height control. <u>See Figure 1</u>	The floor-to-floor height is to comply with Development Control guidelines. In Emerald Hill Conservation Area, two rows of buildings along Emerald Hill Road and Saunders Road are under street block control as shown in plan <u>URA/CUD Plan Release</u> <u>1/2006E.</u>	
B. Setback	Front and rear facades of the building are to line up with the adjacent conserved buildings.	The road reserve lines and current Development Control setback requirements are applicable. In Emerald Hill Conservation Area, two rows of buildings along Emerald Hill Road and Saunders Road are under street block control as shown in plan <u>URA/CUD Plan Release</u> <u>1/2006E.</u>	
C. Roof	Form and material can vary.	Form and material can vary.	
D. Front Facade	Design and material can vary.	Design and material can vary.	

ENVELOPE CONTROL GUIDELINES			
н	HISTORIC DISTRICTS AND RESIDENTIAL HISTORIC DISTRICTS		
K	(ey Elements	Infill Development	Independent Development
D1.	Covered Walkway	Colonnaded covered walkway is to be provided to maintain the continuity of the streetscape.	Covered walkway is to be provided to maintain the character of the streetscape.
		The width and height are to match that of adjacent conserved buildings and the soffit height cannot exceed 3.6m.	The width and height are to comply with Development Control guidelines. The floor level is to match that of open walkway.
		The floor level is to match that of the adjacent conserved building. Where the difference in level is not more than 175mm, a ramp is to be provided. The gradient of the ramps cannot be steeper than 1:10.	
		The flooring can be of any materials provided it does not have a highly polished gloss finish.	
E.	Side Facade	Design and material can vary.	Design and material can vary.
F.	Rear Facade	Design and material can vary.	Design and material can vary.
G.	Party Wall	The party wall form of development is to be kept. Party wall, if existing, is to be retained.	Any party wall exposed as external wall cannot have any opening.
		Any party wall exposed as external wall cannot have any opening.	
H.	Basement	Basement can be considered on a case to case basis and it must not affect the structural stability of adjacent conserved buildings.	Basement is allowed.
١.	Mechanical/Electri	cal	
11.	Flue and Vent	Flue and vent are to be located at the rear and their height, not higher than the ridge of the main roof.	Flue and vent are to be located at the rear.

	ENVELOPE CONTROL GUIDELINES			
H	HISTORIC DISTRICTS AND RESIDENTIAL HISTORIC DISTRICTS			
I	Key Elements	Infill Development	Independent Development	
12.	Lift Shaft	Lift shaft is to be located at the rear slope of the main roof or on secondary roof. The height cannot exceed the ridge of the main roof.	Lift shaft can be at any location.	
13.	Air Conditioning System	Condensing units are to be located out of sight from public road and be least obtrusive from the exterior. The condensing units are to be screened unless they are small and not visible from the street levels.	Condensing units are to be located out of sight from public road and be least obtrusive from the exterior. The condensing units are to be screened unless they are small and not visible from the street levels.	
		<u>See Figure 3</u>	<u>See Figure 3</u>	
		For developments within the Central Area, they are to comply with the screening requirements stipulated in the "Screening of Mechanical & Electrical Services and Car Parks on Roofs and Building Facades Within the Central Area".	For developments within the Central Area, they are to comply with the screening requirements stipulated in the "Screening of Mechanical & Electrical Services and Car Parks on Roofs and Building Facades Within the Central Area".	
		See URA's Circular to Professional Institutes dated 6 Sep 2004 (Circular No: URA/ PB/2004/29-CUDD)	See URA's Circular to Professional Institutes dated 6 Sep 2004 (Circular No: URA/ PB/2004/29-CUDD)	
14.	Rooftop Mechanical & Electrical Plants and Services	Mechanical & Electrical plants and rooftop services are to be visually screened from the top and all sides. If metal is used for the screening, it is to be anodised or colour coated.	Mechanical & Electrical plants and rooftop services are to be visually screened from the top and all sides. If metal is used for the screening, it is to be anodised or colour coated.	
		The spacing of trellises, louvres or other similar types of construction used for screening are to be equal or less than the depth of its individual members.	The spacing of trellises, louvres or other similar types of construction used for screening are to be equal or less than the depth of its individual members.	
		The screening elements are to be orientated to cut off views of the services from the street level and surrounding buildings.	The screening elements are to be orientated to cut off views of the services from the street level and surrounding buildings.	
		If perforated panels are used, the porosity (i.e. percentage of	If perforated panels are used, the porosity (i.e. percentage of	

ENVELOPE CONTROL GUIDELINES		
HISTORIC DISTRICTS AND RESIDENTIAL HISTORIC DISTRICTS		
Key Elements Infill Development		Independent Development
	void-to-solid) of the perforated panels is to be equal or less than 25% and the size of openings cannot exceed 30mm in diameter. void-to-solid) of the p panels is to be equal than 25% and the openings cannot exceed in diameter.	
J. Signages	Please refer to <u>Part 4</u> on "Signage Guidelines" for conserved buildings.	Please refer to <u>Part 4</u> on "Signage Guidelines" for conserved buildings.

