DUBBO CITY COUNCIL

ELIZABETH PARK REGIONAL BOTANIC GARDENS

Brigalow Belt South Bioregion

Master Plan 2011

LANDPLAN
landscape architects
2100902 February 2011

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1. GENERAL ISSUES

1.1. Establishment Process

1.1.1. Site History

1998 Master Plan
The original master plan for Elizabeth Park Regional Botanic Park was prepared by Lawrie Smith, Landscape architect Landplan Studio, Brisbane – February 1998 and was subsequently adopted by Council.

Development of the Botanic Gardens commenced soon after basically following the recommendations of the planning documents but modified for excellent reasons. Memorial Avenue was the first element established. The relatively small Japanese Garden planned for the site was enlarged significantly to become the principal feature of the developing Botanic Gardens. The initially recommended earth mound located centrally around the proposed Visitor Centre was relocated to the north east to become the Biodiversity Garden.

1999 Memorial Avenue
The principal visual axis extending north east from the corner of Windsor Parade and Coronation Drive was planted in 1999 to commemorate the Sesquicentenary of Dubbo. The citizens of Dubbo planted the double avenues of commemorative trees each side of the access route.

2001 – 2002 Shoyoen
Not long after the master plan was adopted, the then Mayor of Dubbo, Anthony McGrane. OAM briefed Mayor Kawai of Minokamo on the concept for a Japanese Garden. In 1999 Mayor Kawai, Dr Yamada and others from Minokamo visited Dubbo to help celebrate Dubbo's 150th anniversary. Mayor Kawai indicated that Minokamo would like to assist in the planning and development of the garden.

Students at the Kamo Agricultural and Forestry High School, Landscape Design Section, under the guidance of Koketsu-sensei, developed the designs for the garden. In September 2001 the plans were adopted by Dubbo City Council. In December 2001, the then Mayor of Dubbo, Councillor Allan Smith and the Director of Parks and Landcare Services, Mr Ken Rogers visited Minokamo.

On the 18th March 2002 excavation work began. A series of visits by specialists from Minokamo followed; Mr Toshiyuki Hasebe a Shinto Priest conducted a ground breaking ceremony on the site, Koketsu-sensei and two of his students worked on the garden for 10 days,Yoshiki Itazu and his tradesmen constructed the fully imported tea house, Mrs Tomiko Baba provided instruction on the tea ceremony and six professional gardeners worked for 9 days. Mr Yoshizumi Fujiyoshi and Mr Masashi Kimura visited many times assisting with detail and administration during the course of the project. The garden was opened with a celebration on the 23 November 2002.

The Biodiversity Garden
This Garden is an attempt to replicate some of the biodiversity of the Dubbo region in a small space. The garden is designed to give visitors a taste of the range of habitats and plants that are found when investigating the parks and reserves of the Dubbo region.

Council has constructed an extensive earth mound surrounded by native grasslands that flow into a grassy box woodland and on to a wetland. The mound simulates the natural change of plant communities over a ridgeline, with the deeper soils at the base growing Ironbarks, the slightly shallower soils mid-slope growing Red Stringybarks and the poor, shallower ridgetop soils reflected in the smaller stunted growth of the Green Mallee.

Each of the 'natural' areas you pass through is different; each contains distinctive plants and offers particular food and habitat opportunities for a range of animals, birds and other wildlife.

The access path up the mound contains some steeper ramps and steps and is difficult for visitors in wheelchairs to negotiate all sections.

2010/2011 Establishment and Revision
These three elements in Elizabeth Park have continued to be established and maintained appropriately and are now well established as major points of botanic, cultural and environment interest. In September 2010 Landplan was commissioned to review the 1998 master plan to accommodate the existing Shoyoen and Biodiversity Gardens and incorporate several other elements within the matrix. The Master Plan revision was completed in February 2011.

1.1.2. Site Selection / Suitability

The following lists the relationship between the Elizabeth Park Regional Botanic Gardens site and the principal parameters generally applied to a site selection process to determine the optimum location for a botanic garden.

Location
Elizabeth Park is within a large provincial town or city with a strong economic base able to accept the financial responsibility for initial development and ongoing operation and maintenance.

Access
The site has excellent relationship to the city road systems and existing major highways and tourist routes; all weather access available and pedestrian pathways, bikeways and public transport.

Ownership
Elizabeth Park is under one ownership usually vested in the local authority with a suitably set up management body.

Tenure & Zoning
Ensure long term security of tenure, with the site set aside for botanic garden purposes and protected under the town plan.

Description & Area
The site is described as Lot 53 DP 259660.

The area of 10.18 ha is small but adequate for a regionally specialised botanic garden. There is no agreed minimum area for a botanic gardens, each site is determined by availability and economics; it is generally agreed that regional sites should range from 50 ha to 200 ha; smaller sites are appropriate for specialised collections, but consideration should then be given to annexe sites to allow optimum bioregional collections. The possibility exists to link Regional Park 57 ha as an Botanic Garden annex for Brigalow Belt South Bioregion environments.

Shape and Form
The basically rectangular site has excellent configuration for the purpose.

Security
Valuable collections require appropriate security to protect against physical damage, theft and vandalism as well as environmental damage like storms, floods, pest & disease; fencing should be considered.

Services Adequacy
All services water, sewerage, stormwater & drainage, electricity, communications exist on site.

Topography
The site slopes gently down from east to west; created landform will enhance the microclimatic zones and visual diversity.

Hydrology
The site slopes gently east to west; there are no major hydrological issues.

Soils & Geology
The site exhibits a uniform pattern of natural soil with two extensive areas of deposited fill; the project will benefit from soil improvement and introduction of selected specialised soils.

Vegetation
No natural vegetation was retained on the site. The site has a juvenile forest of exotic & native trees which require detail analysis to determine appropriate management. The Biodiversity Garden and Shoyoen contain representative species for their theme.

Fauna
The establishment of the Botanic Gardens will enhance wildlife habitat and provide opportunity for biodiversity interpretation.

Climate & Microclimate
The basically level site provides limited microclimatic diversity; construction of the Biodiversity Garden, Shoyoen and other planned elements substantially enhanced the site diversity.

Structures & Artefacts
There were no existing structures on the site; the Centre of Excellence and each theme Garden area will provide appropriate facilities for management and visitors. Due to the highly modified condition of Elizabeth Park it is unlikely that artefacts (Aboriginal or European) will be present.

Visual Context
The site is physically and visually contained by commercial and residential areas with limited views into and beyond the site.

1.2. Botanic Gardens Context

1.2.1. What is a Botanic Garden

In order to understand the ongoing relationship and potential of this garden within the Australian Botanic Gardens context, it is important to outline the functions, benefits and obligations related to the planning, design, management and operation of the facility.

Traditionally Botanic Gardens have been regarded primarily as scientific institutions established to collect, study, exchange and display plants for research, education and to identify their economic potential.

Arboreta are essentially Botanic Gardens in which the collection is limited to woody plants, especially trees, whose growth habits may be individually recorded.

Thus Botanic Gardens and Arboreta, although essentially places of scientific, educative and cultural function, are also inherently pleasant and attractive venues for passive recreation and relaxation.

Community concern for the environment and evolving management roles have encouraged growing public participation in Botanic Gardens. Scientific study remains of fundamental importance, but encouragement of direct involvement by local people in management and in enjoying the specialised surrounds, has evolved to equal importance.

1.2.2. Significance of Elizabeth Park Regional Botanic Gardens

Botanic Gardens are a significant element in the ongoing development of any city or region. A Botanic Garden is primarily a specialised park or passive recreation area where visitors can appreciate the botanical values of plants and their use in ornamental horticulture. Importantly, it also provides facilities for environmental education and specialised botanic and horticultural research.

The Elizabeth Park Regional Botanic Garden although a small site is significant in regional terms for the following principal reasons:

- Dubbo is located relative to four bioregions: it is within the southern extent of the Brigalow Belt South bioregion; close to the northern extent of the South West Slopes; and east of the Cobar Penneplain; the Hunter section of the Sydney Basin bioregion is to the east.

- The surrounding regions contain a wealth of unique plant communities, individual genus and species which have potential for horticulture;

- A number of bioregional species are rare and endangered and require to be established in ex-situ situations to ensure the continuing preservation of the gene bank;

- The growing and demonstration of plants introduced from other similar climatic zones elsewhere in the world provides the opportunity for comparative research and display.

1.2.2.1. Botanic Garden Relationships

The Royal Botanic Garden – Sydney is the principal Botanic Garden of New South Wales. The State Herbarium is located in the Gardens. It is important to develop a continuing relationship with these two facilities.

Within the regions of the western slopes of New South Wales there are other of botanic gardens both existing and/or planned for which there is potential to develop relationships for mutual benefit.

- Burrendong Arboretum, Wellington
- Orange Botanic Gardens
- Wagga Wagga Botanic Gardens

While outside the region these two gardens have affinities with Dubbo.

- Australian National Botanic Gardens, Canberra
- Hunter Region Botanic Gardens, Newcastle

1.2.3. Development Objectives

This Master Plan is prepared to guide the integrated development and management of the Botanic Gardens. The following general objectives have defined the planning process and initial establishment:

- Establish the gardens as part of the National System of Regional Botanic Gardens;
- Develop an integrated relationship between the Botanic Gardens and the surrounding locality through appropriate open space linkages;
- Collect, display, interpret and research the native plants of the associated bioregions;
- Represent the diverse range of regional plants in habitat settings where appropriate;
- Establish a local Herbarium as part of the associated administrative and operational facilities;
- Maintain a comprehensive system of records to ensure the scientific value of the collection;
- Label individual plants and provide interpretive and educational data on specimens, plant communities and natural associations;
- Promote research into specific projects, such as the potential to use selected species for amenity horticulture to enhance town, rural and tourism related projects in the region;
- Demonstrate the use of regional species for public, commercial and domestic landscape purposes, for food and other economic uses.

- Create a Centre of Excellence with allied passive recreation facilities for local residents and visitors;
- Promote the Botanic Gardens as a major tourist attraction of the region.

1.2.4. Ownership, Tenure and Zoning

Ownership
The site is owned by Dubbo City Council in 'Fee Simple'. The Local Government therefore has the responsibility for development and management of the Botanic Gardens.

Tenure
It is fundamental that land tenure be organised so that the subject land is set aside specifically for Botanic Gardens purposes for all time.

Zoning
The current Planning Scheme zones the site as 'open space'. It is fundamentally important that special recognition be given in the planning scheme so that the use of the subject land as Botanic Gardens is established and protected. It may be necessary to organise a new exclusive zone or specific definition under the Open Space category to cover and protect the site use as a Botanic Garden.

1.2.5. Open Space Linkages

It is also desirable to consider and preserve the available open space linkages joining the Botanic Gardens to the city open space system and to any identified natural wildlife corridors. These linkages will also facilitate pedestrian access to the site and increase the overall potential to preserve and interpret bio-diversity.

1.2.6. Functions of a Botanic Garden

Traditionally, the title and status of a Botanic Garden has been accorded to only those facilities incorporating an appropriate herbarium. Regional Botanic Gardens, including Arboreta, keep adequate records, undertake appropriate research and perform several other important functions:

- The most fundamental is the collection and display of living plants organised to demonstrate their natural form and properties; to identify their potential for use in amenity horticulture and landscape design, whether the interest be in their functional value, shade, shelter or ornament; in biological science and education and for personal aesthetic enjoyment;
- The plants displayed to be individually identified, labelled and appropriate records kept; with voucher specimens lodged in the Gardens Herbarium and / or State Herbarium;
- The garden should be carefully planned and designed relative to physical and environmental site opportunities and constraints as they relate to the collection and its particular functions;
- The opportunity to see living plants displayed in cultivation, described and explained by interpretive aids, will provide opportunity for Australia's increasingly urban population to appreciate the natural diversity and horticultural value of the natural flora of the region; the displays should also promote awareness of the need for conservation and environmentally sustainable development;
- The educational role of Botanic Gardens in conservation is particularly significant; a Botanic Gardens is definitely not a substitute for the preservation of natural populations in the wild but should provide for the ex situ conservation of rare and endangered species;
- The horticultural advisory role of a Botanic Garden directly relates to experience gained in growing plants in cultivation, for display and for other purposes. Specific horticultural research could identify the potential for a range of commercial purposes, such as cut flowers or dried ornamental materials;
- Few tourists, whether intrastate, interstate or international, will have the opportunity to gain a detail understanding of, or observe a comprehensive selection of the native flora of this large and diverse continent. A national system of Regional Botanic Gardens and Arboreta will facilitate this.

1.2.7. Benefits of a Botanic Garden

The development of a Botanic Garden has numerous short and long-term benefits, which result directly from the planning, design, construction and operation procedures.

The following are some of the more significant:

Environment Benefits
- To be a practical means of preserving aspects of the national and regional bio-diversity;
- To stimulate a wider awareness of and caring for the environment;
- To provide interpretive data to increase awareness of the values of native plant communities and ecosystems;

- To create positive community focus for the conservation movement;

Community Benefits

- To provide expansive areas of attractive open space for passive recreation use by the local community and by visitors;
- To provide a source of specific information about plants and their uses;
- To create a centre for education and research into botany, horticulture and landscape;
- To provide demonstration gardens which assist the local community to establish appropriate home, commercial and industrial environments suited to the local conditions;
- To carry out research to assist industry in environmental awareness, e.g. mining rehabilitation, ornamental horticulture;
- To provide a facility for local schools and colleges to use for education in botany, biology and other related subjects;
- To provide a focus and opportunities for community involvement with related benefits for all age groups and abilities;
- To establish a Friends of the Botanic Garden group which offers a valuable community service opportunity for those with specific interest in botany, horticulture and the environment; this is of interest to people who are retired or others not currently in the workforce.

Economic Benefits

- To become a major element attracting tourists to the area, with consequent stimulus to the local economy;
- To stimulate the development of related and flow on projects in the locality, e.g. additional accommodation, new infrastructure;
- To provide a comprehensive planning and construction strategy for a large open space area which will enable the responsible Local Government to organise associated long term budgets with consequent economies of scale;
- To assist in the development and introduction of Australian plants as horticultural subjects and the promotion of their use in the nursery and landscape industry and by the general community.

Political Benefits

- To provide one of the more fundamental expressions of Nationalism through the preservation and interpretation of Australian plant material and environments;
- To be the subject of applications for funding and assistance to Local, State and Federal sources as well as to the corporate sector;
- To appeal to the 'green vote' with resultant political kudos.

1.2.8. Network of Australian Regional Botanic Gardens

The Australian flora is a unique world treasure of vast plant diversity. There is a National obligation to conserve the Australian flora and dependent fauna. This can only be achieved by the managed conservation of significant natural areas.

The increasing measures consequent on the expanding human presence across the nation demands appropriate compromise between conservation and ecologically sustainable development.

The creation of a network of Regional Botanic Gardens of Australian flora established in selected locations throughout Australia is planned to support research into the management of natural areas, and the conservation and rehabilitation of rare and endangered flora outside these natural reserves.

The Regional Botanic Gardens network will also support the development of the Australian horticultural industry by research leading to the introduction of appropriate native species into cultivation.

The network of Regional Botanic Gardens is planned to become a major factor in a national conservation strategy designed to assist and promote ecologically sustainable development by:

- The preservation of the local bio-diversity;
- Assisting botanic research;
- Increasing awareness of the value and use of the Australian flora;
- Establishing facilities that will contribute to community lifestyle, and
- Assisting in attracting tourism to the region.

1.2.8.1. BGANZ

The Botanic Gardens Australia and New Zealand Inc (BGANZ) is the chief body representing the interests of botanic gardens in Australia and New Zealand. It promotes the interests and activities of Australian and New Zealand botanic gardens and botanic gardens generally and enhances the state of botanic gardens for the benefit of the community.

Membership provides substantial benefit though access to a wider group of botanic gardens. It is

recommended that Elizabeth Park Regional Botanic Gardens joins BGANZ to enable access to all other member gardens and gain invaluable benefits in closer liaison of management and staff.

Individual, Institutional or Associate membership of BGANZ will provide opportunities for information exchange, advocacy, development and grant opportunities and the benefits derived from national conferences and exhibitions.

Enquiries should be addressed to:
BGANZ
GPO Box 1777
Canberra, ACT 2601
Phone: 02 6250 9507
Facsimile: 02 6250 9599
Email: bganz.secretariat@environment.gov.au

1.2.9. Visitation Statistics

Increasingly, the community is discovering the benefits and attractiveness of visiting a Botanic Garden. The Australian Bureau of Statistics in conjunction with the Australian National Botanic Gardens and the Council of Heads of Australian Botanic Gardens (CHABG) has compiled the following figures that illustrate the community response (November 1994 – March 1995) to Botanic Garden visitation. It is likely that the figures remain largely unchanged since then.

1.2.9.1. Australian Bureau of Statistics

Botanic Garden visitation (1994 - 1995):

- 38.5% of persons aged 15 and over visited a Botanic Garden at least once during the last 12 months.
- 41.3% of women and 35.5% of men visited botanic gardens at least once per year
- 42.9% of capital city residents visit a Botanic Garden at least once per year
- 31.2% of regional residents visit a Botanic Garden at least once per year
- Botanic Gardens are the second most popular cultural venue visited after the cinema.

Of those people who visit a Botanic Garden:

- 36.7% visit at least once per year
- 26.2% visit at least twice per year
- 16.8% visit more than five times per year

Botanic Gardens visitation by Age Group

Age	*%*
15 – 17	5.7
18 – 24	15.1
25 – 34	21.5
35 – 44	20.8
45 – 54	15.9
55 – 64	10.0
over 65	11.0
	100.0

Visit at least one Botanic Garden each year

Age	*%*
15 – 17	39.1
18 – 24	42.7
25 – 34	41.5
35 – 44	41.4
45 – 54	39.0
55 – 64	36.0
over 65	27.8
	38.5

Botanic Gardens visitation by State

State	*%*
NSW	34.1
VIC	38.5
QLD	40.3
SA	39.2
WA	47.9
TAS	37.0
NT	44.6
ACT	49.3
	100

1.2.9.2. Regional Tourism Influence

Attractions are diverse across the region and include the Warrumbungle Aboriginal Site Tour, Bird Routes of Baradine and the Pilliga, Gilgandra Flora Reserve, Mount Kaputar National Park and the Siding Spring Observatory. Most tourism operations are small, with the exception of a few large attractions such as the Taronga Western Plains Zoo. There were 46 attractions registered with Tourism NSW under the Visnet database in 1999 (Tourism NSW 1999).

It is estimated that nature based tourism and recreation, based around natural features of interest, walking tracks and national parks is the main reason for visiting rural areas in New South Wales (Stage 1: Attractions Development Strategy 1999).

Visitors make a significant contribution to the Brigalow Belt South Bioregion economy. It is estimated that there were approximately 1,252,000 visits to the region in 1996/97 (Tourism NSW Visitor Database 1996/97). Visitor expenditure in 1996/97 in the South Brigalow Region totalled $200 million (Tourism NSW 2000).

In 1998/99 there were approximately 66,250 visits to national parks in the BBSB and 15,000 to State forests (RACAC 2000).

1.2.9.3. Interpretation for Dubbo

Regional Population
The estimated resident population of Dubbo region was 40,306 persons with an estimated 120,000 in the surrounding region.

Comment:
Australian Bureau of Census and Statics figures indicate that 38.5% of the population visit a botanic garden at least once each year; consequently for Dubbo it could be expected that approximately 15,000 local residents and possibly 5,000 visitors – or an overall figure of 20,000 may visit the botanic gardens each year once an appropriate level of development has been achieved.

Impact of tourism
Tourism will obviously be a significant generator of additional visitation for the Botanic Gardens provided a suitable marketing and promotion strategy is organised. The Orana region is heavily visited by domestic driving tourists attracted by the region's natural attractions. The Botanic Gardens is likely to be a significant attraction for such tourists. Detail visitation projections should be determined as an integral component of the recommended Economic Feasibility Study.
(Refer to clause 5.1.2)

1.3. Government Context

The development of a Regional Botanic Gardens has potential for involvement by State and Federal Government in various ways including the following:

1.3.1. Australian Government

- Registration as a Botanic Garden with the Australian National Botanic Garden index;
- Relationship with Australian National Botanic Garden with specified reference to bioregional flora;
- Relationship with various Government departments for assistance provided under specific programmes;
- Research and development in conjunction with CSIRO, Landcare and other related bodies;

1.3.2. New South Wales Government

- Department Climate Change & Environment for aspects of environmental management and regional flora and fauna;
- Department Primary Industries for amenity horticulture aspects;
- Department of Tourism for promotion and marketing initiatives;
- Department of Education and Training for all aspects of related primary, secondary and tertiary educational opportunities;
- State Herbarium for plant identification and lodging of voucher specimens; and for continuing establishment of the on-site Herbarium;
- Specific relationships with National Parks and Environmental Parks in the region;

1.4. Council Context

1.4.1. Vision, Mission and Values

Council is committed to overseeing the continued growth of the City and ensuring high quality of life for residents and visitors. This role is guided by Council's Vision and Mission Statements.

Our vision
A vibrant city of lifestyle and opportunity.

Our mission
To manage and promote Dubbo's diversity, lifestyle and opportunity through innovation and excellence.

Our values
To realise our mission, all Councillors, officers and agents of Dubbo City Council are guided in the way that they behave by our values. In practice, behaving in a way that upholds our HONEST values will result in long-term benefits by engendering collaboration among our community and ourselves.

1.4.2. Council Departments

All Council departments will have application and responsibility to a greater or lesser extent in the continuing planning, establishment, management and operation of the Botanic Gardens. The following are the Council's departments and their most relevant subsidiary divisions considered to have particular reference to the Botanic Garden:

- Community Services
  - Public Health
  - Public Events

- Community Grants
- Cultural Development
- Social Planning
- Youth Services

- Council Services.
  - Environmental Management
  - Roads & Traffic
  - Water Supply

- Building & Development
  - Building Approvals

- Business & Industry
  - Economic Statistics
  - Council Businesses

- Recreation & Culture
  - Parks
  - Volunteers

- Information & Resources
  - Events Calendar
  - Media Centre
  - Information

Comment:
Aspects of the policies of the Council departments apply variously to most aspects of the Botanic Gardens consequently it is important that the relevant departments be suitably represented in any management or advisory committee specifically set up to oversee the development of this significant community project. This will ensure that those responsible for implementation, management and operations will have appropriate backing and support available through already existing Council initiatives.

1.4.3. Botanic Gardens Management & Community Committees

1.4.3.1. Botanic Gardens Advisory Group

As the development of the Botanic Gardens gains momentum Council should consider establishing an Advisory Group to coordinate the planning and management process for the project.

Advisory Group Aim
The group's primary role is to provide a forum for community input to ensure optimum procedures are considered and followed in planning, development and ongoing management of the Elizabeth Park Regional Botanic Garden.

Objectives
The purpose of the Advisory Group is to provide the necessary input, information sourcing, research and advice to develop and coordinate a project management plan for the establishment of the Regional Botanic Gardens over an extended time period. To act as a task force to oversee or provide:

- Executive Summary Reports to Council
- Organization Plan and Responsibilities
- Managerial Process
- Design Process
- Quality Assurance
- Activities / Tasks, Schedules and Budgets
- Community Consultation

These objectives are to address key issues:

- Conceptual Plan
- Cost Analysis
- Tourist Attraction / Information
- Funding & Sponsorship Sources
- Botanic, Scientific, Educational and Recreational Content
- Construction Staging

Membership
Membership of the Advisory Group should include a relevant cross section of Council and officers as well as appropriate community representatives, including:

Dubbo City Council:
- Interested Councillor
- Parks Department
- Environment Officer
- Community Services

Community Representatives:
- Landscape
- Horticulture
- Nursery Industry
- Garden Club
- Tourism

1.4.3.2. Friends of Shoyoen & Elizabeth Park

The Friends of Shoyoen & Elizabeth Park are a socially active and enthusiastic group who guide visitors, assist with maintaining the gardens, uphold the spirit of our Sister City relations, and stage special events throughout the year.