ENVELOPE CONTROL GUIDELINES				
	SECONDARY SETTLEMENTS			
K	Key Elements	Type I Infill Development	Type II Infill & Independent Development	
Α.	Building Height*	The overall scale of the main building fronting the road, in terms of the springing line, roof ridge or top of the roof parapet where applicable, is to match that of the adjacent conserved buildings. If the adjacent conserved buildings have different heights, the higher building forms the basis of the height control. <u>See Figure 1</u>	Development can be up to the maximum number of storeys allowable within the respective areas. The floor-to-floor height is to comply with Development Control Guidelines.	
		The rear can be developed up to the maximum number of storeys allowable within the respective areas. The floor-to- floor height of the rear is to comply with Development Control guidelines. <u>See Figure 2</u>		
В.	Setback*	Front façade of the building is to line up with the adjacent conserved buildings. The rear is to be set back to the rear service road widening line.	The road reserve lines and current Development Control setback requirements are applicable.	
C.	Roof*	Form and material can vary	Form and material can vary	
D.	Front Facade	Design and material can vary.	Design and material can vary.	
D1.	Covered Walkway*	Colonnaded covered walkway is to be provided to maintain the continuity of the streetscape.	Covered walkway is to be provided to maintain the character of the streetscape.	
		The width and height are to match that of adjacent conserved buildings and the soffit height cannot exceed 3.6m.	The width and height of covered walkways are to comply with Development Control guidelines. The floor level is to match that	
		The floor level is to match that of the adjacent conserved building. Where the difference in level is not more than 175mm, a ramp is to be provided. The gradient of the ramps cannot be steeper than 1:10.	of open walkway.	
		The flooring can be of any material provided it does not have a highly polished gloss finish.		

ENVELOPE CONTROL GUIDELINES				
	SECONDARY SETTLEMENTS			
	Key Elements	Type I Infill Development	Type II Infill & Independent Development	
*	For Geylang Conservation Area, the building height, setbacks, roof forms and covered walkway of envelope control sites are also subject to the Geylang Urban Design Guidelines.			
	For Upper Circular 7.5m of the develo building. The rear µ Type 2 Infill & Indeµ of 6 storeys.	Road Conservation Area, for Type pment is to match the storey hei portion of the site can be built up pendent Development, the entire s	e 1 Infill Developments, the front ght of the adjacent conservation to a maximum of 6 storeys. For ite can be built up to a maximum	
Ε.	Side Facade	Design and material can vary.	Design and material can vary.	
F.	Rear Facade	Design and material can vary.	Design and material can vary.	
G.	Party Wall	The party wall form of development is to be kept. Party wall, if existing, is to be retained.	For Type II Infill Development, the party wall form of development is to be kept. Party wall, if existing, is to be retained.	
		external wall cannot have any opening.	Any party wall exposed as external wall cannot have any opening.	
H.	Basement	Basement is allowed provided it does not affect the structural stability of adjacent conserved buildings.	For Type II Infill Development, basement is allowed provided it does not affect the structural stability of adjacent conserved buildings.	
			For Independent Development, basement is allowed.	
I.	Mechanical/Electri	cal		
11.	Flue and Vent	Flue and vent are to be located at the rear.	Flue and vent are to be located at the rear.	
12.	Lift Shaft	Lift shaft is to be located away from the road and not on the front slope of the main roof.	Lift shaft can be at any location.	
13.	Air Conditioning System	Condensing units are to be located out of sight from public road and be least obtrusive from the exterior. The condensing units are to be screened unless they are small and not visible from the street levels. <u>See Figure 3</u> For developments within the	Condensing units are to be located out of sight from public road and be least obtrusive from the exterior. The condensing units are to be screened unless they are small and not visible from the street levels. <u>See Figure 3</u> For developments within the	

ENVELOPE CONTROL GUIDELINES				
	SECONDARY SETTLEMENTS			
	Key Elements	Type I Infill Development	Type II Infill & Independent Development	
		Central Area, they are to comply with the screening requirements stipulated in the "Screening of Mechanical & Electrical Services and Car Parks on Roofs and Building Facades Within the Central Area".	Central Area, they are to comply with the screening requirements stipulated in the "Screening of Mechanical & Electrical Services and Car Parks on Roofs and Building Facades Within the Central Area".	
		See URA's Circular to Professional Institutes dated 6 Sep 2004 (Circular No: URA/ PB/2004/29-CUDD)	See URA's Circular to Professional Institutes dated 6 Sep 2004 (Circular No: URA/ PB/2004/29-CUDD)	
14.	Rooftop Mechanical & Electrical Plants and Services	Mechanical & Electrical plants and rooftop services are to be visually screened from the top and all sides. If metal is used for the screening, it is to be anodised or colour coated.	Mechanical & Electrical plants and rooftop services are to be visually screened from the top and all sides. If metal is used for the screening, it is to be anodised or colour coated.	
		The spacing of trellises, louvres or other similar types of construction used for screening are to be equal or less than the depth of its individual members.	The spacing of trellises, louvres or other similar types of construction used for screening are to be equal or less than the depth of its individual members.	
		The screening elements are to be orientated to cut off views of the services from the street level and surrounding buildings.	The screening elements are to be orientated to cut off views of the services from the street level and surrounding buildings.	
		If perforated panels are used, the porosity (i.e. percentage of void-to-solid) of the perforated panels is to be equal or less than 25% and the size of openings cannot exceed 30mm in diameter.	If perforated panels are used, the porosity (i.e. percentage of void-to-solid) of the perforated panels is to be equal or less than 25% and the size of openings cannot exceed 30mm in diameter.	
J.	Signages	Please refer to <u>Part 4</u> on "Signage Guidelines" for conserved buildings.	Please refer to Part 4 on "Signage Guidelines" for conserved buildings.	

# 3.4 DRAWINGS & ILLUSTRATIONS

(Click here to see Figure 1 to Figure 3)

- Figure 1: Building Height of Infill Developments at Historic & Residential Historic Districts and Type 1 Infills in Secondary Settlements
- Figure 2: Envelope of Type I Infill Developments at Secondary Settlements
- Figure 3: Air Conditioning System

# PART 4: SIGNAGE GUIDELINES

Building signs have many functions. They also add interest and character to a building particularly if it is designated part of a conservation area.

## 4.1 SIGNS IN CONSERVATION AREAS

Two types of signs are common in conservation areas.

### 4.1.1 **Traditional Signs**

These take the form of carved timber panels with gold-painted Chinese characters sometimes combined with English translations, and letterings/characters formed in plaster relief or painted onto timber boards or metal panels. The degree of embellishment varies considerably. Traditional signs are not self-illuminating.

Owners are to retain existing traditional signs that have acquired significance e.g. plaster relief signs on the outer face of columns, beams, friezes and pediments. They are part of the cultural history of the building and cannot be removed. However, they can be covered over with a new sign panel, if necessary, without damaging the original plaster reliefs.

The original building date on the facade or pediment cannot be removed or replaced.

### 4.1.2 **Contemporary Signs**

These are made usually of plastic with characters or words formed in contrasting colours, and can be lit from within their casings, ie self-illuminating. Some contemporary signs include painted metal panels and cloth banners to publicise events or promote sale.

#### 4.2 **DESIGN, LOCATION AND SIZE OF SIGNS**

Business signs are useful, interesting and attractive when thoughtfully and tastefully designed, and compatible with the character of the building and streetscape. As such, care is to be taken when designing such signs.

Signs are to be carefully positioned so that they are clear and easy to read from the street level and do not visually dominate the building. Most important of all, they do not cover or block any key architectural features.

A sensitively planned and designed sign will complement a building's heritage. The incorrect use of signage can severely compromise the character and unity of a building and its setting.

The following guidelines are applicable to business signs which also have to comply with the requirements of the relevant technical departments. Variations can be considered based on the merits of each case.

	SIGNAGE GUIDELINES	
K	EY ELEMENTS	LOCATION / SIZE
Α.	Forecourt Wall	Signs can be mounted on top or on the surface of a forecourt wall.
		They are to be confined within the width or surface area of the wall, and do not cover or block any architectural features.
		See Figure 1
В.	Front Facade	
B1.	Shopfront & Residential Front	For a shopfront (either full-width or with side staircase entrance), signs can be mounted within the transom panel.
		For an original residential front, signs can be mounted above the entrance door and are not to exceed the width of the door.
		See Figure 2
B2.	Five- Foot Way	Signs can be suspended within the clear width between the column and the party wall. The underside of the sign is to have a minimum headroom clearance of 2500mm above the walkway level.
		See Figure 3
B3.	First Storey Column	Signs can be projected from a column or mounted on the surface of column.
		For signs projected from a column, the following are applicable :
		(a) They are located at the left hand side of the building as viewed from the road.
		(b) They do not exceed the height of the column shaft.
		(c) They do not project beyond existing roadside drain at first storey.
		(d) The width is not more than 600mm.
		(e) The underside of the sign is to have a minimum headroom clearance of 2500mm above the walkway level.
		For signs on the surface of column, individual letters or sign panel cannot be larger than the surface of the column and must follow the shape of the column.
		See Figure 4