Some of our 'Friends' simply enjoy a pleasant garden setting to relax in and they choose to slot in a morning or an afternoon one weekend per month to meet and greet our many visitors to the garden. Some 'Friends' choose to become a part of the 'Wednesday Morning' group who meet for a chat, morning tea and attend to the odd chores

around the garden. Other 'Friends' enjoy assisting with school groups and bus tours on a week day.

1.4.3.3. Horticultural Reference Group

The Horticultural Reference Group is recommended to be set up as a community reference group to provide specialised support for the Curator and to the landscape architect responsible for detail planning and design.

Objectives
The principal objectives and responsibilities of the Horticultural Reference Group are to:

- Assist the Curator in establishing the criteria for the development of the policy to guide the selection and establishment of the living collections;
- Define a systematic botanic and horticultural strategy for the planning and development of the plant collection consistent with the aims and objectives of the Botanic Gardens master plan;
- Liaise with the State Herbarium to ensure that the living collection is appropriately representative of the bioregional vegetation;
- Provide specific local botanic / horticultural knowledge and information to assist in the planning, design, documentation and management of the living collection;
- Contribute to the progressive development and rationalisation of the primary theme categories for the collection including:
  - Geographical
  - Biological & Ecological
  - Taxonomic & Evolutionary
  - Ornamental & Landscape
  - Historical & Cultural
  - Conservation
  - Research Collections
- Identify and assist sourcing and acquisition of the most appropriate plant species to be used in the various bioregional, community and theme gardens throughout the site;
- Provide related botanic and horticultural information to assist with the development of the digital records and accession database for the collection;
- Contribute to the ongoing development and management of the Gardens with specific reference to identified landscape and horticultural opportunities and constraints.

Membership
The Horticultural Reference Group is formally structured, meets monthly and offers the opportunity for Gardens horticultural staff to raise items to the agenda; to discuss relevant collection performance and procurement information.

Membership of the committee will vary but initially should include the following community representatives:

- Dubbo City Council Officers
- National Parks & Wildlife Service
- Department of Primary Industries
- Nursery Industry
- Australian Plants Society
- Landscape architect

1.5. Academic Context

1.5.1. Tertiary Education Generally

A close relationship between the Botanic Gardens with the regional University and TAFE College could lead to numerous opportunities for mutual benefit.

The opportunity exists for cooperative research between the tertiary institutions and the Botanic Gardens. The principal academic institutions in the immediate region include:

- Charles Sturt University
- TAFE Western Dubbo

Education and Interpretation
Maximise the benefits of the Botanic Garden in providing education and interpretation in Botanic, horticultural and environmental aspects as displayed through the establishment of a range of appropriate research and development initiatives. This can relate to the student body as well as the general community.

Research
Facilitate specific research into many areas of botany, horticulture and environment carried out by the academics and students as well as the corporate sector. These research programmes can create unique and innovative plant trial areas, which can be interpreted for the observer as integral parts of the overall experience and value of the Botanic Garden.

Intellectual Resources
The availability of a wide and varied intellectual resource at the regional tertiary education facilities suggests that there is potential to use this opportunity to influence the planning, design and implementation of the Botanic Garden. This opportunity will provide a diverse range of facilities and expertise that will contribute to the development of a unique physical environment.

1.5.2. Pre-school, Primary and Secondary Schools

The development of specific educational programmes set in Botanic Gardens can be a successful way to introduce the science of botany and horticulture to the student in an innovative and 'user friendly' way.

Many Botanic Gardens have developed special programmes using the resource of active retired teachers to provide an innovative and valuable service in many areas of the school curriculum, ranging from natural & cultural history, mathematics, biology and physics to home science.

The Brisbane Botanic Garden, Mt Coot-tha, has found such programmes to be an effective public relations and education tool. Currently, students are charged a small fee per field trip. The programme 'Lessons in the Gardens' is so popular that in excess of over 400 schools and 20,000 children have used the programme during the past three years. It is planned to progressively increase participation to approximately 100,000 students per year with a consequent positive economic return for the Botanic Gardens.

1.6. Corporate Context

1.6.1. Corporate Sponsorship

There are numerous opportunities to involve the corporate sector (as well as families and individuals) in the sponsorship of various Botanic Gardens facilities. In other gardens major sponsors have contributed toward the construction and or maintenance of a range of elements at all scales from seats to glasshouses, and by the donation of materials and services. Such sponsorship will need to be suitably acknowledged.

It is recommended that identification of sponsorship opportunities and methods are a specific component of the proposed marketing and promotion strategy.

The following list is indicative of the principal local corporate sector that might be interested in participating by support for the ongoing development of the Botanic Gardens.

- Chamber of Commerce and Industry,
- Tourism Companies
- Industrial Companies within the region
- Media & Newspapers
- Shopping Centres
- Nursery & Garden Industry Association
- Development Companies
- Service Clubs
- Individuals

1.6.2. Corporate Research

There is potential to involve the corporate sector in various initiatives in research and development which can collectively assists to establish specialised elements in the Botanic Garden and utilise available expertise and experience. For instance:

- To offer research and development in primary and secondary industry e.g. restoration planting for mining rehabilitation, pastoral and agricultural research, medicinal uses of plant material, etc;

- To carry out specific research into amenity horticulture - cut flowers, new garden specimens and shade trees for specific purposes, etc.;

- To research and develop ways to utilise local flora to create a character and sense of place appropriate to the Dubbo region particularly;

1.7. Institutional Context

To liaise with various professional, commercial and social institutions for mutual advantage and to utilise their expertise and influence to enhance the development of the Botanic Gardens, including the following:

- Nursery and Garden Industry
- Horticultural Research and Development Corporation
- Australian Institute of Parks and Recreation
- Australian Institute of Landscape Architects
- Australian Institute of Horticulture
- Land Care

1.8. Community Context

1.8.1. Community Awareness

The community is not generally aware of the special qualities and relevance of a Botanic Garden. Gardens are seen primarily as a place for passive recreation and cultural events rather than for their role in botanic, horticultural and scientific research and demonstration.

In order to reach and engage with the public, the recreational and educational facilities of the Botanic Gardens must be clearly stated in positive and applied promotional material. The use of specific and innovative advertising techniques to compete with aggressively advertised active recreation is essential. Without such a programme, many young people will be unaware of the values and benefits of Botanic Gardens that, to them, become associated with older generations and cultural stuffiness. This is unfortunate, because many of these same young people are vitally interested in plants, permaculture, and the whole environmental ethic. In modern western society, passive recreation is in direct competition with active recreation and the Botanic Gardens must compete or be bypassed by society.

1.8.2. Community Information

The Botanic Gardens is a resource of specific community services that have the potential to make an important, if sometimes subjective, contribution to the quality of life. The following are the major opportunities potentially available.

- Libraries of botanical and horticultural reference books to be available to members of the public, but not necessarily on a loan basis;
- A herbarium of native and cultivated plants to be available for public consultation;
- Exhibitions, both local and visiting, should be arranged or assisted by the Botanic Gardens when appropriate, to increase botanical or horticultural interests;
- Public lectures on botanical and horticultural topics to interested groups;
- Community involvement fostered in the Gardens either through horticultural societies or through “friends” organisations;
- Advisory service to home gardeners by mail, email, telephone and personal inquiry;
- Production of professional publications as well as popular material providing interpretive materials and general information. Fact sheets are an inexpensive way of publishing small amounts of specialised material and information;
- Support should be given for specifically skilled Gardens staff to prepare information for publication in local press, or television.

1.8.3. Community Involvement

The development of the Botanic Gardens can be greatly assisted by the community, both individually and through specific organizations.

Friends of the Botanic Gardens
Most Botanic Gardens establish a ‘Friends of the Botanic Gardens’ group to assist Council and the Curator with the promotion, planning, establishment and development process. Membership of the Friends provides the opportunity for the community contribute in many ways irrespective of their specific interests, expertise or abilities. Involvement provides educational opportunities, physical activity as well as social and cultural opportunities. Friends Groups are generally the conduit between the Gardens and the wider community through organisation of events, fund raising and attracting corporate sponsorship as well as in-kind donations. It is recommended that the existing ‘Friends of Shoyoen & Elizabeth Park’ group be encouraged and expanded as a high priority in the next stages of development.

Other Community Groups
Service Clubs and other community groups may wish to be directly involved with the continuing development of the Botanic Gardens site for mutual benefit.

Care should be exercised to ensure that well-meaning community ‘design and construct’ projects do not compromise the overall aesthetic quality of the Botanic Gardens through inexpert or inappropriate design, construction and maintenance. Consequently it is important to identify and define appropriate opportunities for involvement ensuring that the optimum support groups, corporate sector participants and individuals are involved.

It is likely that many of the following local groups could be encouraged to be involved with the development of the Botanic Gardens.

Horticultural / Environmental Interests
- Garden Clubs
- Australian Plants Society
- Land Care Groups
- and others

Wildlife Interests
- Bird Observers Club of Australia
- Wildlife Care Services Inc.
- and others.

Heritage
- Historical Societies & Groups
- and others

Arts Interest
- Art Groups
- Camera Clubs

- Arts Council
- and others

Community and Service Clubs
- Apex
- Jaycees
- Lions
- Quota
- Rotary
- Scouts & Guides
- Probus
- Toastmasters
- Zonta
- Church Groups
- and others

Other
- Individual Estate Bequests
- Senior Citizens Club
- RSL Club

1.8.4. Community Benefits

When developed in an appropriate manner, the Botanic Gardens has the ability to be used to substantially enhance the quality of life for local residents, to attract visitors and be the interface between the science of botany and the horticultural needs of the community.

There is increasing use of Botanic Gardens elsewhere, by the community for theatre, cultural and musical events and for family celebrations such as weddings, birthdays and reunions. These sympathetic uses should be encouraged.

1.8.4.1. Major Events

The use of the Botanic Gardens for major community events can place an inappropriate impact on the plant collection through physical damage, soil compaction and the need to prune branches and foliage of trees to suit specific event structures (tents and stages).

While it is important to encourage community support and use of the Botanic Garden, it should not be to the detriment of the scientific basis of the Garden and the plant collection. Appropriately managed within the carrying capacity of the Gardens generally and the plant collection particularly, it is possible to stage events which encourage specific visitation on an irregular basis throughout the year.

2. PHYSICAL CONTEXT

The physical conditions of the site are a fundamental influence on the site planning and development of the Botanic Gardens. The following descriptions expressly focus on the identified site conditions and define the related physical opportunities and constraints to be applied in the continuing planning and development of the site.

2.1. Location & Land Use

2.1.1. Location and Site Description

Suburb: Dulhunty – East Dubbo

Bounded by: Birch Avenue (north)
Royal Parade (east)
Coronation Drive (south)
Windsor Parade (west)

Description: Lot 53 on DP 259660

Zoning: Open Space

Designation: Regional Recreational Area – Botanic Park

Site Area: 101,816 square metres

Ownership: Dubbo City Council

2.1.2. Zone & Tenure - Botanic Garden

To formally register the site as a Botanic Garden it is necessary to organise and demonstrate appropriate means of permanent protection for the site as a Botanic Garden. It is fundamental that future Council administrations cannot make inappropriate changes or approve site uses for the site that compromise the basic function of the Botanic Garden.

Council will therefore require to ensure that appropriate designation and recognition for the Botanic Garden is established in at least the Dubbo Planning Scheme, the Corporate Plan and particularly included in the L.E.P. under a specifically created zone as a Botanic Garden.

2.1.3. Adjoining Land Uses

The site is well located in an area of appropriate land uses that generally complement the development of a Botanic Garden.

North: Residential
East: Residential
South: Aged Persons Housing
West: Hotel, Commercial & Shopping Centre

2.2. Existing Circulation

2.2.1. Vehicle Access & Circulation

The site is primarily accessed off the Mitchell Highway (from Sydney) along Sheraton Road or Wheelers Lane which each intersect with Birch Avenue. From this road the three other roads bounding the site are accessed.

Wingewarra Street links with Birch Avenue to give a more direct access to the Dubbo CBD.

Birch Avenue and Windsor Parade are sufficiently wide to allow nose in parking or other specialised facilities to be established.

Royal Parade and Coronation Drive are narrower and allow only parallel parking.

2.2.2. Pedestrian Access & Circulation

The site is basically isolated by the surrounding road system from direct segregated access to nearby parks and open spaces, consequently it will be necessary to consider appropriate road treatment and crossings to ensure safe access of pedestrians associated with the various gates.

Pedestrian desire lines to the site are:

Windsor Parade
- from the Macquarie Inn
- from the Orana Shopping Centre

Coronation Drive
- from the Aged Persons Housing

Birch Avenue
- from the residential areas along Birch Avenue and Viceroy Avenue

Pedestrian desire lines from the site are:

- to the power easement and south to the Keswick Estate open space
- to the Buckingham Drive parkland
- through the commercial development to Jubilee Park

.

2.2.3. Cycle Access & Circulation

Elizabeth Park should be linked to the city cycle network which provides access to the CBD, along the Macquarie River and on to the Taronga Western Plains Zoo. The existing desire line for pedestrians and cycles line from Viceroy Avenue across the Botanic Gardens site to the shopping centre to be considered.

2.3. Existing Services Infrastructure

The site has the following services installed:

Town Water
Town water is reticulated to the site in Birch Avenue opposite Viceroy Avenue, along Coronation Drive and on the opposite side of Windsor Parade and Royal Parade.

Irrigation
An extensive irrigation system has been installed throughout the site currently using town water.

Electricity
Underground power is reticulated around all surrounding streets. Power control boxes are located at the corners of Windsor/Birch and Birch/Coronation and at the western end of Coronation. The principal electricity connection is off Coronation Drive; consider installation of suitably sized power reticulation facilities to suit the completed Botanic Gardens.

Lighting
Perimeter street lighting has some overspill to the perimeter of the Park. There is some limited lighting integrated into the Shoyoen Garden and Memorial Avenue.

Communications
Access point is off Coronation Drive; plan to extend the existing line beyond Shoyoen gate to connect with the Centre of Excellence building.

Stormwater Drainage
The road system has an associated stormwater system at the site perimeter at the corner of Windsor / Coronation and Birch / Royal and on the western side of Windsor and Coronation.

Sewerage
Connection to the city sewerage system is available on site midway between the intersection of Birch / Windsor and Viceroy Avenue.

2.4. Existing Site Conditions

2.4.1. Geology and Soils

No detail site soil mapping or analysis is available. It is understood that the site is underlain by a Basalt sub-base which may be approximately 800mm below surface level. This is suggested from previous excavations in the adjoining site at the corner of Windsor and Coronation.

The possibility exists to excavate down to this layer to expose the basalt for specialised landscape use. The overburden is to be used to create specific landform.

Soils Assessment
It is suggested that during the continuing design development of the Botanic Gardens the following procedures be followed:

- Additional soils testing and mapping would be beneficial in the core gardens area.
- pH modification and the addition of organic matter is undertaken in developing massed planting areas.
- Soil testing for the structural qualities of subsoils be undertaken for design of major constructions such as buildings, structures, boardwalks, etc.

2.4.2. Landform

Refer to figure 2.02

Original Situation
The site has a relatively simple form, sloping evenly from east to west from 300m to 296m or 4 metre fall. There have been three initial topographic amendments.

A grassed earth mound has been formed along Windsor Parade alignment approx 30m wide and 700mm high.

Two sections of the site have been filled to create more level topography:
- An oval area approx 150m x 70m at the corner of Windsor and Coronation;
- A triangular area 100m x 70m midway along Royal Parade.

Recent Changes
Construction of the Shoyoen Garden and the Biodiversity Garden have seen substantial landform changes, primarily though deposition of fill material.

2.4.3. Slope Analysis

The natural topography of the site presents no problems of slope for access or site maintenance.

Amendment to landform and slopes will need to conform to the following accepted standards.

- Basically level areas – less than 1 in 20 (no impediment to access)
- Gentle slopes - 1 in 14 to 1 in 20 (readily accessible without steps and ramps)
- Medium slopes. 1 in 5 to 1 in 14 (generally accessible with steps and ramps)
- Steep Slopes greater than 1 in 5 (inaccessible without steps)

Mowing slopes
Slopes in excess of 1 in 4 are difficult to mow and beyond 1 in 2 mowing is impossible due to workplace health and safety issues. In areas where steep slopes may inhibit mowing garden beds with mulching is recommended. Alternatively specifically constructed terraces contained by retaining structures should be used to modify landform to manageable slopes.

2.5. Climate

2.5.1. Climate
The Dubbo region experiences a temperate climate. Summers are warm to hot, generally ranging from 17ºC to 31ºC, with some extremes exceeding 38ºC.

During the winter months, the average daily temperature varies from 3ºC to 16ºC with some occurrences of early morning frost.

Dubbo's location in the transition area between the Central Tablelands and the Western Plains has the effect of providing even distribution of rainfall throughout the year. Average annual rainfall recorded at Dubbo is 584.8mm. Dubbo's wettest month is January with an average rainfall of 60.1mm occurring on average over five days.

Evaporation in the area averages approximately 1880mm per year.

Wind patterns are consistent over the whole year. The prevailing winds at Dubbo are from the southeast, south, southwest and west, which account for a combined 64.4% of the wind direction over the whole year.

The site is relatively exposed to the climatic influences of the region due to the level topography and the extensive unprotected site area. Already the Arboretum trees and the Shoyoen and Biodiversity Gardens are moderating the impact.

Climate change research suggests that temperature and rainfall events will become more extreme and this needs to be considered in the ongoing detail design process.

2.5.2. Hydraulic Study
It is important to ensure that proposed changes to landform and the construction of waterways and ponds are subject to a detail hydraulic analysis. It is important to ensure that the collection and storage of stormwater is planned to maximise water quality through gross pollutants traps, biological filtering and the like.

The introduction of gross pollutant traps, detention basins, and water quality treatment by biological means presents an opportunity to enhance the botanic gardens as well as educating the community through demonstration of appropriate sustainable procedures.

The early engagement of an Hydraulic Consultant is fundamental to the successful detail planning and development of Oasis Valley and the associated waterways.

2.6. Visual Context

The uniform topography provides little visual drama and creating views, vistas and focal points will be a major factor in the site planning. Currently views from the surrounding residential and commercial areas are of little more than grassed fields and juvenile trees. The Shoyoen Garden and Biodiversity Garden give an indication of what is able to be achieved.

Refer to Section 3 for specific details of the visual context applied to the site planning.

2.7. Existing Vegetation

Refer to figures 3.05 & 3.06

2.7.1. Initial Planting

The site has been planted with a range of exotic species as well as native species which are establishing to a varied degree of health and vigour. Council Parks staff broadly analysed the species in 1998 and a more comprehensive analysis is currently underway in 2010. The initial 1998 master plan categorised the collection under four vegetation types.

Schedule of identified species:

(Exotic species are indicated by *)

Deciduous Species

Ref	Genus/species	Common name
1	*Carya illinoiensis*	*Pecan*
2	*Crataegus laevigata*	*Hawthorn*
3	*Fraxinus raywoodii*	*Ash*
4	*Liquidamber stryacifluia*	*Liquidamber*
5	*Pistacia chinensis*	*Pistachio Nut*
6	*Populus species*	*Poplar*
7	*Quercus ilex*	*Holm Oak*
8	*Quercus palustris*	*Oin Oak*
9	*Sapium sebiferum*	*Chinese Tallow Tree*
10	*Ulmus chinensis*	*Elm*
11	*Ulmus procera*	*English Elm*

Evergreen - Eucalyptus Species

Ref	Genus/species	Common name
12	*Eucalyptus melliodora*	*Yellow Box*
13	*Eucalyptus robusta*	*Swamp Mahogany*
14	*Eucalyptus species*	*gum*
15	*Eucalyptus species*	*West Australia spp*

Evergreen - Eucalyptus Species

Ref	Genus/species	Common name
16	*Angophora floribunda*	*Rough-bark Apple*
17	*Brachychiton populneus*	*Kurrajong*
18	*Casuarina cunninghamiana*	*River Oak, She Oak*
19	*Grevillea 'Ivanhoe'*	
20	*Olea europea*	*Olive*

Conifer Species

Ref	Genus/species	Common name
21	*Cedrus deodara*	*Deodar Cedar*
22	*Cupressus species*	*Cypress*
23	*Pinus pinea*	*Italian Stone Pine*

Refer to drawing 4.02

This drawing illustrates the broad massing of the various species by vegetation type. The analysis indicates a dominance of deciduous species with smaller isolated areas of the other vegetation types.

2.7.2. Shoyoen Garden Planting

The site has been planted with an extensive range of 109 species associated with Japanese garden character and design. The majority of the plants are exotic with selected native species used as appropriate.

Refer to the Shoyoen Garden brochure for a list of species.

2.7.3. Biodiversity Garden Planting

The site has been planted with a selected range of bioregional species representative of seventeen communities.

1. Green Mallee: *Eucalyptus viridis, Acacia cultriformis, A. spectabilis, Allocasuarina diminuta, Kunzea parvifolia*
2. Red Stringy Bark: *Eucalyptus macrorhynca, Acacia buxifolia, Acacia gladiformis, Dianella revoluta, Lomandra filiformis*
3. Ironbark: *Eucalyptus sideroxylon, E. crebra, Acacia deanei, A. subulata, Dodonaea cuneata, Xanthorraea johnsonii*
4. Rocky Slope: *Acacia brownii, A. decora, A. implexa, Cheilanthes seiberi, Clematis microphylla, Petalostylus labechioides*
5. Mixed Grasses: *Bothriochloa macra, Chloris truncata, Poa seiberiana, Brachychitn populneus, Eucalyptus albens, Bulbine bulbosa*
6. Grasses & Riverina Bluebell: *Austrodanthonia laevis, Austrostipa spp. Wahlenbergia luteola, Bulbine bulbosa*
7. Kangaroo Grass: *Themeda australis, Bulbine bulbosa, Microseris lanceolata, Chrysocephalum apiculatum, Acacia pendula*
8. Grassy White Box Woodland: *Eucalyptis albens, Brachtchiton populneus, Bothriochloa macra, Themeda australis, Indigofera australis*
9. Dianella: *Dianella longifolia*
10. Sheoak Forest: *Casuarina cunninghamiana, Leptospermum polylifolium, Melaleuca thymifolia, Acacia pendula*
11. Redgum Forest: *Eucalyptus blakelii, Goodenia macbaronii, Hardenbergia violaceae*
12. Wetland: (Open Water)
13. Reed Bed: *Bulboschoenus fluviatilis*
14. Sedge Bed: *Juncus usitatus, Carex appressa, Eleocharis acuta*
15. Creekline Reeds: *Juncus usitatus, Cyperus exaltatus,*
16. Rocky Creekline: *Lomandra longifolia, Gahnia seiberiana*
17. Threatened Species

3. MASTER PLANNING PROCESS

3.1. The Vision for the Gardens

3.1.1. Principal Objectives

- To create a major park node to compliment and integrate with aspects of the overall open space system of Dubbo.
- To provide facilities for the immediate neighbourhood, local residents and to develop as an attraction for regional tourism.
- To establish, manage and operate the Regional Botanic Garden in order to preserve and interpret the values of the bioregional flora through research and cultivation.
- To identify and promote the unique potential of the bioregional flora in conservation and for application in ornamental horticulture;
- To identify and promote the potential of appropriate introduced (exotic) flora for application in ornamental horticulture;
- To establish an invaluable community facility which enhances lifestyle and assists to establish a strong 'sense of place' for the city and region through wide recognition and use of plant species in amenity horticulture;
- To demonstrate the relationships between the built environment and the plant kingdom.