SIGNAGE GUIDELINES		
KEY ELEMENTS	LOCATION / SIZE	
B4. Frieze	Individual letters or sign panel can be mounted within a frieze or suspended from a frieze.	
	See Figure 5	
B5. Upper Storey Facade	Signs can be projected from an upper storey pilaster. They are to be located at the left hand side of the building as viewed from the road.	
	The overall height of the sign (inclusive of the suspension brackets) cannot exceed the shaft of the pilaster.	
	The width of the sign is not more than 600mm, and the width for brackets is not more than 200mm.	
	<u>See Figure 6</u>	
	For a building of Art Deco or Modern style, individual letters sensitively planned and designed, can be mounted on the facade. They cannot cover or block any architectural features.	
	<u>See Figure 7</u>	
C. End Gable Wall	Sign can be mounted within the width of an entrance to a five-foot way and a door to the upper storey, where applicable.	
	Variations in the size and location can be considered on merits of the case if they meet the following criteria:	
	(a) The sign is attractively designed.	
	(b) It comprises mural painting on the wall, individual letters and graphics, or flat-mounted display panels. Projected sign is not allowed.	
	(c) The sign does not cover or block any architectural elements or features/ornaments.	
	(d) It does not overwhelm or adversely impact on the architectural character of the building.	
	<u>See Figure 8.</u>	
D. Rear Wall	Signs can be mounted above a rear door and not to exceed the width of the door. Variations can be considered based on the merits of the case.	

**Note:** Business signs can incorporate small advertisements, up to one-third of the overall content of each sign.

# 4.3 **APPROVAL FOR CONSERVATION SIGNAGE**

All signage proposals within Conservation Areas (except for premium service) are to be submitted directly to the Advertising Licensing Section of the Building and Construction Authority (BCA).

Premium service for signage proposals is available at The URA Centre. A fee of \$40 (subject to GST) payable by cash, cashcard or NETS, will be charged and the submission is processed on-the-spot. Please note that this service is only for proposals that comply fully with the signage guidelines.

# PART 5: APPENDICES

# APPENDIX IA - INCOMPATIBLE USES

#### **Incompatible Uses Not Allowed in Historic District Core Areas**

(See <u>Appendix 1B</u> for location of core areas)

- 1 Bars/Pubs and Nightclubs (includes karaoke lounge & discotheque)
- 2 Health centres
- 3 Amusement centres
- 4 Western fast-food restaurants
- 5 Supermarkets
- 6 Building materials/car showrooms
- 7 Nursing Homes
- 8 Western knock-down furniture
- 9 Offices (except at the upper storeys); excludes banks which are allowed on all storeys

#### **Uses Not Allowed in Historic Districts**

- 1 New bars, pubs, nightclubs and karaoke outlets are not allowed according to prevailing use controls for pub/nightclub/ktv lounge.
- 2 New health centres (massage establishments and spas) are not allowed according to prevailing use controls for health centre.
- 3 Warehouse stores are not allowed. They may only be considered if such a use is ancillary to the main use.
- 4 Places of worship, unless previously authorised, are not allowed within the conserved buildings. They should be located on land zoned for places of worship.
- 5 Pollutive trades such as engineering, spray-painting, welding, plumbing, motor, metal and joinery workshops, tyre and battery shops, are not allowed.

# APPENDIX IB - LOCATION OF CORE AREAS

- 1 <u>Chinatown Historic District</u>
- 2 <u>Kampong Glam Historic District</u>
- 3 <u>Little India Historic District</u>

# APPENDIX II - CONSERVATION AREA PLANS

To view the conservation area maps, please click here.

# APPENDIX H DISTRIBUTION OF CAR PARKING

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# APPENDIX H DISTRIBUTION OF CAR PARKING

Location	Visitor Car Lots	Coach Lots	Handicapped	Red Lots (seasoned parking lots)	[B] Motorbike Lots (Free)	[A] TOTAL (FINAL)	TOTAL (FINAL) Payable [A +B]					
Tangling and Central Cores												
Botany Centre (Tanglin Core - Basement)	232	-	2	-	19	253	234					
Visitor Centre/ National Parks Board Headquarters/Car Park A (Level 3)	29	-	2	-	5	36	31					
Visitor Centre/ National Parks Board Headquarters/Car Park B (Basement)	72	-	1	-	10	83	73					
Visitor Centre/ National Parks Board Headquarters/Car Park C (Coach Parking)	46	5	1	-	10	62	52					
Cluny Park Road (outside Garage Building)	50	-	2	-	5	57	52					
Total	429	5	8	0	49	491	442					
Bukit Timah Core												
Raffles Building/Area A	98		2	-	10	110	100					
Raffles Building/Area B	35	-	-	-	5	40	35					
Jacob Ballas Children's Garden	39	5	1	-	3	48	45					
House 1	10	-	-	8	6	24	18					
House 2 (NUSS)	-	-	-	5	-	5	5					
House 3	-	-	-	9	-	9	9					
House 4 (Blue Bali	10			4	10	20	47					

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39

29

11

20

296

17

11

17

257

13

-

17

212

Rest)

Total

House 5 ( IPS)

Opposite Blk A

# APPENDIX I

# IMAGE INVENTORY & AUTHORISATION TABLE

# APPENDIX I

# IMAGE INVENTORY & AUTHORISATION TABLE

Listed in the following table are all the photographs included in the Nomination. Together these provide a good general picture of the Nominated Property.

Those photographs indicated in the column 'Non exclusive cession of rights' may be used by UNESCO in the way described in Annex 5 of the *Operational Guidelines* (2013). These have been included on a USB stick annexed to the Nomination. If UNESCO wishes to use any other of the photographs in this Nomination, please contact the photographer and/ or the copyright holder. An audio-visual presentation describing the history of the Singapore Botanic Gardens is also included on the USB stick annexed to the Nomination. This presentation was created by the Singapore Botanic Gardens. This presentation may be used for informative, non-commercial purposes. Reproduction of it in any form and dissemination of copies is prohibited. Agreement must be sought with the rightful owner/copyright holder if the material is to be used in any other way.

No.	Format	Caption	Date of photo	Photographer	Copyright owner	Contact details of copyright owner	Non exclusive cession of rights
01	jpg	The Bandstand (Front and Back	01-Jun- 10	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road	Yes
02	jpg	Ginger Garden	01-Jun- 10	NParks Official Photographer	SBG	Singapore 255505 Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
03	jpg	View looking out from the Bandstand	17-Apr- 13	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
04	jpg	Emblem of Singapore Botanic Gardens: the Cyrtostachys palm	28- May-12	Chris Blandford	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
05	jpg	The Bandstand	01-Jun- 10	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	Yes
06	jpg	The National Orchid Garden	01-Jun- 10	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
07	jpg	Evolution Garden	01-Jun- 10	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
08	jpg	Swan Lake	17-Apr- 13	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	Yes

No.	Format	Caption	Date of photo	Photographer	Copyright owner	Contact details of copyright owner	Non exclusive cession of rights
09	jpg	Momentous occasions: The Botanic Gardens is popular as a location for marriage proposals	Not known	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
10	jpg	An educational school visit	24-Jan- 13	Seri Hayuni Hadi	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	Yes
11	jpg	Tanglin Gate, main historical Entrance (c.1890)	1890	SBG Archives	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	Yes
12	jpg	Holttum Hall,1920	1920	SBG Archives	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
13	jpg	Evolution Garden	26- Nov-13	David Lim	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
14	jpg	Arborist at work	2007	Not Known	National Parks Board	National Parks Board 1 Cluny Road Singapore 259569	
15	jpg	City in a Garden	2006	Not Known	National Parks Board	National Parks Board 1 Cluny Road Singapore 259569	
16	jpg	Bandstand Hill	01-Jun- 10	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	Yes
17	jpg	Swan Lake (slopes)	26-Jul- 13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
18	jpg	Ginger Garden	26-Jul- 13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	

No.	Format	Caption	Date of photo	Photographer	Copyright owner	Contact details of copyright owner	Non exclusive cession of
19	jpg	The Botany Centre	Jan-13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	rights
20	jpg	The Plant House	17-Apr- 13	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
21	jpg	Rainforest	30-Jan- 13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
22	jpg	Palm Court	17-Apr- 13	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
23	jpg	Symphony Lake	26-Jul- 13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
24	jpg	Palm Valley	26-Jul- 13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
25	jpg	Orchid Garden	01-Jun- 10	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
26	jpg	Raffles Building	02- Feb-13	Aylin Orbasli	Aylin Orbasli	Dr Aylin Orbaşlı 4/3 Northwood Hall Hornsey Lane Highgate London N6 5PJ UK aorbasli@aol.com www.aylinorbasli.com	
27	jpg	Eco Lake	01-Jun- 10	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	