3.1.2. Principal Elements

The site inventory process has identified a number of elements, which specifically influence site planning for the continuing development of the Botanic Garden. The initial Master Plan 1998 and the review of 2011 build on the existing site elements and environments to create a specialised facility with a wide range of research, development and display opportunities for environmental, botanical and horticultural initiatives.

The 2011 Master Plan documents define the planning concept identified for the continuing development of the Elizabeth Park Regional Botanic Gardens. The following are the principal objectives and elements of the Master Plan:

- Accentuate the importance of the approach to the Botanic Gardens by appropriate streetscape treatment along the access roads, particularly along Birch Avenue and Windsor Parade;
- Define the arrival locations to the Botanic Gardens by suitable 'gateway' treatments at each site entry;
- Incorporate specialised hydraulic and water management elements within the site to maximise water quality, integrated with specialised environments for water related plant communities;
- Establish a specialised Centre of Excellence for Amenity Horticulture to provide optimum facilities for administration, information, interpretation, and to encourage environmental awareness;
- Establish a small operations and maintenance facility off Coronation Drive; the main operations facility to be at the Council Depot;
- Establish primary, secondary and tertiary circulation elements (trails, paths, roads, boardwalks) to provide access throughout and appreciation of the Botanic Garden and the plant collection;
- Preserve and develop the existing plant collection; establish other appropriate bioregional plant communities and exotic plantings;
- Develop specialised display and demonstration gardens on various identified areas of the site which research and illustrate the potential of the bioregional flora (as well as selected introduced flora) for use in amenity horticulture;
- Develop a series of axes, vistas, viewpoints and lookouts related to the visual context of the site to enhance appreciation and site orientation;
- Provide appropriate facilities which encourage increased use of the Botanic Gardens by the general community and by youth particularly.

3.1.3. Development Sequence

This Master Plan will suggest a sequence of development identified through an itemised estimate for construction and a suggested allocation year by year over a pre-determined period. It should be understood that master plan documents and related estimates are only tools to assist progressive development and are always subject to change and revision as specific detail planning or budget changes identify constraints and opportunities.

It is important to realise that the progressive development of the Botanic Gardens will be a long-term process and influenced as much by successful marketing and promotion as the quality of its botanic and horticultural components. The core of this Botanic Gardens is already well established but it is anticipated that development will be continuing for generations to come.

However, it is fundamentally important to ensure that the staged development process provides for the progressive high quality construction of site sections of appropriate size and manageable extent within identified annual budget allocations. It would be counterproductive to 'spread the effort and the dollars' thinly throughout the site, which would only serve to dilute the overall impact and quality of experience by first time visitors.

3.2. Principal Elements

3.2.1. Generally

A number of structures are necessary to enable a Botanic Garden to operate adequately, and meet scientific, educational, recreational and tourism requirements. Shoyoen already contains several built structures which are integral to the planning and design process for the Botanic Gardens. Modification of existing and design of new structures should be guided by the following parameters.

Regional and Site Specific Design
It is proposed that all of these functional elements be designed to be architecturally integrated into the surroundings within the constraints set by their particular functional requirements. Generally, it is recommended that materials used should be in harmony with the colours and textures of the natural materials of the site with particular reference to the built heritage character of the region. Planning, design, construction and management procedures should all demonstrate optimum sustainability principles.

The structures and elements as listed hereafter are not all required at the outset, but will be staged into the overall development schedule. The related descriptions outline the optimum physical parameters for, and the functional relationships of, the various building structures and other related elements.

The descriptions of these elements and related areas are indicative and will require preparation of specific briefs at the time of detail design and construction.

3.2.2. Centre of Excellence for Amenity Horticulture (CEAH)

Refer to figures 3.02, 3.03 & 3.05

This structure is the central functional and visual element of the Botanic Gardens. The master plan illustrates a site location for the proposed structure; it is defined by the three principal axes which are strong visual elements each focussing the attention of the visitor on the Centre of Excellence – Memorial Avenue, Ginkgo Avenue and Oasis Avenue.

The site for the Centre of Excellence

The architects (Geolyse Architects) have developed an excellent preliminary design that combines library, meeting, training & function room, information and souvenir shop, staff facilities and toilets, all within an organically inspired structure, demonstrating sustainability and integrated with the surrounding gardens and water elements. The formal pool at the end of the Oasis Valley waterway is planned to integrate with the architecture. The landform is planned to mound up over or 'wrap' the southern and western section of the building to provide an intriguing cave like entry on the south but opening out widely to the north and the spectacle of the amenity horticulture gardens.

The axial site configuration, the location of Shoyoen and the mounded landform has required that the Centre of Excellence be placed with the main entry slightly to the west of the Memorial Axis. This asymmetric layout works well by providing an appropriate Orientation Courtyard and paved arrival area (which will accommodate maintenance & emergency vehicles). Each of the three site principal axes will have a specific focus element all integrated with the mounded landform over the Centre of Excellence.

Centre of Excellence - brief

The Centre of Excellence – Visitor Centre is a building complex providing effective facilities for a group of functions designed with one overall architectural theme to create a unified complex that expresses its role as the key centre for the Botanic Gardens. The architectural theme and materials of the complex should be derivative of

the unique organic forms associated with the vegetation of the Region as well as responding to elements of the regions built heritage.

Importantly the Centre of Excellence building should utilise, demonstrate and interpret sustainability principles in all possible aspects of the planning, design and implementation. Consideration should be given to use of design with climate; alternative power sources, solar and wind; water storing and recycling; waste treatment; and materials technology.

The Centre is planned to be capable of construction in stages consistent with the overall development programme for the Botanic Gardens.

The Centre is designed to carefully integrate the structure with its site position, taking advantage of available views and vistas, existing trees, its surroundings, and in direct response to the specific requirements of the associated botanic, horticultural and landscape functions.

The Centre is the first point of contact for visitors to the Botanic Garden and is effectively the interface between the technical and scientific staff and the public. It is, therefore, very important that the centre be designed to provide suitable facilities to assist the general public in their use and enjoyment of the Botanic Garden. It should be a physically attractive structure that reflects its use in providing information about the Botanic Garden and to explain the science of botany and its application to amenity horticulture in innovative interpretive displays and methods, both internally and externally.

Orientation Gardens, Walkway & Arrival

First impressions are always the most lasting and the walk from the carpark through the Events Precinct, the Orientation Garden and along Memorial Avenue to the Centre of Excellence, is to be developed as a specialised and dramatic introduction to the Botanic Gardens and to the plant collection. It is planned to include an innovative covered walkway (for rain and sun) providing excellent visual relationships and interaction with the Centre and the specialised orientation landscape and plant collection.

The Orientation Garden is characterised by the specialised display gardens and particularly the innovative paved forecourt, mounded landform, walls and entry door to the Centre of Excellence and the axial focal points.

The arrival experience will be enhanced by the provision of interpretive information, signage, special plant displays, and a series of views and vistas that will open up enticing glimpses into the surrounding specialised demonstration gardens courtyards on each side of the complex.

Centre of Excellence – components
The complex contains four basic zones each with a differing function but fully integrated by the strong architectural character. The southern and western sections of the structure are effectively buried into the mounded landform which merges into the surrounding created topography of Shoyoen, Events Precinct and Oasis Valley. The Centre is approached along Memorial Avenue through the Orientation Garden then entered through a small but inviting doorway formed in rammed earth walls. The contrast between the low key entry and the expansive views north through the Centre to the Amenity Horticulture Gardens creates an appropriate and impressive visual impact.

Centre of Excellence – zones
The principal zones of the Centre comprise:

INFORMATION AREA	
Entry & Information	122 sqm
Gardens Shop (Volunteer Friends)	26 sqm
Computer Room	27 sqm
Gardens Cafe	38 sqm
Store room	30 sqm
Deck	185 sqm
GALLERY & MEETING AREA	
Meeting Room & Museum	35 sqm
Training & Teaching Room	35 sqm
Function Room	combination of above areas
Video Room	35 sqm
Theme Garden & Deck	106 sqm
AMENITIES	
Lounge Room	29 sqm
Tea Room	29 sqm
Outdoor Cafe	45 sqm
Kitchen	14 sqm
Toilets – public & staff	27 sqm
LIBRARY	
Botanic Reference Library	51 sqm
Reflecting Pond	258 sqm

The following functions are yet to be incorporated into the Concept Drawing. Comments and preliminary areas are mentioned below:

ADMINISTRATION	
Curator Office	Approx 16 sqm on top of Library
Herbarium	Approx 30 sqm extension to existing design; possible location to the east of Souvenir shop.

INTERPRETATION & EDUCATION
The provision of facilities to allow the science of botany and horticulture to be made available to the public through interpretation and education by display, lecture, video and workshops is an important aspect of a Botanic Garden. These functions are to be incorporated into the final planning for the Centre.

Education staff office
Storage and exhibit preparation
Teaching areas (inside / outside)

Multipurpose Gallery
The opportunity exists to incorporate a multipurpose Gallery (possibly in the Library) to accommodate works by local arts groups. The combination of a gallery facility in which art, literature and botanic display can be combined would add substantially to the viability of the Centre.

Gardens Cafe
A small specialised food and beverage outlet with the cuisine emphasising the use of locally produced and native foods is incorporated into the Centre. This provides an entrepreneurial opportunity as well as an attraction for visitors. The cafe would serve simple snack foods, light meals and beverages in a style that is appropriate to a Botanic Garden.

3.2.3. Amenity Horticulture Gardens

Refer to figure 3.02

These gardens are closely related physically and visually to the Centre of Excellence and extend in a quadrant from the Events Precinct in the west to the Biodiversity Gardens and Vine Arbours in the east. The northern aspect provides optimum microclimatic conditions for developing display gardens which also will be a visual focus as Birch Avenue is traversed. A small number of selected decorative trees will be located in the lawns close to the Centre to provide shade and visually highlight the view under the foliage canopy to the demonstration gardens in the sun.

The Gardens are to be a formal arrangement of theme and demonstration gardens possibly set out in a series of 'rooms' to demonstrate the optimum use of a range of plants in amenity horticulture for Dubbo. It is planned that the eastern section of the precinct adjacent to the Biodiversity Garden will primarily feature Australian native species display gardens to facilitate comparison with the exotic species in the adjacent western section;

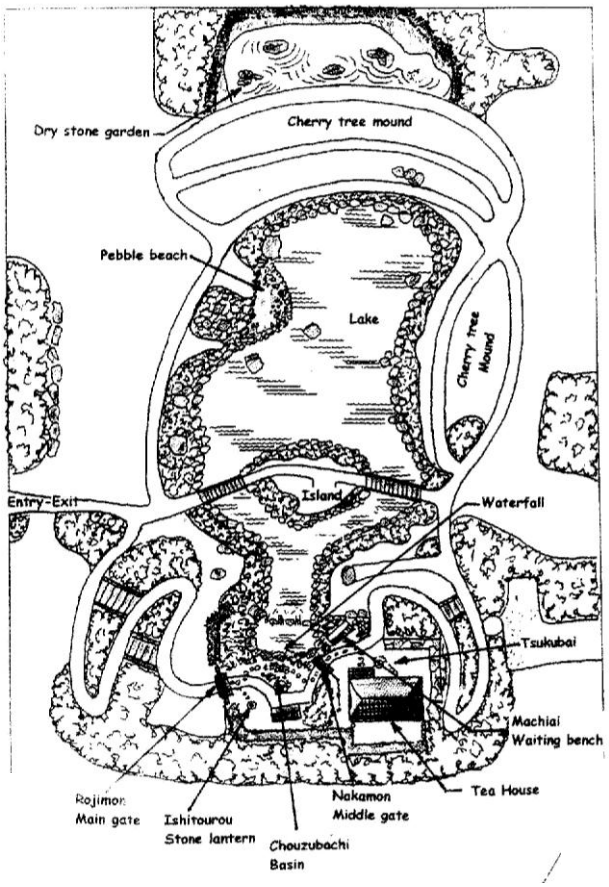
Other components of these gardens include:
- Flowering trees
- Seasonal display

- International theme gardens linked to Taronga Western Plains Zoo
- Perfumed and aromatic plants
- Shade gardens
- Hedges and topiary
- Vine arbour
- Aquatic & marginal plants (Oasis Waterway)

Security
It is planned that these gardens be enclosed by a security fence to protect the collection of plants against theft and vandalism. The four gates would be closed between sunset and sunrise as is the case for many Botanic Gardens.

3.2.4. Shoyoen (existing)

The official opening of the Shoyoen Sister City Garden and Jurian Ceremonial Tea House on November 23, 2002 occurred on the 153rd anniversary of the founding of Dubbo. It also marked the 13th anniversary of Sister City relations between Minokamo, Japan, and Dubbo. The spectacular Garden – managed and operated by Council - was a living gift from the people of Minokamo.



This traditional Japanese sister city garden is a major existing focus of the Botanic Gardens. It will ultimately be surrounded by a traditional wall enclosing the space and ensuring security of the valuable plant collection. The main entry to Shoyoen will be retained off Memorial Avenue where a specialised entry forecourt will be developed.

Pedestrian access to the Garden will be enhanced by the development of a paved forecourt about the axis between the Shoyoen Gate and the Botanic Play. The paving pattern to be designed to geometrically focus and define both axes.

The existing temporary toilet will be removed once the adjacent Centre of Excellence is complete. Maintenance access to the garden is maintained as existing off Coronation Drive with the facility being rationalised and visually enhanced.

View of Shoyoen

3.2.5. Biodiversity Garden (existing)

This existing representation of the diversity of the surrounding bioregion was established in 2004 to develop the 1998 Master Plan proposal for establishing selected Regional Communities. The Biodiversity Garden provides the opportunity to observe a representative selection of species from the seventeen regional communities in a 'natural' setting. This will allow observers to compare and contrast how the same bioregional species react when planted under more formal cultivation once the adjacent amenity horticulture demonstration gardens are developed.

The existing interpretive signage associated with the Kurrajong tree to be relocated to the proposed Biodiversity Shelter at the entrance to the Garden.

View of the Biodiversity Garden entrance

This is a list of the principal plants and their related communities established in the Biodiversity Garden; the list is not definitive or complete, either of plants here in the garden or in nature.

1. Green Mallee: *Eucalyptus viridis, Acacia cultriformis, A. spectabilis, Allocasuarina diminuta, Kunzea parvifolia*
2. Red Stringy Bark: *Eucalyptus macrorhynca, Acacia buxifolia, Acacia gladiformis, Dianella revoluta, Lomandra filiformis*
3. Ironbark: *Eucalyptus sideroxylon, E. crebra, Acacia deanei, A. subulata, Dodonaea cuneata, Xanthorraea johnsonii*
4. Rocky Slope: *Acacia brownii, A. decora, A. implexa, Cheilanthes seiberi, Clematis microphylla, Petalostylus labechioides*
5. Mixed Grasses: *Bothriochloa macra, Chloris truncata, Poa seiberiana, Brachychitn populneus, Eucalyptus albens, Bulbine bulbosa*
6. Grasses & Riverina Bluebell: *Austrodanthonia laevis, Austrostipa spp. Wahlenbergia luteola, Bulbine bulbosa*
7. Kangaroo Grass: *Themeda australis, Bulbine bulbosa, Microseris lanceolata, Chrysocephalum apiculatum, Acacia pendula*
8. Grassy White Box Woodland: *Eucalyptis albens, Brachtchiton populneus, Bothriochloa macra, Themeda australis, Indigofera australis*
9. Dianella: *Dianella longifolia*
10. Sheoak Forest: *Casuarina cunninghamiana, Leptospermum polylifolium, Melaleuca thymifolia, Acacia pendula*
11. Redgum Forest: *Eucalyptus blakelii, Goodenia macbaronii, Hardenbergia violaceae*
12. Wetland: (Open Water)
13. Reed Bed: *Bulboschoenus fluviatilis*
14. Sedge Bed: *Juncus usitatus, Carex appressa, Eleocharis acuta*
15. Creekline Reeds: *Juncus usitatus, Cyperus exaltatus,*
16. Rocky Creekline: *Lomandra longifolia, Gahnia seiberiana*
17. Threatened Species

3.2.6. Oasis Valley

Refer to figure 3.03

The concept is to create site conditions to allow a collection of rainforest and allied species to be established to provide a 'green oasis' contrast in this seasonally dry ochre western NSW landscape. To achieve this it will be necessary to undertake specific research to identify plants suited to local conditions sourced from other Australian bioregions and appropriate world regions that have the character of verdant 'dry' rainforest species – an interesting research opportunity. The intention is to create an oasis of green to contrast with the drier qualities of the communities in the adjacent Biodiversity Garden.

The existing grove of Pistachio trees between Oasis Avenue and the Oasis Valley to be preserved as an appropriate element of the 'green oasis'.

Oasis Valley Waterway

A new waterway is planned to commence from the Biodiversity Garden system to flow though a constructed landform creating a protected microclimate to support an oasis or rainforest character valley. The planned stream route loops to the east intentionally uphill as it is planned to excavate deeper into the slope to create a gentle fall from the water origin cascading over several rocky weirs to the formal still pool.

The excavated material will be used to create stylised geometric mounds each side of and along the stream to create a relatively deep valley contained and formed by introduced basalt, granite and sandstone boulders which are generally associated with rainforest communities. In addition sculptural coloured & textured poured concrete walls will be used appropriately to retain slopes.

Formal Pool

The Oasis Valley waterway flows through the landform and gullies to terminate in a formal reflection pool, on the north side of the Vine Arbours, and integrated with the Centre of Excellence.

Hydraulic Design
The constructed landform is planned to collect and drain surface water from most of the adjacent site areas to the east into the waterway and pond system for irrigation use on site and to specifically demonstrate sustainability. Water will be recycled along the stream and detail planning for the waterway system will require specific hydraulic design to ensure appropriate water quality through biological filtering / purification in the lower lagoon areas.

Concept sketch of the Rainforest Valley & Waterway

3.2.7. Sensory Garden

The 1998 Master Plan provision for a Sensory Garden – sound, touch, taste, aroma and colour along the western section of Coronation Drive has been developed into a more formal Garden. Design drawings have been prepared for this garden by Gardenfunktion Design in 2007 but these will be modified to suit the amended parameters defined by this master plan. Principal access to the garden is from the Windsor Parade Gate precinct and Coronation Walkway recommended to meander through the garden.

3.2.8. Arboretum

One of the more important elements of the Botanic Gardens is a diverse collection of tree species arranged throughout the site in a zoned arboretum of specific communities and associations to aid botanic research, demonstration and interpretation.

Urban Forest
The northwest corner of the site bounded by Windsor Parade and Birch Avenue has a plantation of existing tress. These will be assessed to determine their health, significance and botanic relationships e.g family groups etc. It is expected that some existing specimens will be removed to avoid unnecessary duplication or for health reasons. Additional species to be selected to augment the existing themes and arranged so that there is botanic relevance as the pathways and lawns are traversed.

View across the existing Urban Forest planting

The street trees of the proposed Birch Avenue 'Garden Street' *Gingko biloba*, will formally diverge from the streetscape to dissect the Urban Forest in a formal avenue. Gingko Avenue is one of three principal axes to focus on the Centre of Excellence. The access pathways Windsor Walkway and Viceroy Walkway are planned to meander through the collection providing ease of access to observe the main collection groups.

Conifer Forest (Gymnosperm)
Two areas of existing conifers basically exist in the north-eastern section of the site. These will be assessed for their health, significance and botanic relationships e.g family groups etc. It is expected that some existing specimens will be removed to avoid unnecessary duplication or for health reasons. Additional species to be selected to augment the existing themes and arranged so that there is botanic relevance as the pathways and lawns are traversed. The access pathway Gymnosperm Loop is planned to meander through the collection providing ease of access to observe the main collection groups.

Eucalyptus Forest (Myrtaceae)
Two areas of existing Eucalyptus and allies exist basically in the south-eastern section of the site. These will be assessed for their health, significance and botanic relationships e.g family groups etc. It is expected that some existing specimens will be removed to avoid unnecessary duplication or for health reasons. Additional species to be selected to augment the existing

themes and arranged so that there is botanic relevance as the pathways are traversed. The access pathway Myrtaceae Walkway is planned to meander through the collection providing ease of access to observe the main collection groups.

View across the existing Arboretum plantings

Flowering Deciduous Forest
The perimeter path Coronation Walkway meandering along Coronation Drive from the Sensory Garden to the Coronation Gate to be a display of flowering deciduous trees. Flowering screen and hedge species to be used to obscure the maintenance yard.

Formal Forest
The south west corner of the site bounded by Windsor and Coronation contains the proposed carpark and associated undulating landform. The carpark is to be depressed (at street level) into the existing mounded landform and shaded by strategically located spreading trees. The area to be planted out as a collection of trees identified to be suitable for street use in a series of short radial avenues planned to group specimens in specific families or other parameters. Windsor Walkway traverses the forest from Memorial Gate to the Events Precinct.

3.2.9. Lawns

The various components of the site will be separated and defined with irregular areas of lawn sweeping throughout the site. The lawn areas are planned to provide both intimate and more extensive views and vistas encouraging exploration throughout the Botanic Gardens. The lawns will also provide the opportunity for passive recreation. The paved circulation routes meander seemingly randomly throughout the lawn areas and corridors.

3.2.10. Events Precinct

Refer to figure 3.05

The Events Precinct is to be planned to provide space and facilities for a range of community events including:

- Small amphitheatre for concerts (accommodates approx 300 – 400 people)
- Fairs and markets
- Weddings and parties
- Live theatre in the Gardens
- Jazz and classical music
- Sculpture garden, etc

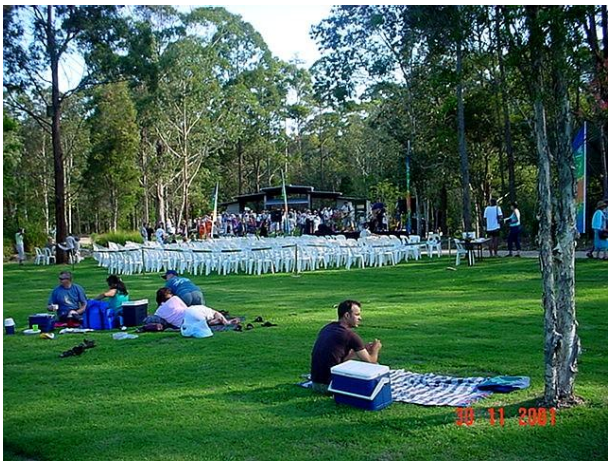
These events attract people to the Gardens who may not otherwise use the facility. In addition some of these activities can be a potential source of revenue.

The character of the area is to be inspired by elements of classical Chinese landscape.

The Events Precinct includes the following elements:

Sculpture Walk
The Events Precinct is accessed from the path which links the carpark, Windsor Walkway and Memorial Avenue at the Shoyoen Forecourt. It is suggested that a series of sculptures or other art elements be located along the Sculpture Walk.

Events Circle
A circular area 50m in diameter (2,000 sqm) located between Memorial Avenue and the carpark to allow various events to be staged. The area is defined by a ring of deciduous trees (one species) to provide summer shade and winter sun.



Events area Maroochy Regional Botanic Gardens, Qld

Performance Area
An asymmetrically located inner grass circle 30m in diameter (700 sqm) for performances of all types. The area will accommodate approx 300 people sitting as an audience.

Stage & Shelter
A small stage and shelter is to be provided at the southern extremity of the Performance Area.

Concession Area
The area between the outer circle and the Performance Area (1,300 sqm) is to be developed as an area for market stalls, or other concessions that may service events. The area to be surfaced in decomposed granite until use demands a more serviceable surface.

Equipment Access
All vehicles and equipment to access the Events Precinct from the carpark.

3.2.11. Botanic Play Experience

It is desirable to provide activities for children to attract them to the Botanic Gardens and introduce them to the world of botany and horticulture in a fun but educational way. Current education instils into students a respect for the environment and in this section of the Botanic Gardens they would be encouraged to apply and expand their acquired skills. The theme of discovering and interacting with the world of plants should inspire the design.

Recreation and play facilities should desirably be provided in age separated facilities to encourage use of the Gardens by both young children and by adolescents. It is recommended that appropriate 'garden experiences' be established that have relevance to the particular user group and are able to withstand the associated uses and impacts expected. It is desirable to involve the youth who will use the facility in the planning and development of the play experience so that they gain a sense of ownership.

The play experience is located on the axis originating at the Shoyoen Gate. To assist supervision, the children's botanic play experience is visually associated with the Centre of Excellence and the Events Precinct. It could be developed as a botanically inspired entity or as a series of themed elements suited to various age groups, appropriately scattered throughout the Events Precinct. It is strongly recommended that this play experience differs from other play facilities elsewhere in the city through the specialised botanic theme.

Children's Garden
A special garden for young children could be established in close association with the Centre of Excellence and integrated with the Orientation Gardens. The 'garden' should not be a typical 'off the shelf' play facility but rather one that stimulates young minds and bodies and introduces them to the wonders of the plant world through appropriate play and educational experiences. It should offer hands on gardening and other opportunities for children to interact with their natural environment, all planned to expose children to the science of botany in an exciting and educational way.

There are recent examples of such innovative play facilities in a number of Botanic Gardens, most notably the Ian Potter Play Garden at the Royal Botanic Gardens - Melbourne.

Ian Potter Children's Garden Melbourne BG

3.2.12. Sun and Rain Shelters

A number of simple roof structures with seating under to be located at strategic locations to provide shelter from sun and rain as well as displaying interpretive information for the adjacent collections.

The shelters are recommended to be of simple design and construction, with a combination of

roof structure and pergola, to create an identifiable common theme throughout the gardens.

It is recommended that the shelters be strategically located, generally 50m to 100m apart, at appropriate locations such as particular interest points and pathway junctions throughout the Botanic Gardens – specifically related to the primary circulation system.

3.2.13. Vine Arbour

A series of five vine arbours is planned to link between the Centre of Excellence and the Biodiversity Garden to define the edge and provide some protection for the Oasis Valley from sun and wind to the north and west. This will provide the opportunity to display a collection of vine species as well as a shaded access pathway along the edge of the oasis forest.

It is recommended that the design and construction of the vine arbours continue the architectural character of the Centre of Excellence and planned as an integral component defining both the Amenity Horticulture Demonstration Gardens to the north and the Oasis Valley to the east.

3.3. Access and Circulation

Refer to figures 3.06 & 3.07

3.3.1. Gate Precincts

A network of primary, secondary and tertiary pathways are planned to provide access throughout the Botanic Gardens. The principal pathways originate at one of the five designated 'gates' around the perimeter each with its own surrounding precinct and character. Site maps, identification and directional signage is provided at each location to assist visitor exploration.

3.3.1.1. Memorial Gate

The detail design for this entry will encompass the wider corner of Windsor Parade and Coronation Drive to create an asymmetric forecourt which collects people from the street footpaths (from the shopping centre & RSL Village) and the adjacent carpark and directs them to traverse the existing axial Memorial Avenue to the Centre of Excellence and the Shoyoen. The precinct to include appropriate signage, paving, possible water or sculptural feature a pergola, seats and amenity horticulture display gardens.

3.3.1.2. Gingko Gate

This entry links the adjacent Macquarie Inn to the Gardens and particularly addresses the interface with Birch Avenue, a planned 'Garden Street' or boulevard of *Ginkgo biloba* specimens. The street tree avenue will diverge from Birch Avenue to thrust formally into the Botanic Gardens dissecting the existing and proposed Urban Forest as one of the three major axes of the Botanic Gardens. The pathway system will not run parallel to the Ginkgo Avenue but rather meander through the various components of the Urban Forest and street tree collection to the Centre of Excellence.

View across Windsor Parade to Ginkgo Gate

3.3.1.3. Viceroy Avenue Gate

There is an existing desire line for residents to cut across the site (by bike and foot) towards the hotel and shops along Windsor Parade. This access is maintained as Viceroy Walkway, but the path meanders outside the Amenity Horticulture Gardens security fence to join the Sculpture Walkway to Windsor Parade Memorial Gate.

3.3.1.4. Royal Parade Gate

The access from Royal Parade is the third axis defining the site – the Arboretum Walkway. This is in the form of an angular geometric pathway linking Royal Parade to the Centre of Excellence. At each pathway junction a shelter will be provided as a focus and for interpretive signage of the adjacent collection. The final link to the Centre is a vine arbour across the Oasis Valley and waterway.

3.3.1.5. Oasis Gate

The access from Coronation Drive is the fourth axis defining the site. It is parallel to the Ginkgo Avenue axis but with a different character as reflected in the name Oasis Avenue. The species in this section will be selected to relate to the adjacent Oasis Valley character. A time capsule (to be opened in 2020) has been previously buried close to the location of Oasis Gate and it is

recommended that the existing marker rock be suitably integrated into the pavement area.

3.3.1.6. Maintenance Gate

Access to the existing maintenance area is from Coronation Drive; the access and the maintenance yard will be upgraded to be suitable for the overall Botanic Gardens; it is expected that the Council facilities elsewhere will be the principal depot.

3.3.2. Pedestrian Circulation Network

Refer figure 3.06

The network of pathway trails and circuits has been planned to provide access throughout the Botanic Gardens linking the Centre of Excellence or Visitor Centre with the various site areas. The pedestrian circulation system has been planned as a hierarchy of primary, secondary and tertiary pathways each relative to the site opportunities, constraints and to the existing and proposed plant collections. The network provides 'circuits' of varying length each traversing a specific series of plant communities and theme areas to offer a diverse range of interest and experiences for visitors.

This network is to be progressively planned in detail as an integral component of the design development for the various horticultural zones and garden areas throughout the Botanic Gardens. The primary pathways will generally function as multipurpose to provide also for maintenance vehicle access.

Areas with steeper site topography will require that various innovative and safe methods be designed to provide equal access opportunities for visitors of all ages and capabilities.

3.3.2.1. Security Issues & CPTED

It is important to ensure that adherence to Crime Prevention Through Environmental Design (CPTED) standards are observed in the planning, design and management of the Botanic Gardens. The basic function of the Gardens to research and display plant material of all types is a complicating factor as CPTED requires that the site remain relatively uncluttered by inappropriate areas of dense vegetation. The planned secondary loop pathway network diverging from the four primary axial and linear pathways and lawn areas facilitate this.

Personal security is important and by their very nature Botanic Gardens inherently include areas of vegetation which will create screening. The installation of a CCTV system throughout the Gardens should be considered as fundamental in the detail planning phase.

3.3.2.2. Primary Pedestrian Circulation

The primary pathway network is planned to provide direct access between the principal site entries and the major elements of the Botanic Gardens.

The primary pathway network has been planned in a series of axial walkways described as follows:

View from Coronation Drive along Memorial Avenue

1. Memorial Avenue 230m
   Commencing at the Windsor Parade Memorial Gate, adjacent to the Sensory Garden, Events Precinct, Shoyoen and linking to the Centre of Excellence. The trees along the avenue were planted by the families of the region in 1999 to commemorate the sesquicentenary of Dubbo.

2. Ginkgo Avenue 200m
   Commencing at the Birch Avenue gate, dissecting the Urban Forest and focussing on the Centre of Excellence and Amenity Horticulture Gardens.

3. Arboretum Walkway 175m
   Vine Arbour 125m
   Commencing at the Royal Parade Ginkgo Gate, zigzagging through the Arboretum, providing access to the Biodiversity Gardens, Oasis Valley and Vine Arbour to the Centre of Excellence and Amenity Horticulture Gardens.

4. Oasis Avenue 130m
   Commencing at the Coronation Drive Oasis Gate, past the Flowering Deciduous Forest, adjacent the Oasis Valley and Vine Arbour to the Centre of Excellence and Amenity Horticulture Gardens.

West along Arboretum Walkway

These primary pathways should be approximately 3 – 3.5m wide to facilitate access by larger groups (schools and tours). As well most sections of the primary circulation system are planned to be used for maintenance vehicle access.

The surface may vary from high quality paved areas in close proximity to the Centre of Excellence to concrete, asphalt, gravel pathways or timber boardwalks. The entire primary circulation network should be accessible to the disabled.

3.3.2.3. Secondary Pedestrian Circulation

The secondary pathway network is planned as a series of walkways and loop pathways off the primary route to provide specific access to closely observe the botanic collection.

This secondary network basically integrates with the primary circulation system but offers more variety of experience and indirect access between different plant communities and display areas. Disabled people should be able to utilise most of this pathway network system.

This secondary pathway system should be approximately 2 to 2.5m wide to accommodate smaller groups and individuals. The surface would vary relative to specific site zones and plant community character.

The secondary pathway network has been planned in a series of theme walkways described as follows:

1. Windsor Walkway 350m
   Commencing at the Windsor Parade Memorial Gate, through the Formal Forest, accessing the car park and Events Precinct then traversing the Urban Forest, to the Birch Avenue Ginkgo Gate.

2. Viceroy Walkway 100m + 100m
   Links with the Windsor Walkway within the Urban Forest and meanders outside the security fence of the Amenity Horticulture demonstration gardens to the Viceroy Gate.

   This walkway divides in the Urban Forest to link with the Orientation Garden. 50m

3. Amenity Gardens Walkway 250m
   The most important inner walkway commencing at the Shoyoen forecourt, through the edge of the Events Precinct then meandering through the Orientation Garden and the Amenity Horticulture Gardens to link with the Vine Arbour and Oasis Valley.

4. Biodiversity Walkway 350m
   Existing pathway loop commencing at the Biodiversity Gate and Shelter and winding around the base and ramping to the top of the created landform providing close appreciation of the various communities of the bioregion.

Access pathways ramping up Biodiversity hill

5. Oasis Valley Walkway 180m
   A specialised walkway commencing at the Centre of Excellence Vine Arbour meandering through the created landform forming the Oasis Valley with the central waterway exiting at the Biodiversity Shelter.

6. Gymnosperm Loop 200m
   A loop pathway extending north from the Arboretum Walkway axis through the Conifer and Eucalyptus forests bounded by Birch Avenue and Royal Parade.

7. Myrtaceae Walkway 250m
   A walkway extending south from the Arboretum Walkway axis through the Conifer and Eucalyptus forests bounded by Royal Parade and Coronation Drive exiting at the Coronation Drive Gate.

8. Shoyoen 300+m
   A meandering pathway network traversing Shoyoen based on traditional Japanese garden design principles.

9. Coronation Walkway 275m
   Commencing at the Windsor Parade Memorial Gate, through the Sensory Garden then traversing the Flowering Deciduous Forest to the Coronation Drive Oasis Gate.

3.3.2.4. Tertiary Pedestrian Circulation

The third circulation network forms a sometimes complex system of smaller paths, steps and ramps providing access within the various theme gardens or plant communities. The routes are to be specifically integrated with the detail design of each community and consequently will be constructed in a range of materials appropriate to the specific character.

The paths will be of varying width, generally narrow and where necessary incorporating steps and other informal access methods. Not all paths will be able to meet the access standards given the proposed landform changes.

3.3.2.5. Bicycle Circulation

It is recommended that the Botanic Gardens pedestrian circulation network be expressly for foot traffic and not available for general use by cyclists. Consideration could be given to permitting supervised young children to use some of the pathways, particularly those associated with the Events Precinct.

It is important to consider whether the existing cycle desire line across the site from Viceroy Avenue toward the shopping centre can be accommodated in one multipurpose route. The plan currently provides for this access from Viceroy Gate meandering through the Urban Forest and Events Precinct to the Windsor Parade Memorial Gate. Should this be provided it will be necessary for safety reasons to limit speed and suitably sign and define the pathways as a multipurpose route.

It is expected that in the long term once the Botanic Gardens are more fully developed that this cycle route might be reconsidered.

3.3.3. Pavements & Surface Finishes

It is important to develop a comprehensive paving strategy to be used throughout the gardens to preserve design continuity and achieve specific precinct characters while providing for flexibility and appropriate diversity.

This will need to consider the definition and selection of pavement construction materials, surface finishes; appropriate design and construction methods which relate to the intended function, to safety; and to the particular aesthetic requirements for specific site and plant community zones.

A variety of materials and finishes can be considered for the pavements including:

- Asphalt
- Poured concrete
- Concrete pavers
- Textured ‘Fossil’ concrete
- Exposed aggregate concrete
- Crushed gravel
- Timber boardwalks and bridges

3.3.4. Bridges & Boardwalks

Bridges, boardwalks and lookout platform structures as well as canopy walks can be used to provide specialised access within the gardens encouraging multi-level interaction with the plant collections. These structures will enable visitors to gain a greater appreciation of botanic displays through a variety of experiences such as level changes, elevated viewing platforms, tree canopy observation, close water contact and to traverse steeper or rocky areas of the gardens which would have been otherwise difficult to access, particularly for the elderly and disabled.

Raised walkway Darwin Botanic Gardens

3.3.4.1. Waterway Bridges

The proposed Oasis Valley waterways are traversed by bridges and or culverts of varying design and quality. It is desirable that they are part of a family of standardised structures that use selected materials and techniques to produce uniformity but allow controlled diversity and

ensure simple maintenance. The principal bridge crossings are as follows:

Vine Arbour Walkway Axis
These two bridges are part of the primary circulation route and consequently require adequate width and strength to take smaller maintenance vehicles. Access for larger equipment is available from the perimeter.

Oasis Valley Waterway
Two bridges are planned over the Oasis Waterway. These are part of the secondary circulation system and should integrate with the character of the rocky waterway through the Oasis plant community.

3.3.5. Vehicle Access & Circulation

Vehicle access within the site is to be limited to maintenance, and emergency use; private vehicles to be prohibited on site.

Refer to figures 3.05, 3.06 & 3.07

Currently Memorial Avenue provides vehicle access and off-street parking for the Botanic Gardens, principally Shoyoen. It is recommended that once the Windsor Parade off-street carpark is constructed Memorial Avenue be restricted to maintenance vehicles only. Access to the Centre of Excellence will be via this avenue but restricted to official and delivery vehicles.

3.3.5.1. Windsor Parade Carpark

The western section of the site has been previously recontoured and partially filled to approximately a metre above the finished road level of Windsor Parade.

View north along Windsor Parade of carpark site

It is proposed create an off-street carpark for 75-80 vehicles, effectively depressed into the landform to street level and surrounded by generous undulating mounding on the Gardens side to visually obscure the parked vehicles. The carpark will function as a one way system with vehicles accessing from Windsor Parade entering from the north entry and exiting from the south exit.

The carpark to be designed with optimum sustainable principles and materials, water harvesting and protected by extensive use of suitable shade trees. This would be an ideal Council demonstration of desirable carpark design and species selection for the city.

3.3.5.2. Coach Parking

It is recommended that an indented bus bay be established commencing in line with the southern end of the median strip (cnr of Windsor Parade and Birch Avenue). Buses would enter in from the north end and exit through the south.

Example of indented bus bay located at St John's High School (Dubbo).

The bay would be approximately 75 m in length and arranged in a saw tooth fashion. This arrangement will allow for 3 buses (bus = 14.6m).

A planting buffer on the edge of Windsor Parade will help screen the area. A pathway will link the coach parking facility to the Gardens circulation network.

3.3.5.3. Maintenance Vehicle Circulation

The primary vehicle and pedestrian circulation network to be designed to accommodate Gardens construction, emergency and maintenance vehicles. These vehicles will be able to access the site through the designated entry points. The site circulation network will link the operations and maintenance facility with most areas of the Gardens where topography allows.

Access from surrounding roads is restricted to the following locations, from:

- Windsor Parade to the off-street carpark;
- Windsor Parade / Coronation Drive corner along Memorial Avenue;
- Coronation Drive to the maintenance yard;
- Royal Parade to the forest areas;

It is important that the final design of Memorial Avenue is planned to accommodate the weights and turning circles of emergency vehicles – ambulance and fire – occasionally accessing the Events Precinct and the Centre of Excellence.

3.4. Other Elements

3.4.1. View Corridors & Focal Points

Refer to figure 3.08

The site size and configuration presents opportunities for establishing strong visual relationships to enhance appreciation of the Botanic Gardens. Site planning has defined specific view corridors and a series of focal points which assist in orientation around the site and to particularly highlight the most significant features of the Botanic Gardens when viewed from external areas and also from internal viewpoints.

Focal points are specialised elements that generally occur as the genesis of or at the intersection of the various view corridors. These important elements basically relate to existing or proposed physical features of the Botanic Gardens including:

- A building, structure, observation tower or shelter within the site;
- Specialised landscape elements such as a lake, pond or fountain;
- Specific botanical elements whose form or colour create a focus.

The principal focal point elements are as follows;

FOCAL POINTS
1. Centre of Excellence for Amenity Horticulture
2. Biodiversity Garden landform
3. Shoyoen
4. Oasis Valley and Waterway
5. The Arboretum
6. Sensory Garden

The principal external and internal view corridors are as follows:

EXTERNAL VIEWS
1. Birch Avenue
   Progressive close views into the Botanic Gardens – principally the Amenity Horticulture Gardens in front of the Centre of Excellence;

2. Birch Avenue
   Long views into the Botanic Gardens – principally of the Biodiversity Garden 'hill';

3. Windsor Parade
   Views north into the Botanic Gardens – principally the Memorial Avenue vista;

4. Coronation Drive
   Progressive views toward the Sensory Garden, Shoyoen, Oasis Valley and the Arboretum;

5. Royal Parade
   Progressive views through the Arboretum;

INTERNAL VIEWS
1. Memorial Avenue
   Views diagonally north-east across the Botanic Gardens toward the Centre of Excellence;

2. Shoyoen Forecourt
   Views east-west between the Shoyoen entry gate and the Events Precinct;

3. Ginkgo Avenue
   Vista diagonally south-east across the Botanic Gardens toward the Centre of Excellence and Amenity Horticulture Gardens;

4. Vine Arbour
   Views into the Amenity Horticulture Gardens, Oasis Valley and waterway;

5. Oasis Avenue
   Vista diagonally north-west across the Botanic Gardens toward the Centre of Excellence;

3.4.2. Memorials

In most botanic gardens incorporation of built memorials is limited and strictly controlled. For any commemorative elements being suggested in future it is important that their location, appearance and function is considered as the detail planning and design process continues.

To aid in the assessment of proposed memorial features, it is important to prepare a policy document to define the parameters for accepting and identification signing of such commemorative elements in the Botanic Gardens. These potentially can range from large donations of money, construction materials, donated living plants to items of furniture and even peoples ashes.

There are two existing memorial features within the site however it is recommended that no further commemorative elements be provided unless they are carefully considered relative to the provisions of the Master Plan and the ongoing development of the gardens site.

Memorial Avenue
Memorial Avenue is the principal memorial element, established in 1999 to commemorate the sesquicentenary of Dubbo. Local families planted the specimen trees along the walkway.

Time Capsule
The time capsule buried beside Coronation Drive is another significant memorial planned to be opened in 2020. This is to be incorporated appropriately into the Coronation Drive Gate forecourt.

3.4.3. Site Fencing & Security

This Botanic Garden and its associated plant collections will ultimately contain numerous rare and valuable specimens. Consequently adequate security will be required to prevent physical damage, theft and vandalism as well as adequate protection from environmental damage through pest, disease, floods and storms.

The principal security issues include:

- Unfortunately damage to plants, signage and facilities through vandalism is not uncommon in botanic gardens and is likely to increase as the Gardens develop and become more popular with the general public.
- It is inevitable that sections of the Botanic Gardens will need to be securely fenced and/or possibly patrolled at night in the future when the collection demands this. This will be a costly exercise and require careful design to ensure security barriers are both aesthetically acceptable and effective.
- Closed circuit television surveillance is also a possibility.
- Security from pests and diseases is part of good agricultural and horticultural practice as well as garden management. Use of pesticides should be kept to an absolute minimum for the health and safety of staff, visitors, fauna and the environment in general; the wise use of water is particularly important.
- It is reasonable to ensure where possible, that rare plants are represented by more than a single specimen and planted in easily supervised locations.
- All structures including shade houses and nursery facilities to be built to approved standards.
- Planting records should be duplicated and stored separately in case of theft, vandalism or destruction by natural causes such as flood and fire.

Amenity Horticulture Garden

Most Botanic Gardens are fenced to protect the collection, discourage inappropriate vehicle access and encourage pedestrians to use the formal gates and pathway system. It is expected that the entire Elizabeth Park Botanic Gardens site will be fenced progressively.

It is recommended that the immediate surrounds to the Centre of Excellence and the Amenity Horticulture Gardens be fenced from the outset as this section will contain the most valuable plant collections. The suggested security fence contains the Gardens in a semicircular enclosure 60m in diameter with four gates.

3.4.4. Services Infrastructure

A range of water, power, drainage and communication services will require to be provided throughout the Botanic Garden.

Refer to figure 2.01

Town Water
Town water is reticulated to the site in Birch Avenue opposite Viceroy Avenue, along Coronation Drive and on the opposite side of Windsor Parade and Royal Parade.

Drinking fountains should be provided at regular intervals around the site, generally in association with shelters, and at major pathway intersections.

Irrigation
An extensive irrigation system has been installed throughout the site currently using town water. As the Gardens develop specialised application of water will be necessary and should follow 'waterwise' strategies and be related to the basic needs of particular plant communities and to specific site conditions.

The Oasis Waterway is planned to harvest site stormwater for use on site to promote and demonstrate sustainability.

Electricity
Underground power is reticulated around all surrounding streets. However Country Energy only allows one connection point for each parcel of land. The Elizabeth Park connection point is designated in Coronation Drive which will require one switchboard for all Botanic Gardens power requirements.

Power will be needed to all structures, some garden areas and to pumping facilities associated with the water recycling and irrigation requirements of the gardens. Sustainable alternative energy sources such as solar and wind power should be considered as appropriate.

Lighting
Lighting to primary circulation routes should be provided and consideration given to sections of the secondary circulation. Specialised lighting to highlight appropriate selected areas of the plant collections will enhance and encourage use of specific garden areas at night time. Harsh flood, spot or event type lighting should be avoided in favour of more subtle, theatrical style lighting.

Lighting to be provided principally to:
- The main access road and carpark;
- Memorial Avenue to the Centre of Excellence;
- Primary circulation network;
- Specialised display gardens and courts associated with the Amenity Horticulture Gardens;
- Shoyoen
- Oasis Valley
- Specific focal points in the Gardens.

Stormwater Drainage
It is important to ensure that stormwater is considered as an integral element of detail planning and design. Global warming research suggests that the wet and dry climatic extremes will become more severe. Consequently all future design should ensure that stormwater flows are collected, distributed and / or dispersed though appropriately sized surface and subsurface drainage systems. The Oasis Valley waterway system is planned to harvest and store surface stormwater for later reticulation. Existing constructed areas should be investigated to rectify any major stormwater problem areas.