No.	Format	Caption	Date of photo	Photographer	Copyright owner	Contact details of copyright owner	Non exclusive cession of rights
28	Jpg	Childrens' Garden	10 10	Official Photographer	SBG	1 Cluny Road Singapore 259569	
29	jpg	Evolution Garden	26- Nov-13	David Lim	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
30	jpg	Steep slopes below Old College Houses	26-Jul- 13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
31	jpg	Healing Garden	04-Jul- 13	Elango Velautham	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
32	jpg	Fragrant Garden	26-Jul- 13	Chloé Cova	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
33	jpg	Tyersall Forest	25- Nov-08	Elango Velautham	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
34	jpg	Burkill Hall	17-Apr- 13	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	Yes
35	jpg	Chinese Grave	25- Nov-13	David Lim	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
36	jpg	House 1	26-Jul- 13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
37	jpg	House 2	26-Jul- 13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	

No.	Format	Caption	Date of	Photographer	Copyright	Contact details of	Non
			photo		owner	copyright owner	exclusive
							cession of
38	ing	House 3	26-Jul-	Chloé Cova	CBA	Chris Blandford Associates	rights
50	142		13		CERT	The Old Crown	
						High Street	
						Blackboys	
						EAST SUSSEX TN22 5JR	
						UK	
39	jpg	House 4	26-Jul-	Chloé Cova	СВА	Chris Blandford Associates	
			13			The Old Crown	
						High Street	
						Blackboys	
						EAST SUSSEX TN22 5JR	
						UK	
40	jpg	House 5	26-Jul-	Chloé Cova	СВА	Chris Blandford Associates	
			13			The Old Crown	
						High Street	
						Blackboys	
						EAST SUSSEX TN22 5JR	
						UK	
41	jpg	Raffles Building	04-	Aylin Orbasli	Aylin	Dr Aylin Orbaşlı	
			Feb-13		Orbasli	4/3 Northwood Hall	
						Hornsey Lane	
						Highgate	
						London N6 5PJ	
						UK	
						aorbasil@aoi.com	
12	ing	The Carage	02	Aylin Orbacli	Aulin	WWW.dylinorbasil.com	
42	JPR	The Galage	02- Eeb-13	Ayiiri Orbasii	Orbasli	1/3 Northwood Hall	
			100-15		Orbasii	Hornsey Lane	
						Highgate	
						London N6 5PI	
						aorbasli@aol.com	
						www.aylinorbasli.com	
43	jpg	House 6	17-Apr-	NParks	SBG	Singapore Botanic Gardens	
	10		13	Official		1 Cluny Road	
				Photographer		Singapore 259569	
44	jpg	Visitor Centre	26-Jul-	Chloé Cova	СВА	Chris Blandford Associates	
		and National	13			The Old Crown	
		Parks Board				High Street	
		Headquarters				Blackboys	
						EAST SUSSEX TN22 5JR	
						UK	

No.	Format	Caption	Date of photo	Photographer	Copyright owner	Contact details of copyright owner	Non exclusive cession of rights
45	jpg	E.J.H. Corner House	02- Feb-13	Aylin Orbasli	Aylin Orbasli	Dr Aylin Orbaşlı 4/3 Northwood Hall Hornsey Lane Highgate London N6 5PJ UK aorbasli@aol.com www.aylinorbasli.com	
46	jpg	Symphony Stage	01-Jun- 10	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
47	jpg	Cool House	01-Jun- 10	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
48	jpg	Burkill Hall	01- Aug-13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
49	jpg	Halia Restaurant complex	26-Jul- 13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
50	jpg	Potting yard buildings (the logs are used for chainsaw training)	17-Jul- 13	David Lim	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
51	jpg	Brick steps detail	25- May-12	Nigel Taylor	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
52	jpg	Pergola in the Plant House Garden	17-Apr- 13	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
53	jpg	Bandstand	17-Apr- 13	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	

No.	Format	Caption	Date of photo	Photographer	Copyright owner	Contact details of copyright owner	Non exclusive cession of rights
54	jpg	Sun Garden	26-Jul- 13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
55	jpg	Holttum Hall	26-Jul- 13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
56	jpg	Ridley Hall	26-Jul- 13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
57	jpg	Green Pavilion	01-Jun- 10	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
58	jpg	Tanglin Gate (decorated with red banners for National Day)	26-Jul- 13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
59	jpg	Swan Lake Gazebo	17-Apr- 13	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
60	jpg	Historic Gazebo	26-Jul- 13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
61	jpg	Girl on a Bicycle	03-Jun- 10	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	