Sewerage
Connection to the city sewerage system is available on site midway between the intersection of Birch Avenue / Windsor Parade and Viceroy Avenue.

Communications
In today's age of technology, communication links to the site and Centre of Excellence will be essential. This includes telephone and computerised communications. A line has already been installed between Coronation Drive and the Shoyoen Gate House; this will need to be extended to the Centre of Excellence building.

3.4.5. Toilets

Public toilets are to be generally incorporated into the major buildings of the site. This assists to limit antisocial activities that are more prevalent in toilets in isolated locations.

Public toilets are recommended to be provided as follows:
- Centre of Excellence
- Events Precinct – connection of temporary toilets to the sewerage system could be most appropriate.

Toilets convenient but visually dominant

3.4.6. Furniture

A range of purpose built and proprietary brand furniture items have been used on site. Appropriate designs, materials and construction techniques should be developed to provide a particular 'family' of furniture elements including seating, litter bins, bollards, drinking fountains, light posts, signage etc.

This range of elements should be integrated with the overall town wide strategy for street furniture but ensuring an applied Botanic Gardens theme. Designs and character should reflect a regional environment theme. Ensure that the design is appropriate for long term use and that a Gardens standard is developed and adopted to ensure visual continuity and allow mass production with consequent economies.

3.4.7. Signage

Signs are one of the most important elements of the Botanic Gardens, in order to display the necessary direction, information, location and interpretation data to the visitor.

In addition the expanding common use of MP3 players and other similar developing technology to provide personal portable interpretive information will need to be considered to compliment the signage.

It is recommended that a Botanic Gardens Signage Strategy be developed to identify a coordinated range of sign types and functions, define the design, materials and fabrication as well as the graphic parameters for text and illustrations.

The principal sign types include:

Botanic Garden Identification
The principal identification name signs for the Botanic Garden to be located in each arrival precinct.

Site Map
Located in each arrival precinct - to illustrate the site layout and major areas of interest. Sign design and graphics should be flexible to allow for changes as the Garden develops or as areas of particular interest vary.

Precinct Sign
Information map and text illustrating the layout, component structures, pathways, gardens and plant collection in each identified site precinct.

General Information / Direction Sign
To indicate the location and direction to various plant collection groups, communities and gardens as well as to public facilities.

Theme Garden Sign
To identify and describe the botanic theme, character or element of a specific garden.

Plant Family or Community Sign
Information signs for a specific plant community or garden area such as “Eucalyptus Woodland” or family groups, such as “Proteaceae”; to provide explanatory details of the garden or community.

Interpretative Signs
To describe and illustrate specific botanic, horticultural or cultural qualities of a plant or plant group.

Trail Markers
Simple markers to provide direction along a particular theme path or trail type.

Specimen Identification Signs
Each plant or plant group should be identified by an individual sign, showing family, genus, species, common name, origin map and accession number.

Miscellaneous & Special Signs
A range of small, permanent, temporary, fixed, and/or moveable signs providing general information, direction and control.

Site map

Theme trail marker


Interpretive sign

Specimen identification

Garden identification

3.4.8. Arts & Cultural Aspects

It is important to involve aspects of regional cultural life in the Botanic Garden including Aboriginal heritage, European heritage and local history generally. This will attract a wider range of

visitors to the Gardens to enjoy, perhaps for the first time, the special qualities and benefits available thereby encouraging increased visitation and support.

These cultural influences can be expressed in many ways through architecture, structures, furniture, art, sculpture and associated vegetation. This is an opportunity for Arts Council funding as well as corporate sponsorship.

3.5. Landscape Maintenance and Management

Effective landscape maintenance strategies are critical to the cost effective management of the landscape development, the event/recreational potential and the environmental health of the Botanic Gardens.

It is important that from the outset levels of staffing are appropriate to ensure the implementation of ongoing establishment and maintenance procedures are able to be followed to result in a quality scientific facility and a valuable community resource. As the Botanic Gardens progressively develop it is fundamental to ensure that there is an appropriate incremental increase in levels of staffing.

A comprehensive Maintenance Plan should be developed to guide general management and maintenance staff by establishing;

- Management Goals
- Staffing levels and responsibilities
- Strategies and Guidelines for Maintenance
  - Water Quality Monitoring
  - Weed Control
  - Litter Removal
  - Pest Control
  - Fertilising
  - Pruning
  - Replanting
  - Mowing
  - Path Maintenance
  - Irrigation
  - Maintenance and Repair of Structures
  - Public Safety Assessment
- Recording Procedures
  - Chemicals Usage
  - Maintenance Checks
  - Maintenance Undertaken
  - Safety Checks
  - Disease, Pest and Weed Occurrences and Treatment Effectiveness
  - Specialist Contractor's Register
- Performance Indicators

The Maintenance Plan should be sectionalised to outline differing maintenance requirements and standards needed in the differing physiographical zones of the site. The Maintenance Plan needs to be prepared in a flexible, easily comprehended format suitable for use in administration and in the field by maintenance staff.

Continuing upgrading and refining of the plan is necessary to progressively incorporate all changing and newly observed aspects of development, management and maintenance procedures.

4. THE PLANT COLLECTION

4.1. Botanic Themes

The plant collection should be planned and designed to create an specialised assemblage of plants which extend progressively throughout the specific garden theme areas to be established. The collection should be arranged in ways that maximise the botanic relationships of the specimens as well as demonstrating the ornamental horticulture opportunities.

It is generally accepted by most Botanic Gardens that the thematic structure of the gardens and the associated plant collection should primarily follow ecological groupings, (which are preferable to taxonomic groupings on horticultural grounds), and for their greater educational and interpretative value.

Other themes have become important in recent years – conservation, ethno-botany, climate change and sustainability. These reflect the growing worldwide concern for conservation of the threatened natural environments and preserving and researching cultural initiatives.

The following descriptions outline the main thematic structure for the plant collections in Botanic Gardens as described in the Australian National Botanic Garden Plan of Management 1993.

Ecological Theme
Plantings with an ecological theme are a relatively recent development in Botanic Gardens, reflecting increasing public interest in the natural environment. Such plantings display a wide taxonomic range of species from the same or similar habitats, providing an excellent basis for interpretative and educational programs. They are easier to manage because the same environmental conditions and horticultural management procedures are appropriate to the entire planting. The problems of pests and diseases are also reduced, in that a pest or disease specific to a certain taxonomic group of plants does not devastate the entire associated planting.

Conservation Theme
The past decades have been marked by increasing worldwide awareness of the richness and diversity of our botanical heritage, its value to humanity, and the need for active conservation in the face of the rapidly accelerating impacts of human development. Botanic Gardens have both an opportunity and a responsibility for significant involvement in these conservation efforts. The International Convention on Conservation of Biodiversity, adopted in Rio de Janeiro in 1992, recognised and brought to the fore this important role of Botanic Gardens.

Taxonomic Theme
Historically, Botanic Gardens have used the taxonomic theme as a method of displaying plant collections. This was primarily because many of the early Botanic Gardens were attached to universities where the medicinal properties and the systematics of plants were being studied. Taxonomic plantings in gardens have been used regularly by researchers, educators and students, taking advantage of the convenience of having related plants to be studied and compared, growing in the one location.

Evolutionary & Biogeographc Themes
Consideration of the Australian flora's origins and relationships is important to an understanding of the national flora as it currently exists. The evolution and biography of the Australian flora has long been accepted as a distinct aspect of the thematic character of gardens. Material on the evolution and biogeography of the flora has largely been limited to interpretative signs and brochures. The existing Biodiversity Garden provides a suitable interpretative display dealing with the origins and relations of Australian plants in the Central Western regions of NSW.

Horticultural Theme
The way in which a Botanic Garden displays its plants is often considered an indication of the status of horticultural and design expertise as well as the professionalism within the organisation. For this reason aesthetically designed horticultural display of plants using both native and exotic annuals, cultivars and mixed plantings are important features. Such plantings also demonstrate the potential for use of Australian plants in amenity horticulture and encourage people to use and value them.

In various areas of the gardens, such as around buildings and in service and amenity areas, the need to provide an attractive landscape setting takes a high priority. Such areas should be designed and planted according to accepted landscape principles, to enhance the built environment or to provide areas for visitor enjoyment, as well as research and demonstration.

Ethno-Botanical Themes
Ethno-botany – the study of human use of plants – has always been of interest and is becoming a major theme for many Botanic Gardens. The

planning and management of these elements should involve the local indigenous community.

4.2. Components of the Collection

A Regional Botanic Garden is primarily concerned with the research, interpretation and display of the flora of the surrounding bioregion. However it has been determined (Master Plan 1998) that the Elizabeth Park Regional Botanic Gardens plant collection will comprise the plant material of the bioregion as well as species from other regions elsewhere in Australia and from other parts of the world with similar climatic and environmental conditions.

This section contains a broad outline and preliminary schedule of specific plant communities, related research and possible theme / demonstration gardens. It will be necessary to organise a continuing programme to identify and prioritise the botanical and horticultural opportunities for progressive inclusion in the Gardens. This is best undertaken by establishing a Horticultural Reference Group to assist the Curator.

One of the most important tasks for the Botanic Gardens is to identify the ornamental horticultural potential of the plant material of the bioregion and other selected areas. Detail planning and design will define the related on-site opportunities for research and demonstration to identify and prove the potential for use in the landscape development of residential, urban and commercial landscape as well as for environment restoration in the wider regional area.

4.2.1. Annex Sites

While most of the bioregional flora may be able to be established on site there will be difficulties with some of the more specialised communities. It may therefore be logical to consider the future development of annex sites related to the core Botanic Garden.

Appropriate sites could be set aside and suitably integrated under the botanic gardens living collection and signage policies with development and management coordinated by the curator and gardens staff.

4.2.2. Herbarium

To be classified as a Regional Botanic Gardens it is necessary to establish an Herbarium on site in close association with the State Herbarium. Voucher specimens should be progressively collected and maintained as the Botanic Gardens develops, as this is the basis of scientific research and development.

4.2.3. Plant Records and Location Data

It is vital that from the outset, that the identification and location of all specimens planted in the botanic gardens and filed in the herbarium is known and documented in a comprehensive and computer based system. It is generally recognised that, to ensure the scientific value of the collection, plants which do not have detailed records of origin and/or species nomenclature are not planted in a Botanic Gardens.

The definition and organization of a plant record / location system is one of the principal components of the detail design phase. This is linked to and supported by a simple but exact method to record the on-site location of all specimens.

A comprehensive data base recording all aspects of the existing and progressively established plants includes:

- Botanic nomenclature – family, genera, species, previous botanic name, common name, origin, type of plant, form and size data, flower, fruit, foliage, colour, etc;

- Procurement - accession reference number, on-site location of individual plants relative to site zone, garden number, bed number, comments about the planting process / technique;

- Design intent - comments, instructions and observations which define the physical & aesthetic expectation for the various specimens in the collection, with reference to anticipated potential for use in ornamental horticulture;

- Maintenance - specific data about individual specimens with particular reference to nutrient needs, water requirements, pest and disease potential & treatment, regular and seasonal maintenance, etc;

- Performance - planting date, progressive development and growth records for each plant specimen (or group of specimens in the one garden);

Herbarium data integration

The living collection and the dried herbarium collection should be linked through the plant record database so that the ability to carry out

specific research is aided by directing users to specimens in the herbarium or in the gardens. It is important that the herbarium records are also linked with or at least follow the parameters set by the State Herbarium.

The State Herbarium will offer advice in this process and suggest databases which integrate with the systems adopted nationally and internationally. BGANZ is currently investigating the possibility of establishing a comprehensive database system that can be used and accessed by all regional botanic gardens.

Interpretation & Information
This is the interface between the public, the Botanic Gardens collection, the Herbarium and the collective data known about the specimens. Interpretive information is made available through appropriate signage throughout the Gardens. Ultimately touch screen terminals in the Centre of Excellence will allow personal access to selected database information.

4.2.4. Living Collections Policy

It is fundamental to develop a specific policy to direct the ongoing development and establishment of the Botanic Gardens and the plant collection particularly. This policy will assist the curator and staff to ensure that the agreed provisions of the Master Plan and particularly the identified extent and composition of the Plant Collection are progressively implemented.

The Living Collections Policy will provide an agreed basis to enable logical consideration and appropriate refusal of any donated elements, whether a built structure or introduction of plant material, that does not conform to the agreed Master Plan.

The Living Collections Policy establishes the criteria for the development and management of the collections. This policy states categories and principles required to define and evaluate the living collections. It provides a methodical and consistent strategy to maintain all components of the existing and future collection. The policy is a comprehensive document that includes:

- Functions of the Living Collections Policy
- Living Collections Categories:
  Geographical, Biological & Ecological, Taxonomic & Evolutionary, Ornamental & Landscape, Ethnobotanic, Conservation, Research Collections.
- Management and development of the Collections & Displays
- Acquisition procedures
- Plant Records and Accession Policy
- Horticultural Management of the Collections and Displays
- Appropriate Donations
- Access to the Collection
- Review Procedures

4.2.5. Bioregional Relationship

Dubbo is located relative to four bioregions:
- It is within the southern extent of the Brigalow Belt South bioregion;
- Close to the northern extent of the South West Slopes; and
- East of the Cobar Penne plain;
- The Hunter Valley section of the Sydney Basin bioregion is just to the east.

As Dubbo is the principal city in the region the Elizabeth Park Botanic Gardens has the potential to draw on the botanic wealth of all four bioregions.

Brigalow Belt South Bioregion
The Brigalow Belt South Bioregion (BBSB) covers an area of 52,400 square kilometres, which is 6.2 percent of the state. Located in the central north of New South Wales, it includes the towns of Dubbo, Merriwa, Coonabarabran, Narrabri, Moree and Warialda.

Eighty-five percent of the bioregion is either freehold land or Crown leasehold, used primarily for agriculture. Eleven percent is State forest, while 2.6 percent is in national parks and nature reserves.

The Brigalow Belt South Bioregion Assessment has been undertaken in two stages, gathering information through a range of projects on the social, economic, environmental and cultural heritage values of the region's native forests and related natural resources. Stage One began in October 1999 and Stage Two began in July 2000. The following extracts are from the summary document.

Fauna
The Brigalow Belt South has high biodiversity with 533 vertebrate fauna species known to occur within the bioregion, including 58 threatened species. An additional 14 species are believed to have become extinct in recent history.

Threatened animal species include the endemic Pilliga mouse, barking owls (which occur in high densities in the region), greater long-eared bats, mallee fowl, koalas, various woodland bird species, the pale-headed snake and cave

dwelling bats such as the large pied bat and eastern cave bat.

Fauna records include a mix of arid, coastal and endemic species. Recent finds include species never before recorded in New South Wales such as the zig zag gecko, delicate mouse and a dragon lizard which indicate several major range extensions of tropical species.

Vegetation
More than two thousand (2,073) vascular plant species have been recorded in the bioregion including 100 rare or threatened species. The Joint Vegetation Mapping Project identified one hundred and eighteen vegetation groups through data analysis and aerial photography interpretation. The potential vegetation distribution patterns were identified through modelling and the extant vegetation derived from utilising aerial photography and satellite imagery.

The bioregion also contains eight vegetation communities listed as endangered or threatened under the Threatened Species Conservation Act 1995 (e.g. Brigalow, Ooline, Semi-evergreen Vine Thicket and Carbeen) and/or the commonwealth Environment Protection and Biodiversity Conservation Act 1999 (e.g. Grassy White Box Woodland).

4.2.6. Established Arboretum Plantings

The initially established Arboretum tree plantings across the site were analysed in the 1998 Master Plan documents to identify any basic pattern of species mix and association; there was no strongly obvious formal, botanic or horticultural theme or relationship followed. An indistinct pattern of plant groupings was identified with the same or allied species planted in relatively discernible groups. Untouched, these 'informal' groups will ultimately create a basically unrelated series of forest characters as they mature severely limiting the research and interpretation opportunities.

Refer to figures 4.01 & 4.02

Rationalisation of the Collection
Given the substantial existing duplication of species and the relatively small site it is desirable that the existing Arboretum collection be rationalised by removing unhealthy specimens, multiple duplicates, and botanically inappropriate individual specimens (which might confuse an otherwise pure group). This will require a detail assessment and evaluation to be carried out immediately while the trees are still basically juvenile specimens. This assessment will inform the subsequent rationalisation process and the preparation of detail planting plans for directing the continuing development and expansion of the Arboretum. The expansion of the Arboretum plant collection will build on the specimens retained from these initial plantings to appropriately augment existing associations and add additional related groups.

4.2.6.1. Arboretum Theme Groups

Seventeen distinct groups of existing specimens have been identified (1998 Master Plan) and are scheduled below. It is expected that these groups may be amended in the detail design process following on from the 2011 Master Plan.

1. Casuarina
2. Brachychiton
3. Eucalyptus
    a. Smooth barks
    b. Rough barks
    c. Rough barks
    d. West Australian species
4. Myrtaceae
    a. Angophora
    b. Lophostemon
    c. Tristaniopsis
5. Oleaceae
    a. Deciduous
    b. Evergreen
6. Pistacia
7. Quercus (Oak)
    a. Eurasia
    b. North America
8. Rosaceae
    a. Hawthorne
    b. Other Genus
9. Ulmaceae (Elms)
    a. Cultivars
    b. Eurasian
    c. North America
10. Conifers
    a. Cupressus, Pinus
    b. Callitris, Cupressus
    c. Araucaria, Cedar, Pinus, Podocarpus
    d. Cupressus, Juniperus
11. Economically Useful
    a. Chestnut, Ginko
    b. Pecan, Pistachio, Walnut
    c. Pomes (Apples, Pears, Quince)
    d. Persimmon
    e. Tamarind, Carob, Citrus, Olive, Fig
12. Laurels
13. Legumes
14. Maples & Sweet Gums
15. Myrtles
16. Palms
    a. Butia grove
    b. Phoenix grove
    c. Washingtonia grove
17. Regional Communities
    a. Local ecosystems

Riverine woodland
Ironbark woodland
Black Cypress woodland
Box woodland
Mallee woodland
Montane woodland
Wetlands

b. Australian tablelands, slopes & plains
c. Associated World regions

4.2.6.2. Arboretum Precincts

The expansion of the Arboretum collection is classified into the following five specific communities or associations in separate site precincts to aid botanic research, demonstration and interpretation.

Urban Forest
Additional species to be selected to augment the existing themes and arranged so that there is botanic relevance as the pathways are traversed. The street tree species selected for planting along the proposed Birch Avenue 'Garden Street' *Gingko biloba* will diverge from the streetscape to effectively dissect the Urban Forest in a formal avenue to focus on the Centre of Excellence.

Conifer Forest (Gymnosperm)
Two areas of existing conifers exist in the northeastern section of the site. Additional species to be selected to augment the existing themes and arranged so that there is botanic relevance as the pathways are traversed.

Eucalyptus Forest (Myrtaceae)
Two areas of existing Eucalyptus and allies exist in the southeastern section of the site. Additional species to be selected to augment the existing themes and arranged so that there is botanic relevance as the pathways are traversed.

Flowering Deciduous Forest
The perimeter path meandering along parallel to Coronation Drive from the Sensory Garden to the Oasis Gate to be a display of flowering deciduous trees. Flowering screen and hedge species to be used to obscure the maintenance yard.

Formal Forest
The south west corner of the site contains the proposed carpark and associated undulating landform. The area to be planted out as a collection of trees identified to be suitable for carpark shade and for street tree planting, laid out in a series of short radial avenues with specimens grouped in specific families or other parameters.

4.2.7. Biodiversity Garden

The Biodiversity Garden has already established a representative collection of the diverse bioregional plant communities of the area. This selected collection provides the stimulus for visitors to explore the surrounding region more fully to experience aspects of the related wider natural environment.

The following list of the principal regional communities and the associated plants established in the Biodiversity Garden is not definitive or complete, either of plants in the garden or in nature.

1. Green Mallee: *Eucalyptus viridis, Acacia cultriformis, A. spectabilis, Allocasuarina diminuta, Kunzea parvifolia*
2. Red Stringy Bark: *Eucalyptus macrorhynca, Acacia buxifolia, Acacia gladiformis, Dianella revoluta, Lomandra filiformis*
3. Ironbark: *Eucalyptus sideroxylon, E. crebra, Acacia deanei, A. subulata, Dodonaea cuneata, Xanthorraea johnsonii*
4. Rocky Slope: *Acacia brownii, A. decora, A. implexa, Cheilanthes seiberi, Clematis microphylla, Petalostylus labechioides*
5. Mixed Grasses: *Bothriochloa macra, Chloris truncata, Poa seiberiana, Brachychitn populneus, Eucalyptus albens, Bulbine bulbosa*

6. Grasses & Riverina Bluebell: *Austrodanthonia laevis, Austrostipa spp. Wahlenbergia luteola, Bulbine bulbosa*
7. Kangaroo Grass: *Themeda australis, Bulbine bulbosa, Microseris lanceolata, Chrysocephalum apiculatum, Acacia pendula*
8. Grassy White Box Woodland: *Eucalyptis albens, Brachtchiton populneus, Bothriochloa macra, Themeda australis, Indigofera australis*
9. Dianella: *Dianella longifolia*
10. Sheoak Forest: *Casuarina cunninghamiana, Leptospermum polylifolium, Melaleuca thymifolia, Acacia pendula*
11. Redgum Forest: *Eucalyptus blakelii, Goodenia macbaronii, Hardenbergia violaceae*
12. Wetland: (Open Water)
13. Reed Bed: *Bulboschoenus fluviatilis*
14. Sedge Bed: *Juncus usitatus, Carex appressa, Eleocharis acuta*
15. Creekline Reeds: *Juncus usitatus, Cyperus exaltatus,*
16. Rocky Creekline: *Lomandra longifolia, Gahnia seiberiana*
17. Threatened Species

4.2.8. Shoyoen

The Shoyoen has been established with a range of species associated with a traditional Japanese garden as well as selected native species. A total of 109 species have been planted in the garden and regularly maintained to provide optimum amenity horticulture display. This garden is an excellent basis to demonstrate the selection, massing and management of plants to create a stylised and formal character. Shoyoen will compliment the proposed Amenity Horticulture Gardens.

4.2.9. Amenity Horticulture Gardens

The plant collection for the Elizabeth Park Regional Botanic Gardens is to comprise the plant material of the bioregion as well as suitable species from other regions elsewhere in Australia and from other parts of the world with similar climatic and environmental conditions. The central area of the Botanic Gardens surrounding the Centre of Excellence contains the two principal areas of demonstration and theme gardens.

The Orientation Gardens are planned to specifically display plants selected for their premium aesthetic and botanic value to create an arrival experience that introduces the visitor to the Botanic Gardens as the pathways to the Centre of Excellence are traversed.

The Amenity Horticulture Demonstration Gardens are planned to specifically research and display plants selected from the various Australian and international environments that have been proven or have potential for use in cultivation.

Refer to section 4.3.2 for a list (in alphabetic order) of potential botanic & horticultural themes; the detail planning and design process will determine the most appropriate selections.

4.3. Plant Collection Planning

The site has been analysed to define the most appropriate strategy for the establishment of various plant communities and other theme gardens. The reconstruction of sections of the site landform (existing and proposed) provides the opportunity to establish specialised soil and microclimatic conditions to support a representative species collection of most of the appropriate Australian and international communities.

The Master Plan defines the ‘structure’ planting and as the development process proceeds it will be necessary to organise detail design and associated plant selection for the various specialised garden areas. This will require the commencement of a progressive programme of specific research, production and acquisition of plant material to ensure optimum scientific value of the collection. The Horticultural Reference Group of local community experts will provide valuable assistance to the Curator.

4.3.1. Site Sectors

Analysis of the environmental, physical and functional characteristics of the site has defined the following sectors and related theme precincts which influence the plant collection strategy and define the progressive experience as the site is traversed.

The Centre of Excellence is the principal element of the Botanic Gardens and the four principal axes which converge there, physically and visually divide the site into four sectors, each with a number of associated theme precincts. It is expected that as design development progresses these suggested boundaries and themes may be subject to change in response to detail botanic research.

Refer to figure 4.03

NORTH SECTOR
Defined by Ginkgo Avenue, Birch Avenue, Royal Parade and the Arboretum Walkway & Vine Arbour.

1. Selected Specimen Trees
2. Arboretum - Urban Forest (north)
3. Amenity Horticulture Gardens (exotic)
4. Amenity Horticulture Gardens (native)
5. Birch & Royal Avenue footpath buffer
6. Biodiversity Garden
7. Arboretum – Gymnosperm Collection
8. Arboretum – Myrtaceae Collection
9. Screens and Hedges
10. Vine Arbour

EAST SECTOR
Defined by the Arboretum Walkway & Vine Arbour, Royal Parade, Coronation Drive and Oasis Avenue.

11. Oasis Valley
12. Oasis Avenue & Gate
13. Arboretum – Gymnosperm Collection
14. Arboretum – Myrtaceae Collection
15. Royal Avenue footpath buffer

SOUTH SECTOR
Defined by Oasis Avenue, Coronation Drive and Memorial Avenue.

16. Shoyoen
17. Shoyoen Forecourt
18. Deciduous Flowering Trees
19. Sensory Garden
20. Memorial Avenue & Gate
21. Coronation Drive footpath buffer

WEST SECTOR
Defined by Memorial Avenue, Windsor Parade and Gingko Avenue.

22. Arboretum - Formal Forest
23. Carpark
24. Events Precinct
25. Botanic Play
26. Orientation Garden
27. Arboretum – Urban Forest (south)
28. Ginkgo Avenue & Gate
29. Windsor Parade footpath buffer

4.3.2. Collection Themes

The following list (in alphabetic order) indicates a selected range of botanic & horticultural themes for consideration; it is anticipated that other themes will be progressively defined. The detail planning and design process will determine the most appropriate theme and demonstration gardens to be included and their location in the various site sectors or precincts.

The letter (N) (S) (E) or (W) indicates the location in the North, South, East or West sector.
Refer to figure 4.03

- Amenity horticulture (N)
- Aquatic plants (E)
- Arboretum (N) (S) (E) (W)
- Biological Wetlands (N) (E)
- Bioregional species (N)
- Bush Tucker (N)
- Butterfly garden (N)
- Carpark - shade trees (W)
- Children's Garden (W)
- Chinese (Events) Garden (W)
- Climate controlled structures – glasshouse, shadehouse (N)
- Conservation (N)
- Events Precinct (W)
- Ethno-botanic Collection (N)
- Flowering screens & hedges (S)
- Gymnosperm Arboretum (N) (E)
- Herbs & spices (S)
- Horticultural technology – green walls & roofs (N)
- Iconic Bioregional species (W)
- Shoyoen (S)
- Myrtaceae arboretum (N) (E)
- Oasis Forest (Notophyll) Valley (E)
- Orientation Garden (W)
- Perfume & aroma (N) (S)
- Play Garden (W)
- Screens & hedges & topiary (N)
- Sensory Garden (S)
- Shade Garden – foliage, ferns, orchids, monocots (N) (E)
- Shade Trees - residential (W)

- Soil types (N)
- Sound Garden (S)
- Street Trees (N) (W)
- Sustainability Garden (N)
- Theme gardens – character, colour, soil, etc (N)
- Vegetables (S)
- Palm Collection (E)
- Vines and scramblers (N)
- Water Wise (N)
- Zoo connection species (N)

The following paragraphs provide additional information regarding the planning for specific elements of the Plant Collection themes.

4.3.2.1. Conservation

Bioregional species classified as rare and threatened or identified to have specific conservation values or issues; primarily established to preserve the gene pool but also trialled and displayed to demonstrate their potential for use in conservation, ornamental horticulture or for economic uses.

4.3.2.2. Taxonomic – Specific Collections

Selected species to be researched and displayed in the various site precincts. Plants trialled and displayed in structured display gardens such as the following to demonstrate their potential for use in ornamental horticulture or for other functional or economic uses.

OASIS FOREST (Notophyll) PLANTS

- Caesalpiniaceae
- Euphorbiaceae
- Fabaceae
- Lauraceae
- Meliaceae
- Mimosaceae
- Myrtaceae
- Proteaceae
- Rubiaceae
- Rutaceae
- Sapindaceae
- Sterculiaceae

MYRTACEAE COLLECTION

- Eucalyptus
- Callistemon (now Melaleuca)
- Melaleuca
- Leptospermum

ACACIA

PROTEACEAE

PALM AND CYCAD

MONOCOT COLLECTION

4.3.2.3. Horticultural

Collections researched and displayed in the various site precincts. Plants trialled and displayed in structured display gardens such as the following to demonstrate their potential for ornamental horticulture or for other functional or economic uses.

ECONOMIC PLANT COLLECTION

- Food Plants (Bush Tucker)
- Timber trees, farm forestry & carbon trading
- Street and residential trees
- Medicinal plants
- Cut flower, foliage, permaculture

AMENITY HORTICULTURE

- Trees for shade, flowering, fruiting
- Trees for streets, industry & home gardens
- Windbreaks, screen and hedges
- Flowering shrubs
- Rockery plants
- Groundcover and bedding plants
- Vines, scramblers and creepers.
- Plants to attract birds and butterflies

DEMONSTRATION GARDENS

- Garden Character – heritage, native, cottage, formal, etc
- Gardens for various soil types
- Seasonal Colour
- Sensory Gardens – fragrance, texture, colour.

4.3.2.4. Evolution & Biogeographc

The species to be researched and displayed in the most appropriate site areas.

- Origin of plants in the local environment
- Plants of other similar Australian regions
- Plants of other similar world regions

4.3.3. Theme Trails

Plant specimens growing in varying site locations and conditions that share common traits or characteristics can best be interpreted displayed and discovered though traversing a specific theme trail. Associated signage and brochures are fundamental tools to convey specialised information and interpretation.

Theme Trails could include:

- Rare & threatened species
- Timber Trees
- Taxonomic Trails

- Bush Tucker & Native Fruits
- Poisonous Plants

4.3.4. Vegetation Planning Generally

The plant collection is fundamental to the evolving value and significance of the Botanic Gardens. Detail vegetation planning and design must be organised progressively, always in close collaboration with the Horticultural Reference Group to ensure optimum selection and establishment of representative bioregional and associated species.

It is not intended to establish or 'duplicate' natural bioregional plant communities in the Botanic Gardens but to evaluate and interpret their individual physical, environmental and landscape attributes in specialised arrangements and relationships. Application of a series of planning parameters will assist in ensuring the establishment of a scientifically logical living collection as well as an aesthetically pleasing landscape.

The principal vegetation planning parameters include:

- The same species quite often occur in more than one bioregional environment consequently it is desirable to avoid unnecessary species repetition; carefully analyse and select representative species to be established in specific biological or ecological groups;
- Linking selected species within related taxonomic classifications will provide the opportunity to interpret and explain species association with soils, microclimate etc; the development of a series of taxonomic theme trails and associated brochures will assist logical collection inspection and interpretation;
- Soil types have little relevance to successfully establishing local bioregional species but surface and subsurface drainage is an important determinant;
- Consideration to be given to specialised contemporary planning initiatives that will create an innovative conventionalised or abstract layout as opposed to a 'natural' representation; planning by a layering process for the various levels of vegetation will assist the process;
- Site planning should consider the development of a series of 'rooms' throughout the various precincts and gardens, each with differing character, size and relationships will provide for optimum interpretation opportunities as well as visual diversity;
- Site planning should consider the use of transitional spaces linking the 'rooms' which may be open lawns, forest corridors or waterways;
- Identify specific 'showcase' areas for the prime plant collection located as focal elements at path junctions and along the primary circulation routes;
- Maximise site diversity by interpreting the physical features of the bioregion through innovative abstract landform and related structures collectively creating the setting for the associated plant groups;
- The linking theme throughout the Gardens to be the 'application of botany into horticulture';

  For instance this approach maximises the ability to demonstrate how tall trees competing for light in a forest environment become a suitably sized smaller shade tree when grown in open sunny situations; conversely, species that tend to be small in the wild due to poor soil, lack of moisture, browsing of animals or frequent fire events may become much larger when grown under good horticultural conditions without these limiting factors.

4.3.5. Plant Community Composition

One of the most important of the planning procedures is the interpretation of the composition and form of the natural bioregion communities to be applied to the layout design for the related planting in the Botanic Gardens. Research supported by field inspections to verify the physical components, relationships and influences is fundamental.

Detail planning and design for the establishment of the living collection throughout the Botanic Gardens will involve consideration of the following components typical of most natural communities:

Composition
Understand the typical basic plant composition of each selected community: dominant species, plant layering and plant density; develop design parameters to influence the planning for the related living collection garden;

Vegetation layers
Understand and assess the composition of the community to define the logical and desirable make up of the on-site garden; note particularly the various layers - tree canopy, understorey, ground cover and feature specimens;

Sectional relationships

Identify and define if there is a range of natural botanic, physical or aesthetic associations occurring within a regional environment for translation into the collection garden design; it is possible that there will be a number of such groupings which could be expressed as individual 'sub-beds' across the living collection garden. Each group should be closely related to a path or lawn area to aid in observation and signage for interpretation.

Species diversity & association

Each regional ecosystem will offer a range of plant relationships relative to microclimate and or local physical conditions which will assist in the display and interpretation of the natural diversity of species through – form, height, spread, habit, texture, colour, flower, fruit, foliage etc; identify the relative patterns from field observation for translation into the living collection garden design;

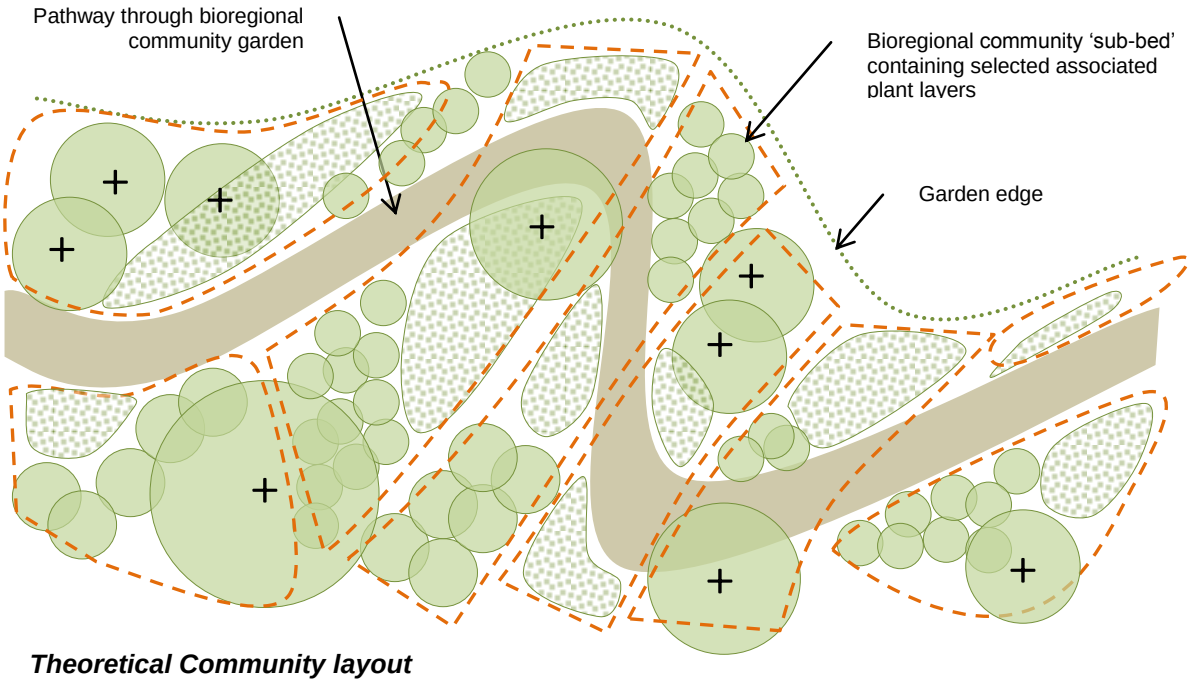
Plant density

The number of plants in a specific area of a regional ecosystem is influenced by both natural and applied influences. Plant density is directly related to the optimum mature size but varies dependent on whether specimens are individual and isolated or if grown together in groups. Additionally horticultural maintenance procedures (formative pruning) can modify natural form and habit.

Comprehensive knowledge

It is vital that the designer, aided by the Horticultural Reference Group, has a comprehensive knowledge and understanding of the bioregional communities and their related species to ensure optimum planning, design and establishment of the living collection.

The diagram illustrates a method of bioregion community representation in 'sub-beds'.



Theoretical Community layout

Forest Garden & Arboretum Lawn relationship

Vegetation groups and path relationship

Vegetation groups and path relationship

Vegetation groups and path relationship

Vegetation groups and path relationship

Formal research gardens related to path

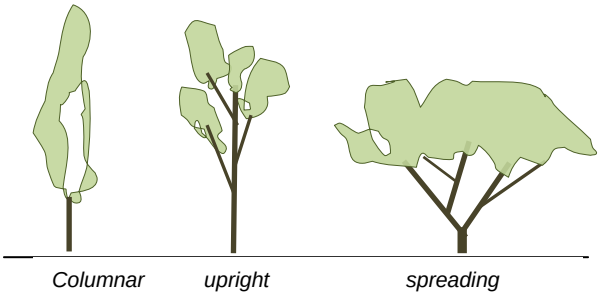
Relationship of plants, paths, rocks and mulches

Dividing plant groups by a drainage swale 'path'

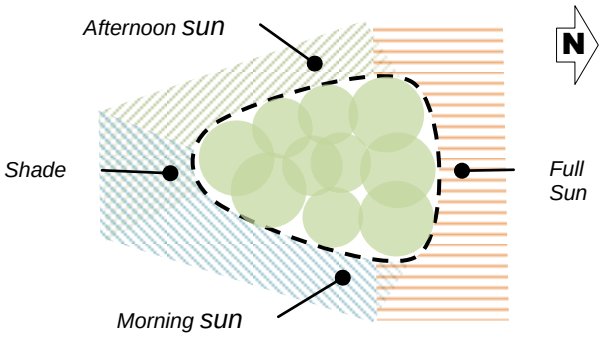
4.3.6. Planting Layout Design

When planning the layout for a garden or forest area it is important to consider and apply specific design principles to ensure that the long term development and establishment of the plant specimens is appropriate for optimum scientific, information and interpretation purposes. The principal considerations include:

Specimen size and spread
Ensure sufficient space is allocated for the expected mature development of tree species; as isolated specimens; in a grove; or as an avenue. Many tree species where competing for space and light in a natural forest, naturally develop columnar form with significantly greater height than when grown in open cultivation. Although as isolated specimens canopy spread may be much greater.

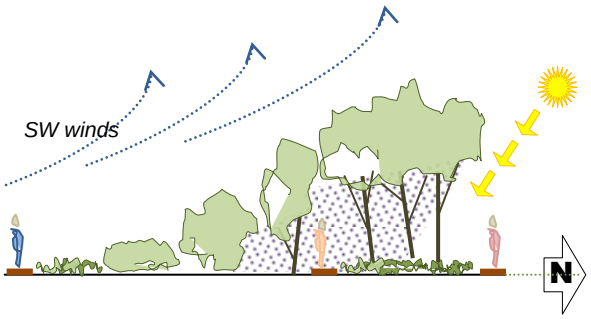


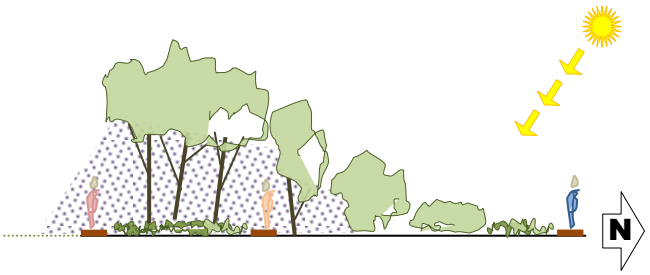
Aspect
Know where north is. Locate specimens relative to preferred sun exposure to maximise flowering, fruiting and foliage colour. Assess where maximum and minimum sun exposure is found around the perimeter of a garden bed or forest area and locate species appropriately.



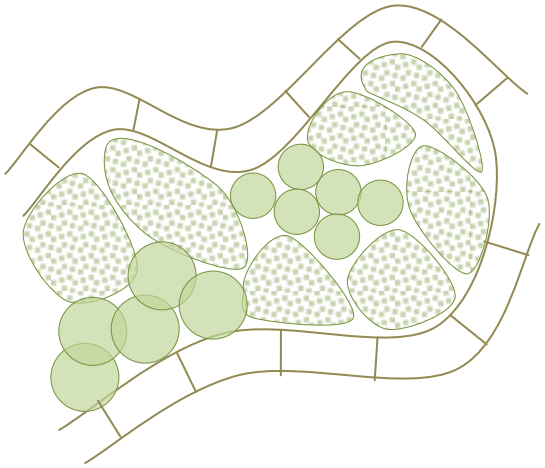
Garden cross section
Locate specimens within a garden bed or forest area to take advantage of their natural form and habit to maximise appreciation as lawns and pathways are traversed. High branching trees allow understory plants; dense full height shrub foliage restricts viewing but provide wind breaks. Reverse configuration maximises canopy sun exposure to the north.

Garden cross sections also function as windbreaks when aligned across the direction of prevailing winds.





Garden layout
Location of specimens in gardens with groups of multiple species should always allow for at least one or two of a group to be placed close to the edge of a path or lawn to assist labelling, close plant inspection and avoid public access across a garden bed to see an internal plant of interest.



4.3.7. Plant Schedules (1998)

The 1998 Master Plan included an extensive series of plant species schedules for the various communities, avenues and arboretum precincts. These schedules have not been amended for the master plan review. Many of the schedules still apply and the contained information is still pertinent but botanic nomenclature, research, and development knowledge has progressed substantially since 1998. It will be necessary to review, amend and update these schedules in parallel with the detail planning and design process.

The development of the plant database as outlined in Clause 4.2.3 is fundamental to the ongoing development of the Botanic Gardens as this will be the tool to control the input of species data and output of plant schedules for the various collections in the sectors, precincts, gardens and beds throughout the site. The database should include all existing and proposed specimens throughout the site, including the arboretum, Memorial Avenue, Shoyoen and the Biodiversity Garden. Progressively add species as planning and design continues for all other areas.

The most important initial task is the assessment of the existing arboretum trees to determine the health, botanic and amenity value of the individual specimens, then to rationalise the plant collection strategy as outlined in section 4 of the 2011 Master Plan documents. It is understood that Council Operations will carry out this assessment as part of the progression leading to detail design.

4.4. Interpretation of the Collection

A botanic garden is by definition a place for research and the study of botany together with its application to horticulture. There is significant potential to increase the public awareness of botany, horticulture and the collection by a professionally structured interpretation strategy, which encourages increased visitation, interaction and use of the Botanic Gardens by the general community. The educational potential of the Garden can be realised in numerous ways, both straightforward and subtle.

There are stories to be told about each section of the site, about the habitat from which the plants come, about the methods used to grow them successfully and about the ways in which they can be used. The techniques used to convey information about these stories may be indoors in a visitor centre, or outdoors on site; they may involve signs, brochures, audio-visual media or person to person interaction with the visitors.

4.4.1. Components of an Interpretive Plan

The three main components of an interpretive plan should not be considered in isolation, as they all depend on, and support each other.

Information
This is the means by which people familiarise themselves with the Gardens' values, facilities, regulation, things to see and do, direction finding and so on. The need for visitors to feel comfortable in the Gardens is vital to their enjoyment.

Education
A more formal approach is used to convey particular types of information and messages, usually through written materials supported by personal services. Emphasis is usually placed on attainment of knowledge and skills.

Interpretation
This is the mean by which the visitor increases enjoyment and awakens interest and understanding, usually by personal involvement through various media.

4.4.2. Aims and Objectives

Aims

- To ensure that the Botanic Gardens is seen as a leader in the study of botany and horticulture for the central western regions of NSW;
- To ensure that the Botanic Gardens is well known and appreciated by local residents and visitors;
- To set directions for the future development of informational, educational and interpretative facilities;
- To ensure that all audience groups and relevant issues are addressed;
- To provide specific recommendations for services inside and outside the Botanic Gardens;
- To ensure that each theme is presented as part of the right story, in the right place, to the right audience, using appropriate and varied techniques;
- To ensure that visitors are moved through a logical progression from basic orientation to broad themes and finally site or plant specific interpretation;
- To ensure that all educational, informational and interpretative materials is of the highest standard.

Objectives

- To encourage the appropriate use of the Botanic Gardens through interpretative devices such as signs, exhibits, walking tracks, person-to-person programs and through audio-visual media;
- To provide visitors with the kind of knowledge and information that will enable discovery, understanding, appreciation and enjoyment of the ecology, and the natural and cultural features of the Gardens;
- To provide general information to visitors about the facilities and features available;
- To assist visitors and local residents to appreciate the role of the Botanic Gardens in preserving plant communities, ecological systems and natural landscapes.

4.4.3. Interpretative / Educational Themes

There is a wide range of opportunities for the interpretation of the Botanic Gardens, which will satisfy a diverse range of visitor interests. The following schedule gives an indication of some of the themes that could be considered and developed.

The Gardens Site:

- Historic aspects of the Gardens site
- People and events of the past
- Historic site, artefacts, plantings
- Historically significant plants
- Botanically significant plants

Aboriginal Perspective:

- Use of the area in pre-contact times
- Ethno-botany in the region
- Current involvement – bush tucker
- Dreamtime legends

Basic Plant Needs:

- Light (competition, leaf shape, photosynthesis)
- Water (too little versus too much, adaptations)
- Nutrients (root competition, epiphytes, parasites, mycorrhiza, soil types)
- Predator avoidance (physical and chemical mechanisms)
- Reproduction (vegetative, sexual, mechanisms for pollination, seed dispersal)
- Poisonous plants

Plant Groups:

- Major divisions of the plant kingdom
- Plant classification
- Evolution of Australian flora - Gondwana
- Flora of Sister Cities

Flora of the Region:

- Bioregional plant communities
- Rare and endangered species
- Current floristic, botanical and ecological research
- History of plant exploration and exploitation in the region
- Links with other parks and reserves in the region

Horticulture:

- Plants with ornamental horticulture potential
- Fruits and commercial products
- Special collection (deciduous, conifers etc)
- Demonstration gardens (windbreak, water-efficient plantings etc)
- Sensory gardens (fragrant flowers, leaves, colour, texture etc)
- Seasonal horticulture display

Fauna:

- Reptiles and frogs
- Birds
- Mammals

Conservation Topics:

- Water Management
- Weeds
- Erosion (by farming, mining, water)
- Pollution, litter
- Feral animals, domestic animals.