No.	Format	Caption	Date of photo	Photographer	Copyright owner	Contact details of copyright owner	Non exclusive cession of
62	jpg	Shelter	26-Jul- 13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	rights
63	jpg	Educational activities	2007	SBG Archives	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
64	jpg	Art in the Gardens (by Zadok Ben- David)	30-Jan- 13	Chris Blandford	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
65	jpg	Research	19- Feb-12	Serena Lee	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
66	jpg	Ginger Garden	01-Jun- 10	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	Yes
67	jpg	Shaker room in the Botany Centre, visible to visitors	26-Jul- 13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
68	jpg	Cypripedium tonsum	1989	SBG Archives	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
69	jpg	Rainforest	19-Jul- 13	Elango Velautham	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	Yes
70	jpg	Common Imperial (Cheritra freja friggia)	2001	Khew Sin Khoon	Khew S K	Not Known	
71	jpg	Lesser Whistling Duck (Dendrocygna javanica)	30- May-13	looyaa	looyaa	Flickrmail at: http:// www.flickr.com/ photos/58196275@N04/	
No.	Format	Caption	Date of	Photographer	Copyright owner	Contact details of	Non exclusive
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			prioto				cession of
72	jpg	Red-Legged	03-	Yixiong Cai	National	National Parks Board	1.8.1.03
		Crake (Rallina	Feb-10		Parks	1 Cluny Road	
		fasciata)			Board	Singapore 259569	
73	jpg	Royal Botanic	14-Jul-	RBGK	RBGK	Royal Botanic Gardens, Kew	
		Gardens, Kew –	10			Richmond	
		Palm House				SURREY TW9 3AB	
						UK	
74	jpg	Lawrence Niven	1920	SBG Archives	SBG	Singapore Botanic Gardens	
						1 Cluny Road	
						Singapore 259569	
75	jpg	J.C. Loudon's	Not	John C	George F	Not Known	
		Plan for Derby	known	Loudon's	Chadwick		
		Arboretum		Gardener's			
		1839		Magazine			
76	jpg	Map of the	1866	SBG Archives	SBG	Singapore Botanic Gardens	Yes
		Gardens 1866				1 Cluny Road	
						Singapore 259569	
77	jpg	Burkill Hall,	17-Apr-	NParks	SBG	Singapore Botanic Gardens	Yes
		built 1867–68	13	Official		1 Cluny Road	
				Photographer		Singapore 259569	
78	jpg	Bandstand Hill	1877	SBG Archives	SBG	Singapore Botanic Gardens	
		1877				1 Cluny Road	
						Singapore 259569	
79	jpg	Palm Valley and	1900	SBG Archives	SBG	Singapore Botanic Gardens	
		Rainforest c				1 Cluny Road	
		1900				Singapore 259569	
80	jpg	Rain tree at	Not	NParks	SBG	Singapore Botanic Gardens	
		Nassim Gate,	known	Official		1 Cluny Road	
		possibly dating		Photographer		Singapore 259569	
81	ing	Ridley with	1905	SBG Archives	SBG	Singanore Botanic Gardens	Yes
01	JPS	rubber tree	1505	SDG Archives	500	1 Cluny Road	105
						Singanore 259569	
82	ing	Rubber	18905	SBG Archives	SBG	Singapore Botanic Gardens	
02	JPB	plantation in	10905	SDG / Terrives	550	1 Cluny Road	
		the Economic				Singanore 259569	
		Gardens.				511.64pore 20000	
		c.1890s					
83	jpg	House 6	May-	Nigel Taylor	SBG	Singapore Botanic Gardens	
		(Former	2012			1 Cluny Road	
		Economic				Singapore 259569	
		Gardens' Field					
		Assistant's					
		residence)					

No.	Format	Caption	Date of photo	Photographer	Copyright owner	Contact details of copyright owner	Non exclusive cession of rights
84	jpg	Sundial Garden 1959	1959	SBG Archives	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
85	jpg	Holttum laboratory 1958	1958	SBG Archives	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
86	jpg	Dr Yam Tim Wing pollinating orchids at the Orchid Nursery	23- May-06	SBG Archives	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
87	jpg	Brick steps, made by Australian Prisoners of War during the 1940s	17-Apr- 13	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
88	jpg	Training in the Botanic Gardens during the 1960s	1960s	SBG Archives	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
89	jpg	Botany Centre, opened in 2006	26-Jul- 13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
90	jpg	National Orchid Garden, opened in 1995	03- May-12	Chris Blandford	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
91	jpg	Redevelopment Masterplan	01- Mar-90	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
92	jpg	Heritage Museum housed in Holttum Hall	26-Jul- 13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	