5. IMPLEMENTATION

5.1. Cost Estimates

5.1.1. Basis of Estimate

A broad scale estimate of costs has been prepared for the Elizabeth Park Regional Botanic Gardens, based on the planning and design data outlined in the text, illustrations and drawings of this Master Plan Report.

Refer to section 3 for specific description of the proposed scope of elements.

This assessment of the construction costs does not cover every aspect of the overall project as there are many factors requiring final determination. Where necessary, appropriate assumptions have been made relative to specific quantities, areas and particular items.

The estimate figures used in the calculation are basically current (2010) contract rates. It is expected that some of the development tasks will be carried out by Dubbo City Council staff and also by volunteers, consequently this will influence (reduce?) the final actual cost.

The next phase of the project will progressively develop the Master Plan to specific detail planning and design development documentation. This process will allow more exact estimates to be prepared for the specific elements.

The following figures are therefore presented as an indicative cost for the design concepts as outlined in the Master Plan. They will assist in identifying the relative value of the various components planned for the continuing development of this Botanic Gardens site, and to determine logical annual budgets, allocation of funds, related extent of development and a time frame for their progressive implementation.

The estimate will need to be progressively reviewed to determine the quantum of budget costs relative to the following items:

- Project Management, Administration, Operations
- Detail Design Documentation and Tender Process
- Construction by Contract
- Construction by Council Resources
- Construction by Voluntary Labour
- Maintenance and Operations – Staffing and Equipment
- Marketing and Promotion
- Accessing Funding and Sponsorship

Opportunities also exist for the Council to use the Master Plan as a basis for applications to source funding for the continuing development of this Botanic Garden. These other source funds may involve State and Federal Government grants or subsidies as well as corporate and private sponsorship for specific elements within the Botanic Gardens.

5.1.2. Economic Evaluation

The overall development of the Botanic Gardens will of necessity continue over an extended period of time and should be directly related to the economic and social benefits that such expenditure could stimulate.

It is expected that the long-term economic stimulus would be of major consequence, primarily related to the flow on benefits to existing and proposed community initiatives engendered through the development of the Gardens. The analysis and assessment of the economic benefits is one of the most important components, which can be used by Council to justify expenditure and source sponsorship for the development of the project.

It is recommended that a cost-benefit and economic evaluation study be carried out as an integral part of the design development and detail planning phase.

5.1.3. Estimated Development Costs

Refer attached estimate spreadsheet, which itemises the principal elements of the Botanic Gardens development.

It is obvious that the capital cost of developing the Botanic Gardens is high and not easily justified without the benefit of a comprehensive cost benefit analysis. It is strongly recommended that an economic evaluation study be carried out.

The following are the major built components of the itemised estimate – exclusive of GST.

Circulation	$ 1,706,000
Construction	$ 6,675,000
Services	$ 400,000
Vegetation	$ 257,500
Development Estimate	**$ 9,038,500**
	plus GST

5.1.4. Other Associated Costs

Management and Operations
It is impossible at this time to assess the exact costs of management and operational procedures related to the establishment and development of the Gardens. These costs involve a range of issues including staff salaries, administration, materials, equipment etc. A provisional allowance has been included to cover these procedures but it will be necessary to establish this component exactly as part of the economic evaluation.

- Allocation $ 632,695

Contingency Sum
The estimate includes a general contingency sum assessed as a percentage of the overall development costs to provide for flexibility, change and to cover unforeseen issues.

- Allocation $ 271,155

Consultancy Fees
The estimate provides for an allowance for consultancy fees and related costs to cover the following issues:

- Project Coordination
- Master Plan Interpretation
- Preparation of related briefs

- Detail design documentation
- Survey – specific areas
- Landscape – design and supervision
- Engineering – roads, bridges, boardwalks, services, hydrology

- Architecture – Centre of Excellence

- Economic evaluation / feasibility

- Assessment of funding options

- Allocation $ 813,465

Associated Costs estimate **$ 1,717,315**
plus GST

Overall estimated cost **$10,755,465**
plus GST

5.1.5. Ten Year Development Plan

The following schedule indicates the provisional value, (rounded), relative to the suggested development programme itemised over a ten year period from 2011/2012 to 2020/2021.

The itemised estimated cost analysis, including additional associated costs, is reproduced in full in the attached spreadsheet.

2011/2012	$ 631,890
2012/2013	$ 2,310,980
2013/2014	$ 2,773,295
2014/2015	$ 1,483,335
2015/2016	$ 1,217,370
2016/2017	$ 925,820
2017/2018	$ 520,625
2018/2019	$ 434,350
2019/2020	$308,210
2020/2021	$149,940
TOTAL	**$ 10,755,815**
	plus GST

It would be possible to extend the continuing development process over a longer period by effectively spreading each proposed annual budget over two or more years. This would be dependent on the availability of capital funding / sponsorship assistance and voluntary labour and materials.

5.1.6. Action Plan

The time and budget restraints dictate that it will not be possible to develop the Botanic Gardens in one process. The logical implementation of the Master Plan requires a staged process of works based on the combination of variable factors of construction, user demand, labour availability and budgetary constraints.

It will be necessary to develop a detail action plan for the development of this Botanic Gardens site once specific budgets and time lines have been set. This is a fundamental and important part of the implementation process. The Action Plan will define the priorities for action and their recommended timing.

By necessity, most Botanic Gardens have a long-term development process as plant material takes a number of years to develop to an advanced state when it is aesthetically dramatic and interesting to the public at large. Generally construction procedures (drainage, earthworks etc) must be completed before many of the planting procedures can take place. Therefore it is strongly recommended that any major construction works, which effect specific planting locations and extensive site landform areas be completed at the earliest time possible in the implementation programme.

5.1.7. Focus Date

It is suggested that Council should determine a date for the completion of the initial development process to act as a focus for the marketing and promotion of the Botanic Gardens. Without such a focus date it will be difficult (if not impossible) to establish and maintain Council, public and corporate enthusiasm and support.

A special date with community relevance or association with a significant local, regional or national event to be considered as a suitable focus date for the completion of the Elizabeth Park Regional Botanic Gardens.

One significant national milestone is 2020 – the 250th anniversary of the discovery of Australia by Captain James Cook in 1770. It is possible that a national programme will be set up by the Government similar to the Bicentenary in 1988. The plant research carried out by expedition botanist Joseph Banks provides particular relevance for the Botanic Gardens of Australia as primary commemorative venues.

5.1.8. Phased Scope of Work

The objective for the continuing establishment of the Botanic Gardens is to identify a scope of work for each phase that is:

- Endorsed by Council with the assurance of continuing support;
- Achievable within available financial and physical resources;
- Constructed to optimum standards to ensure quality of the overall development;
- Indicative of the quality and value of the overall botanic and horticultural experience to be progressively available;
- Educational, attractive and stimulating for the public;
- Encourages corporate involvement and sponsorship;
- Significant element in local and regional tourism;

5.1.9. Initial Implementation

The following is a brief summary of the elements that are recommended to comprise the initial two phases 2011/2012 & 2012/2013 of the continuing development process:

Refer to the attached cost estimate spreadsheet for specific detail:

- **Circulation** – construction of the proposed Viceroy Walkaway and Urban Forest walkway in preparation for construction of the Centre of Excellence.
- **Vegetation** – assessment and rationalisation of the existing tree plantings and establishment of selected gardens and communities for the Urban Forest and Arboretum.
- **Centre of Excellence –** preparation for the establishment and initial stage of the Centre;
- **Oasis Valley –** detail design, development and completion of the landform and waterway;
- **Sensory Garden** – detail design and development of the Sensory Garden.
- **Windsor Road Carpark** - detail design and development of the carpark and formation of the Formal Forest landform using the excavated fill;
- **Structures** – construction of shelter associated with the carpark & Events Precinct;
- **Maintenance** – assessment of the existing Arboretum specimens; removal of inappropriate trees;
- **Services / Infrastructure** – initial works for site drainage, water, power; initial phase of garden irrigation.

The following items are in integral component of the initial development process.

General Items

1. Design and install appropriate subsurface and stormwater drainage for the initial development areas;
2. Design and install appropriate reticulation of water, power and lighting for the initial areas;
3. Design and install appropriate irrigation for the initial areas;
4. Document the Windsor Road Carpark and related Formal Forest landform;
5. Document the Oasis Valley landform and waterway;
6. Document the Centre of Excellence building and associated areas;
7. Document the Sensory Garden;
8. Plan and design the pedestrian circulation and associated gardens for the various areas;

Plants & Planting

9. Prepare planting plans with digitised records; source required plant material – trees, shrubs and ground cover - for the initial planting areas;
10. Commence revegetation planting of arboretum communities;

5.2. Development Assistance

5.2.1. Government Assistance

Investigate available funding and assistance from Government sources and initiatives. It is generally difficult to access specific Government funding for the establishment and development of a Botanic Gardens but lateral interpretation of existing programmes may suggest opportunities for assistance for particular elements or components – for instance sustainability and climate change initiatives.

5.2.2. Corporate Sponsorship

The Dubbo region is one of the more popular tourism destinations of Australia. Council should be well placed to attract assistance in the Botanic Gardens development from the allied corporate sector, tourism industry or individual sponsorship.

Council should make representation to the various larger industries and development companies in the region to engender interest and hopefully enlist financial or practical assistance.

5.3. Detail Planning and Design Development

5.3.1. Project Co-ordination

In order to complete the next phases of the development process, it will be necessary to carry out a range of procedures which will determine specific parameters for detail planning, design, construction and management.

These procedures involve a range of disciplines and expertise and it will be necessary to manage the project to ensure careful control and coordination. An appropriate project manager who is aware of all the aspects of the planning, development and operational processes is a basic requirement.

5.3.2. Specific Design Development Procedures

The following schedule outlines the major items which require to be identified, researched and prepared as part of the Design Development process. The procedures are varied and involve a range of disciplines. Collectively the results of these studies will ensure that the Elizabeth Park Regional Botanic Gardens is planned, developed and managed to optimum standards.

The list is comprehensive and it will be necessary at the outset to determine an exact ongoing study process, prepare briefs and identify the costs of the various consultancies necessary. It is expected that some of these procedures will be able to be carried out by Council personnel and others by consultant. The exact scope of service and specific areas of responsibility will need to be identified progressively and resolved initially in discussion.

This schedule includes the most significant planning and design procedures, which are required to direct the progressive on-going development of the Botanic Gardens. They have been basically listed in order of priority in each section.

- **Landscape Planning**
  - overall project management and control
  - preparation of briefs for engineering and architecture elements
  - general planning and design documentation
  - earthworks documentation
  - preparation of Design Manual to guide implementation procedures
  - preparation of an Environment Management and Maintenance Manual to guide maintenance procedures
  - detail construction documentation
  - tender process and contract administration

- **Detail Site Survey**
  - site boundaries resolution
  - contours and levels of specific site areas
  - existing features location
  - services availability and suitability
  - significant vegetation location & assessment

- **Integrated Hydraulic and Environment Studies**
  - waterway hydraulics & water quality
  - relationship to overall catchment
  - flooding and flood mitigation
  - water supply and irrigation
  - stormwater management
  - environment analysis – flora and fauna

- **Detail Vegetation Assessment**
  - identification of specific bioregional plant communities
  - identification of specific plant communities from Australia and internationally
  - preservation, relocation and removal of Arboretum specimens

- finalisation of plant communities and associated species schedules

- **Roads and Traffic Study**
  - site access
  - roadwork external to site – bus bays
  - internal roadwork and carpark
  - streetscape to surrounding streets

- **Marketing**
  - set up public awareness program
  - develop a promotion and marketing programme

- **Economics**
  - develop a cost benefit analysis and economic feasibility study
  - investigate opportunities for Government, corporate, private funding and sponsorship

5.4. Management and Operation

The development of a Botanic Garden is an extensive undertaking and one, which will continue over many years. The immensity of the task should be moderated by involving physical and financial assistance from the local community, industry and commerce as well as various levels of government.

The final success of the Elizabeth Park Regional Botanic Gardens will depend largely on its management and staffing, generally coordinated by a management committee appointed by and responsible to the Council.

5.4.1. Management Generally

Ideally a Botanic Garden must be autonomous, but supported by Council so that it is possible to function to optimum levels and to be able to respond readily to the range of botanic, horticulture and environment parameters and opportunities. It is generally preferable for a Botanic Garden to function under the Council umbrella but to be responsible for its own management and budget.

The Botanic Gardens could therefore continue to be appropriately managed by the existing Dubbo City Council parks officers supported by others council or community people with specific management and operational expertise. The Friends of Shoyoen & Elizabeth Park could be expanded to fulfil this role.

A Horticultural Reference Group comprising council and community people with specific horticultural knowledge would be set up to assist in the specific tasks related to identification, sourcing, planning and establishment of the plant collection.

5.4.2. Botanic Gardens Advisory Committee

As the Gardens develop, it would be advantageous to establish an Advisory Committee under Dubbo City Council. This would strengthen the status and links between the Gardens and the academic, scientific and general community.

The Advisory Committee would have the responsibility of proposing specific development initiatives, researching available funding and assistance, organising promotion and marketing, representing the Gardens regionally, nationally and possibly internationally - generally assisting with optimum management and organisation.

Advisory Committee members should represent a related cross section of the community with specific reference to environment, botany, horticulture, academic, tourism, finance, marketing and promotion. *Refer to clause 1.4.3.1.*

An important subgroup of the Advisory Committee would be the Horticultural Reference Group. *Refer to clauses 1.4.3.2 & 1.4.3.3*

5.4.3. Botanic Gardens Curator

The appointed Curator is responsible for overall management of the Botanic Gardens. The responsibilities of this position are comprehensive including aspects of planning, development, research, interpretation and operations. The role is time consuming, particularly during the initial progressive development periods when new construction, landscape, botanical and horticultural initiatives demand full attention and understanding.

The Curator is responsible for the management, organisation and implementation of all work on a continuing basis. Apart from the day to day staff management and direction, the Curator must supervise any day labour, or contractors on site as well as organising and co-ordinating volunteer groups.

The person selected should have parks management and horticultural certification (minimum) and be able to demonstrate a real knowledge of and interest in regional vegetation. Previous experience in a Botanic Garden would

be essential. The early selection of this person is of vital importance to the successful continuing establishment of the Botanic Gardens.

To ensure that the planning concept is commenced and continued in accordance with the Master Plan, it is desirable to retain the input of the landscape architect in an 'as needs' role, assisting in the interpretation of the planning documents and in coordinating detail design elements.

5.4.4. General Staff

The horticultural management of the Gardens is very labour intensive and will remain so as the new construction and horticultural elements are progressively developed and maintained to appropriate quality standards.

It will be necessary to progressively engage permanent experienced staff to assist the Curator with Botanic Gardens management and operations as well as construction and maintenance. The quantum of staff will progressively increase with the site facilities established. It is vital to attract the most suitably qualified and experienced staff to assist the Curator.

Other construction staff, maintenance and gardening staff could be made available through the Council workforce, or by contract which would allow staff levels to be varied according to the specific and seasonal demands of the site establishment process.

5.4.5. Friends of the Botanic Gardens

Significant interest has already been exhibited by the community offering to assist in a number of ways with the development of the Botanic Gardens and Shoyoen particularly. It is important to encourage community ownership, public support, interest and involvement with the progressive development by promoting involvement in an expanded 'Friends of the Botanic Gardens' group.

It is beneficial to maximise the use of appropriate volunteers, but it is important to ensure that the work carried out is consistent with the standards associated with a Regional Botanic Gardens. It is desirable to institute training programmes, to ensure that construction, development and maintenance works are consistent with health, safety, quality standards, efficiency as well as ensuring harmonious industrial relations.

Some of the many tasks that can be carried out by 'Friends' and volunteers within the community include:

Administrative Tasks
- Marketing and promotion;
- Herbarium data base records – computer input;
- Liaison with the State Herbarium and other Botanic Gardens;
- Interpretive signage and labeling of plants;
- Acting as guides to group tours;

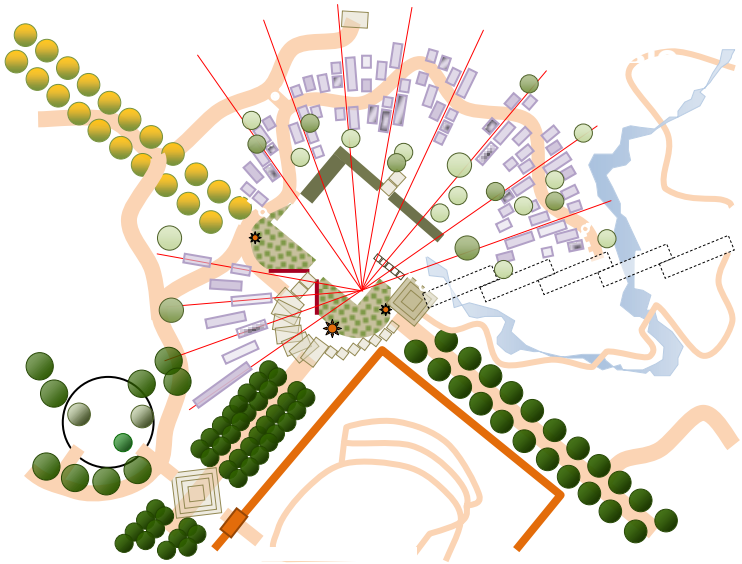
Field Work, Plant Production
- Plant and seed collecting in the region, identification;
- Plant propagation, production;
- Research – applied ornamental horticulture;

Construction and Establishment
- Site clearing, weed species removal;
- Garden establishment, cultivation, mulching;
- Planting;
- Maintenance, weeding and pruning.

5.5. Botanic Gardens Relationships

To ensure the optimum development and management of the Botanic Gardens it is important to register the proposed facility and to maintain continuing close links with the Australian National Botanic Gardens in Canberra, Royal Botanic Gardens Sydney, the Council of Heads of Australian Botanic Gardens (CHABG) and the Botanic Gardens Australia and New Zealand (BGANZ).

It is recommended that a copy of the Master Plan report be lodged with these bodies to ensure that the optimum support and recognition is available.



APPENDIX

Table of Contents

Principal Entryways

A. Elizabeth Gate
B. Royal Parade Entry
C. Macquarie Inn Gate

Principal Axis

D. Western Axis
E. Southern Lawn Axis
F. Southern Axis (extended)
G. The Zig Zag Path

Principal Elements

H. Central Hill
I. Federation Focus
J. Visitor Information Centre
K. Basalt Rockery and Pool
L. Japanese Garden
M. Applied Horticulture and Demonstration Gardens.
N. Maze, Topiary and Sculpture Gallery
O. Sensory Garden
P. Botanic Playgrounds
Q. Concentric Poplar Forest
R. Radical Avenues of Flowering Trees
S. Forest Areas
T. Regional and International Communities
U. Serpentine Lawns
V. Maintenance Facility

Elizabeth Park Regional Botanic Gardens - Dubbo

MASTER PLAN – Master Plan (1998)

LANDPLAN landscape architects ph 0411228900 2100902 February 2011 scale as shown

Figure **1.01**

Elizabeth Park Regional Botanic Gardens - Dubbo

SCHEMATIC MASTER PLAN

LANDPLAN landscape architects ph 0411228900 2100902 October 2010 scale as shown

Figure **1.02**

A. Centre of Excellence
B. Amenity Horticulture Gardens
C. Orientation Gardens
D. Shoyoen
E. Biodiversity Garden
F. Sensory Garden
G. Oasis Valley
H. Events Precinct
I. Botanic Play

J. Memorial Gate
K. Gingko Gate
L. Viceroy Gate
M. Royal Gate
N. Oasis Gate
O. Maintenance Gate
P. Carpark
Q. Bus Bay

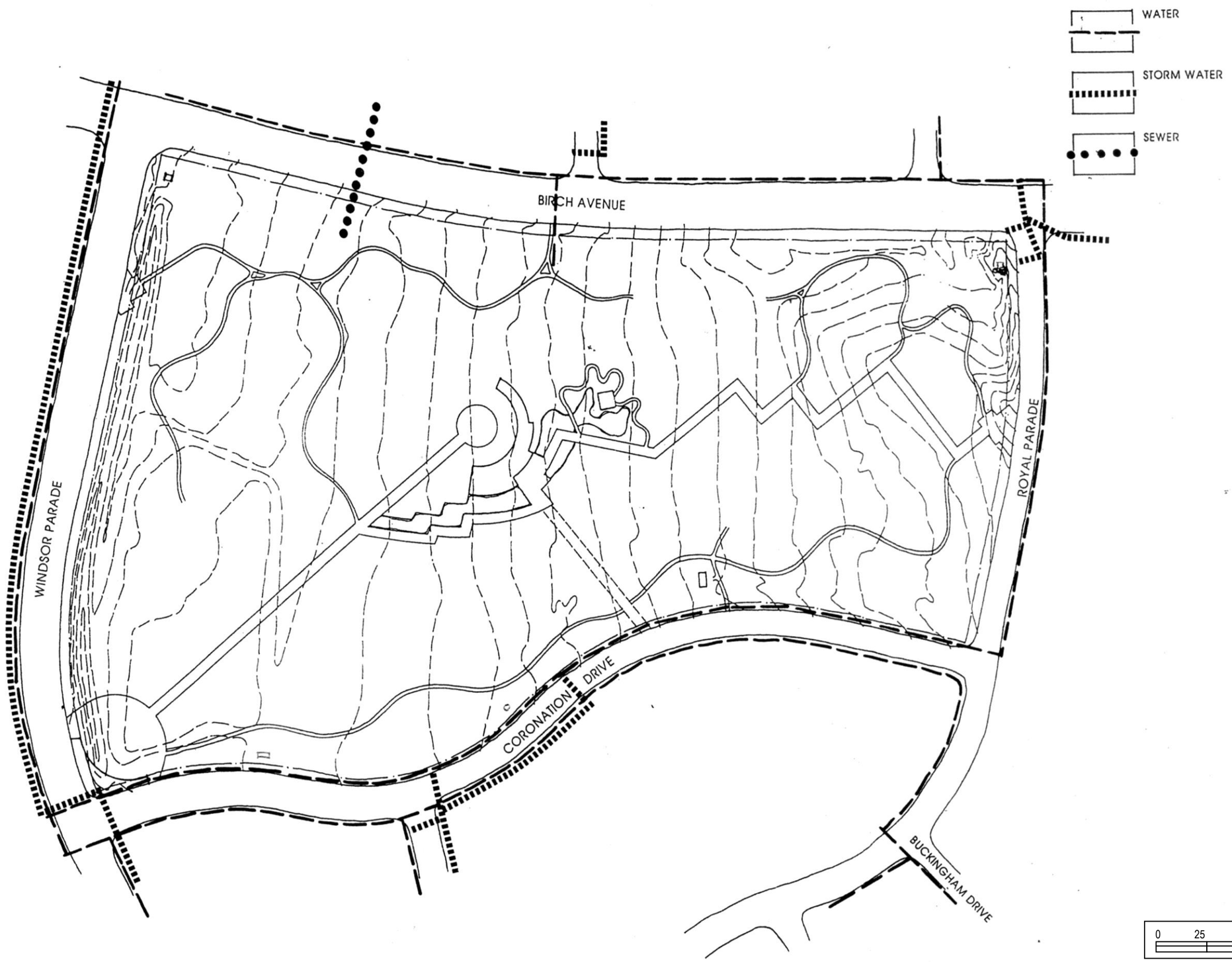
a. Memorial Avenue
b. Gingko Avenue
c. Arboretum Walkway
d. Oasis Avenue
e. Formal Forest
f. Urban Forest
g. Gymnosperm Forest
h. Myrtaceae Forest
i. Flowering Trees