No.	Format	Caption	Date of photo	Photographer	Copyright owner	Contact details of copyright owner	Non exclusive cession of rights
93	jpg	Heritage interpretation	26-Jul- 13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
94	jpg	Former Prime Minister Lee Kuan Yew address at the People's Cultural Concert held at the Botanic Gardens in 1959	1959	The National Archives UK	The National Archives UK	The National Archives Kew Richmond SURREY TW9 4DU UK	
95	jpg	Exercise group	05-Jun- 13	Nick Tang Wen Yi	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
96	jpg	Jogging in the Botanic Gardens	13- Aug-12	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
97	jpg	One-off mass wedding event in 2009	20- Sep-09	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
98	jpg	Wedding photography is very popular in the Gardens	Jan-13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
99	jpg	Visitors enjoying the National Orchid Garden	01-Jun- 10	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
100	jpg	Watching a concert on the Symphony Stage	15- Aug-10	Benjamin AW	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
101	jpg	Guided tour and children's treasure hunt	16- Aug-12	Winnie Wong	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	

No.	Format	Caption	Date of photo	Photographer	Copyright owner	Contact details of copyright owner	Non exclusive cession of rights
102	jpg	Bandstand performance in 1957	1957	National Archives	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
103	jpg	Workshop in plant research	06- Oct-05	Serena Lee	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
104	jpg	Easter holiday makers	09-Apr- 50	Not known	Singapore Press Holdings Ltd	1000 Toa Payoh North News Centre Singapore 318994	
105	jpg	Hari Raya Puasa celebrations	15- Feb-64	Not known	Singapore Press Holdings Ltd	1000 Toa Payoh North News Centre Singapore 318994	
106	jpg	People strolling on the first day of the Chinese New Year, Year of the Rooster	17- Feb-69	Not known	Singapore Press Holdings Ltd	1000 Toa Payoh North News Centre Singapore 318994	
107	jpg	New Year holiday crowds	02-Jan- 67	Not known	Singapore Press Holdings Ltd	1000 Toa Payoh North News Centre Singapore 318994	
108	jpg	A father and son, Mr Mr Goh Seng Fong and Mr Goh Hin Ngim, visiting the Botanic Gardens in the 1980s	July or August 1984	Mr Goh Kun Han	Mr Goh Kun Han	Email: goh_kun_han@ nparks.gov.sg	
109	jpg	People doing their early morning exercises	05- Sep-69	Not known	Singapore Press Holdings Ltd	1000 Toa Payoh North News Centre Singapore 318994	
110	jpg	Chinese New Year celebrations and children feeding the monkeys	06- Feb-70	Not known	Singapore Press Holdings Ltd	1000 Toa Payoh North News Centre Singapore 318994	

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111	jpg	Green street and 'Sky Park'	Not known	SpirosK photography	SpirosK photo- graphy	Flickrmail at: http://www. flickr.com/photos/spirosk/	ngnts
112	jpg	The National Orchid Garden	01-Jun- 10	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
113	jpg	Botanical drawing of Cypripedium tonsum	1989	SBG Archives	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
114	jpg	The National Orchid Garden	03- May-12	Chris Blandford	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
115	jpg	Ginger Garden	27- Feb-13	Jana Skornickova	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
116	jpg	Ginger Garden	26-Jul- 13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
117	jpg	School visit to the Botanic Gardens	07-Jul- 06	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
118	jpg	Ginger flower	25- May-10	Jana Skornickova	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
119	jpg	Palm Valley	26-Jul- 13	Chloé Cova	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
120	jpg	Swan Lake Gazebo	17-Apr- 13	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	Yes

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121	jpg	Detail of the Tanglin Main Gate	28- May-12	Chris Blandford	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	
122	jpg	'Girl on a Bicycle' by Sydney Harpley	01-Jun- 10	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
123	jpg	Tan Hoon Siang Misthouse in the National Orchid Garden	01-Jun- 10	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	
124	jpg	Ginger Garden	01-Jun- 10	NParks Official Photographer	SBG	Singapore Botanic Gardens 1 Cluny Road Singapore 259569	Yes
125	jpg	Rainforest	30-Jan- 13	Chris Blandford	СВА	Chris Blandford Associates The Old Crown High Street Blackboys EAST SUSSEX TN22 5JR UK	



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