Elizabeth Park Regional Botanic Gardens - Dubbo

MASTER PLAN (2011)

LANDPLAN landscape architects ph 0411228900 2100902 February 2011 scale as shown

Figure **1.03**



Drawing extracted from the 1998 Master Plan report

Elizabeth Park Regional Botanic Gardens - Dubbo

MASTER PLAN – Existing Services

LANDPLAN landscape architects ph 0411228900 2100902 February 2011 scale as shown

Figure **2.01**

0 25 50 75 100m

Elizabeth Park Regional Botanic Gardens - Dubbo

MASTER PLAN – Topography

LANDPLAN landscape architects ph 0411228900 2100902 February 2011 scale as shown

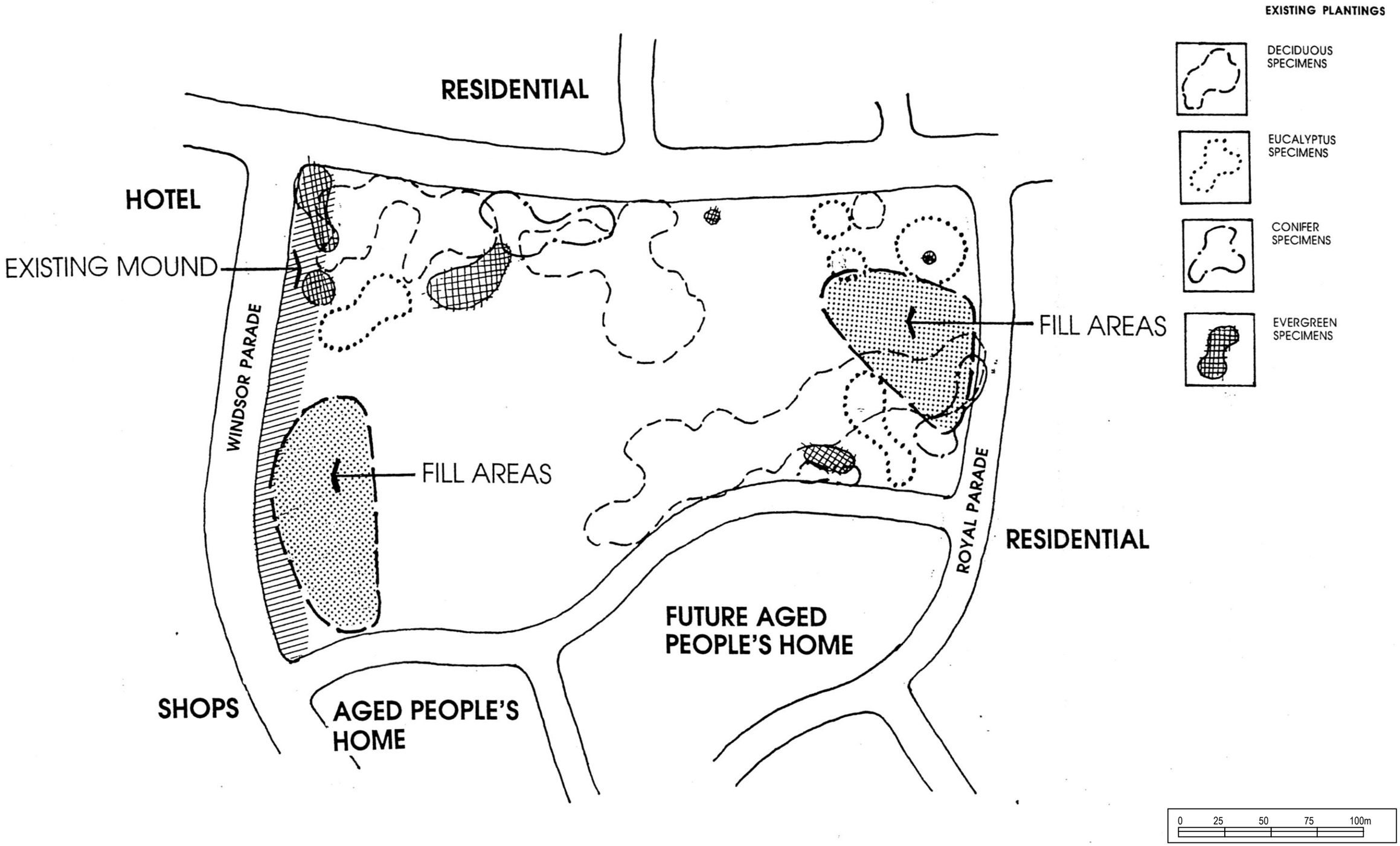
Figure **2.02**

Elizabeth Park Regional Botanic Gardens - Dubbo

MASTER PLAN – Topography & Vegetation

LANDPLAN landscape architects ph 0411228900 2100902 October 2010 scale as shown

Figure **2.03**



Drawing extracted from the 1998 Master Plan report

Elizabeth Park Regional Botanic Gardens - Dubbo

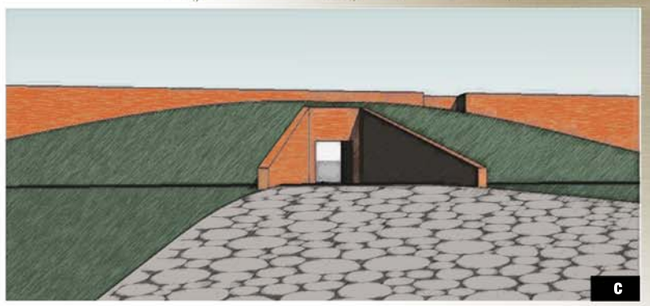
MASTER PLAN – Geology & Landform

LANDPLAN landscape architects ph 0411228900 2100902 February 2011 scale as shown

Figure **2.04**

a. view from South West

b. view from outdoor cafe towards the garden



c view to the entrance

d view from video room entrance to outdoor cafe

e view from South West

13 DECK BETWEEN BUILDINGS

14 RAMMED EARTH WALL AND POND

01 ENTRY: RAMP DOWN TO ENTRANCE UNDERGROUND

01 ENTRY
02 LOUNGE & TEA ROOM
03 KITCHEN
04 SOUVENIR SHOP/ COMPUTER ROOM/ INTERNET CAFE
05 STORE
06 MEETING, TRAINING/ FUNCTION ROOM
07 VIDEO ROOM
08 LIBRARY
09 MALE TOILET
10 DISABLED TOILET
11 FEMALE TOILET
12 OUTDOOR CAFE
13 DECK
14 BRIDGE
15 GARDEN
16 POND

OPTION 3

ENCLOSED AREA: 373 SQM
DECKING AREA: 240 SQM

GEOLYSE
ARCHITECTURE

0 2 4 6 8 10 12 14 16 18 20 m

Memorial Avenue
- Existing avenue species to be subject to arborist's treatment
- Avenue focuses on the Centre of Excellence
- Maintenance, delivery & VIP vehicles allowed to traverse
- Private vehicles prohibited

Shoyoen Forecourt
- Axis links Shoyoen Gate and Botanic Play
- Forecourt paving design to geometrically focus in both directions

Orientation Walk and Garden
- Links carpark with Events, Botanic Play and Centre of Excellence
- Traverses special gardens to introduce the best of the collection
- Main access way is from Memorial Avenue
- Three focal point elements located at end of each axial vista
- Specialised 'green technology' to mounded landform over COEAH

Viceroy Walkway
- Access linking Viceroy Avenue toward shopping centre
- Traverses Urban Forest, Sculpture Walkway & Memorial Gate

Centre of Excellence for Amenity Horticulture (CEOAH)
- Principal element of the Botanic Gardens and focus of three axes
- Geometrical layout to demonstration gardens is fundamental
- Centre is located asymmetrically in response to site constraints
- Mounded landform over southwest elevations

Amenity Horticulture Gardens
- Security fence surround with four gates
- Primary circulation route meanders through gardens
- Radial set out for gardens to facilitate research & demonstration
- Optimum sun exposure to north and Birch Avenue
- Shade trees only on south side of demonstration gardens
- Native collection (east side) related to Biodiversity Gardens
- Exotic collection on opposite side (west side)

Oasis Valley & Waterway
- Specialised landform & microclimate for "green oasis landscape'
- Waterway links Biodiversity Garden to Centre of Excellence
- Vine arbour defines extent of adjoining gardens
- Close physical & visual association with Centre of Excellence

Biodiversity Garden
- Existing garden of selected bioregional species and communities
- Longer visual association with Centre of Excellence

Urban Forest
- Ginkgo Avenue divides the forest
- Existing species to be assessed by arborist and augmented
- Develop logical groups with species & family affinity

Elizabeth Park Regional Botanic Gardens - Dubbo

MASTER PLAN – Centre of Excellence for Amenity Horticulture

LANDPLAN landscape architects ph 0411228900 2100902 February 2011 scale as shown

Figure **3.02**

Memorial Avenue
- Existing avenue species to be subject to arborist's treatment
- Avenue focuses on the Centre of Excellence
- Maintenance vehicles allowed to traverse
- Private vehicles prohibited

Shoyoen
- Memorial Avenue forecourt for access to the Shoyoen Gate
- Enclosing traditional wall to be constructed
- Maintenance yard expanded, access from Coronation Drive

Centre of Excellence for Amenity Horticulture
- Principal element of the BG and focus of three axes
- Geometrical layout in Gardens fundamental

Biodiversity Garden
- Existing garden of selected bioregional species and communities
- Close physical & visual association with Oasis Valley
- Waterway commences in hillside and extends through to Oasis Valley
- The Arboretum Walkway zig zags past the site to Royal Parade

Oasis Valley
- Specialised landform & microclimate for "green oasis landscape'
- Excavate slope to create depressed landform with mounding
- Establish a range of geological types – granite, basalt, sandstone
- Collection of suitable 'dry rainforest' and allied species
- Preserve and integrate existing Pistachio grove to south side
- Vine arbour defines extent of Oasis Valley to north
- A meandering pathway & bridges traverses the various areas of the valley
- Myrtaceae Walkway links the Oasis Valley through the Arboretum

Oasis Waterway
- Excavate slope to create depressed landform with mounding
- Landform designed to collect surface water from Arboretum zone
- Waterway flows from Biodiversity Garden to Centre of Excellence
- Source a spring and wetland in the Biodiversity Garden
- Eastern stream falls over series of rocky weirs to linear lagoon
- Southern stream is a still lagoon with biological filtering

Arboretum
- Existing species to be assessed and augmented
- Develop logical groups with species & family affinity
- Principal zones, Gymnosperm and Myrtaceae

Oasis Avenue & Gate
- Links Coronation Drive with Events Centre of Excellence

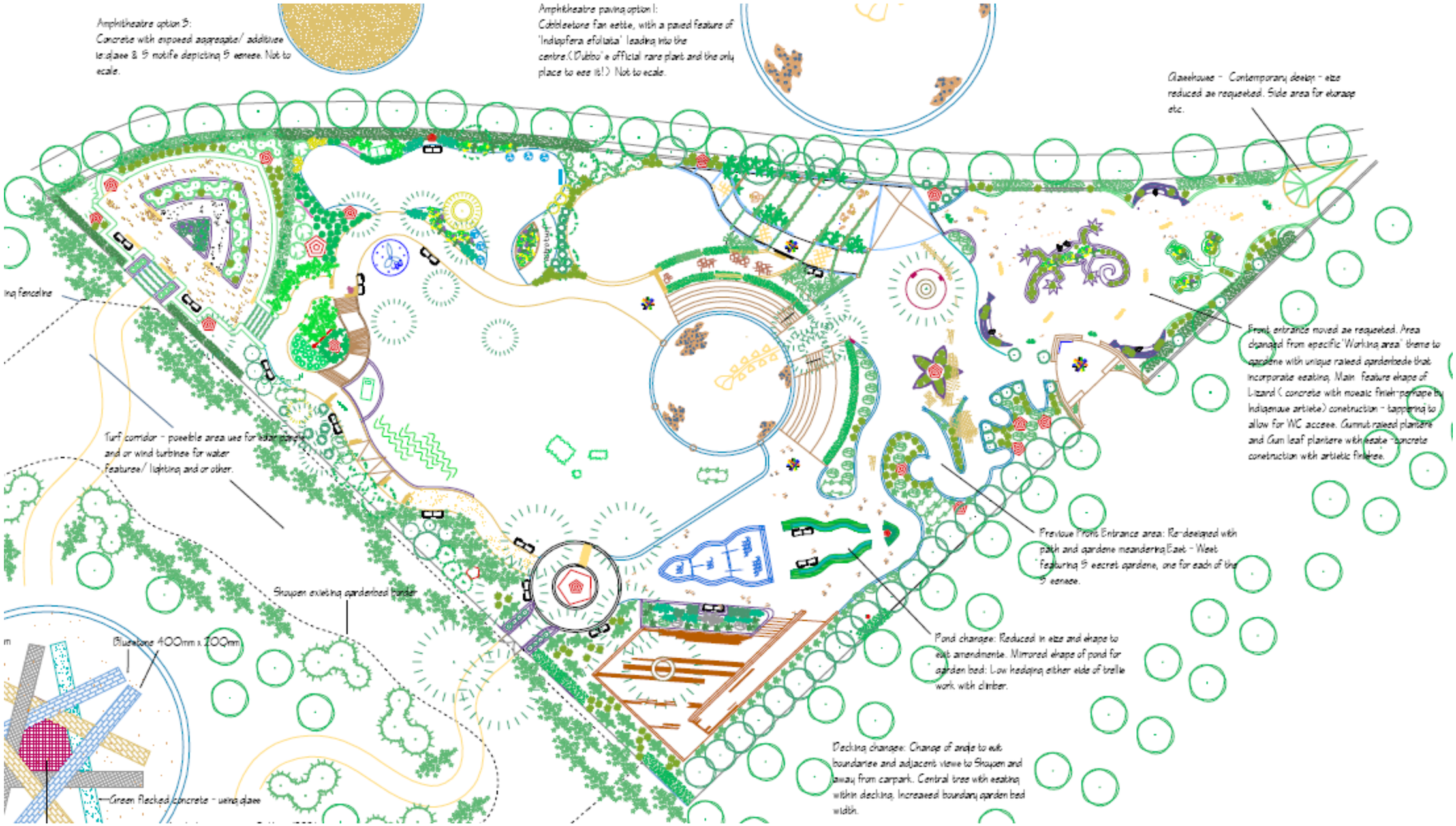
Flowering Deciduous Trees
- Coronation Walkway links Oasis Walkway with Memorial Gate
- Selected deciduous tree groups with optimum flowering display

Elizabeth Park Regional Botanic Gardens - Dubbo

MASTER PLAN – Oasis Valley & Waterway

LANDPLAN landscape architects ph 0411228900 2100902 February 2011 scale as shown

Figure **3.03**



DESIGN UNDER REVISION

Drawing prepared by Gardenfunktion – June 2007

Elizabeth Park Regional Botanic Gardens - Dubbo

MASTER PLAN – Sensory Garden – Concept Plan

LANDPLAN landscape architects ph 0411228900 2100902 February 2011 scale as shown

Figure **3.04**

Memorial Gate Forecourt
- Defines main Botanic Gardens arrival location
- Paved forecourt linking Windsor Parade and Coronation Drive
- Specific paving layout to focus on central axis of Memorial Avenue
- Signage walls integrated – map, information
- Focal point fountain or sculpture
- Pergola on western end of forecourt - Windsor Parade
- Shaded by one large regional shade tree
- Associated display gardens

Memorial Avenue
- Existing avenue species to be subject to arborist's treatment
- Avenue focuses on the Centre of Excellence
- Maintenance vehicles allowed to traverse
- Private vehicles prohibited

Sensory Garden
- Specialised design to stimulate human senses
- Coronation Walkway links to Oasis Avenue and Arboretum

Shoyoen Forecourt
- Axis links the Shoyoen Gate and Botanic Play
- Forecourt design to geometrically focus in both directions

Carpark
- 78 car spaces accessed off Windsor Parade
- Depress carpark into landform at street level
- Shade trees to demonstrate appropriate species

Formal Forest
- Fill material from carpark to created undulating landform
- Mowable grassed areas under forest
- Trees grouped to research and demonstrate selected street trees
- Radial tree layout generated by forecourt paving pattern

Sculpture Walk
- Links carpark with Events, Botanic Play and Centre of Excellence
- Sculptures lining the pathway and nearby gardens

Events Circle
- Circle of one tree species to define area – deciduous for winter sun
- 50m diameter circle for multiple use – various events
- 30m inner grass circle for performance, includes stage & roof
- Perimeter for market stalls or other uses – decomposed granite surface
- Equipment access from carpark

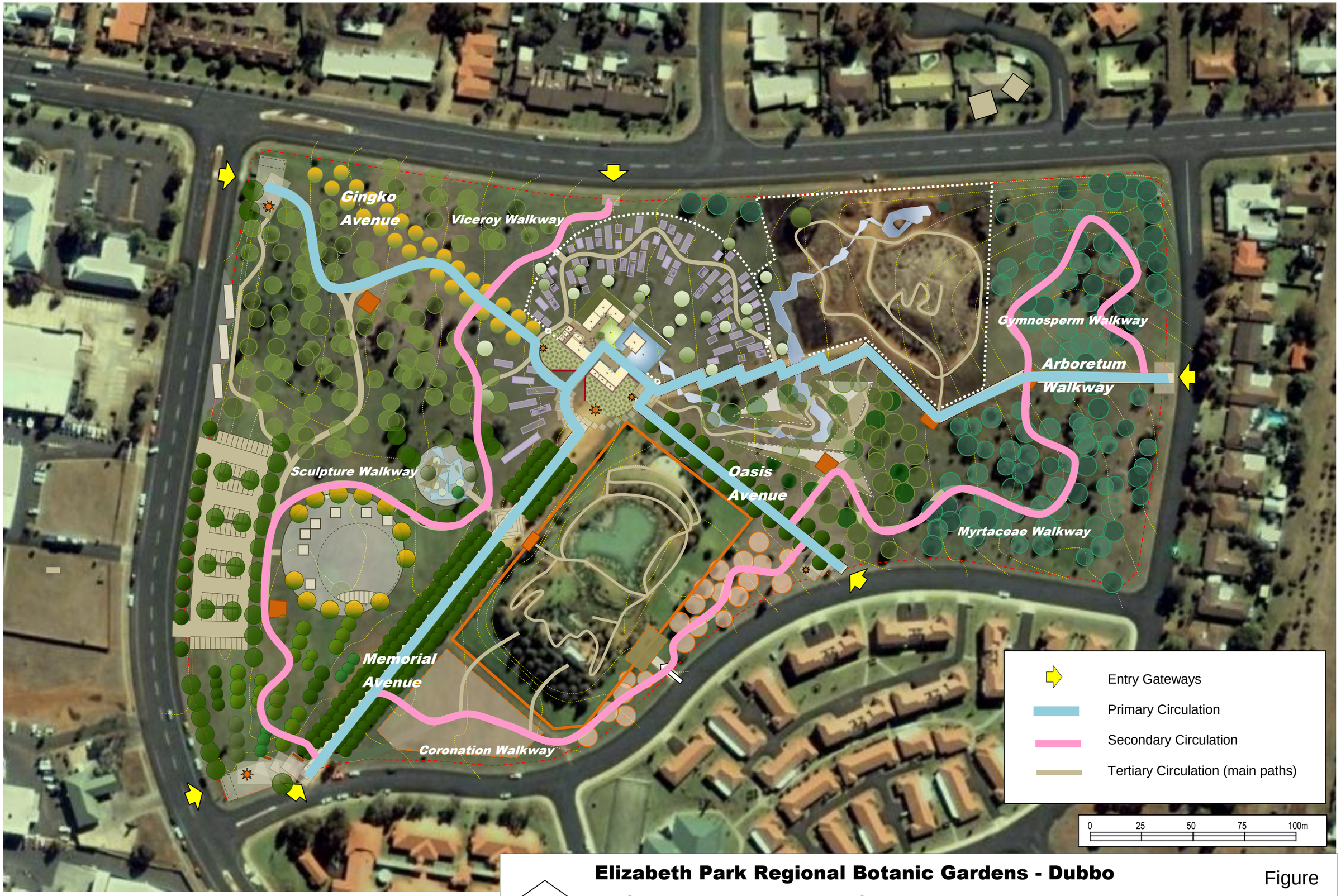
Botanic Play
- Specialised play facility with strong botanic theme
- Close visual association with Centre of Excellence

Elizabeth Park Regional Botanic Gardens - Dubbo

MASTER PLAN – Memorial Avenue, Events Precinct & Carpark

LANDPLAN landscape architects ph 0411228900 2100902 February 2011 scale as shown

Figure **3.05**



Elizabeth Park Regional Botanic Gardens - Dubbo

MASTER PLAN – Pedestrian Circulation

LANDPLAN landscape architects ph 0411228900 2100902 February 2010 scale as shown

Figure **3.06**

Elizabeth Park Regional Botanic Gardens - Dubbo

MASTER PLAN – Vehicle Circulation

LANDPLAN landscape architects ph 0411228900 2100902 February 2011 scale as shown

Figure **3.07**

Elizabeth Park Regional Botanic Gardens - Dubbo

MASTER PLAN – Visual Context

LANDPLAN landscape architects ph 0411228900 2100902 February 2011 scale as shown

Figure **3.08**

EXISTING SPECIES SCHEDULE

ref	Genus / Species	Common Name
□	**DECIDUOUS SPECIES**	
1	Carya illinoiensis	Pecan
2	Crataegus laevigata	Hawthorn
3	Fraxinus raywoodii	Ash
4	Liquidamber styraciflua	Liquadamber
5	Pistacia chinensis	Pistachio Nut Tree
6	Populus species	Poplar
7	Quercus ilex	Holm Oak
8	Quercus palustris	Pin Oak
9	Sapium sebiferum	Chinese Tallow Tree
10	Ulmus chinensis	Elm
11	Ulmus procera	English Elm
⬡	**EVERGREEN - EUCALYPTUS SPECIES**	
12	Eucalyptus melliodora	Yellow Box
13	Eucalyptus robusta	Swamp Mahogany
14	Eucalyptus species (gum)	
15	Eucalyptus species (WA)	
○	**EVERGREEN - OTHER SPECIES**	
16	Angophora floribunda	Rough-barked Apple
17	Brachychiton populneus	Kurrajong
18	Casuarina cunninghamiana	Fire Oak; River Oak; She Oak
19	Grevillea "Ivanhoe"	
20	Olea europea	European Olive
△	**CONIFER SPECIES**	
21	Cedrus deodara	Deodar Cedar
22	Cupressus species	Cypress
23	Pinus pinea	Italian Stone Pine

SPECIES TO BE REMOVED AND TRANSPLANTED
SPECIES TO BE REMOVED AND TRANSPLANTED
SPECIES TO BE REMOVED AND TRANSPLANTED
SPECIES TO BE REMOVED AND TRANSPLANTED

0 25 50 75 100m

Drawing extracted from the 1998 Master Plan report

Elizabeth Park Regional Botanic Gardens - Dubbo

MASTER PLAN – Existing Vegetation (1998)

LANDPLAN landscape architects ph 0411228900 2100902 February 2011 scale as shown

Figure **4.01**

FOREST PLANTING

1 **Casuarina**

2 **Brachychiton**

3 **Eucalyptus**
- a smooth barks
- b rough barks
- c rough barks
- d West Australian

4 **Myrtaceae**
Angophora, Lophostemon, Tristaniopsis

5 **Oleaceae** (Fraxinus, Olea)
- a deciduous,
- b evergreen

6 **Pistacia**

7 **Quercus** (Oaks)
- a Eurasia
- b America

8 **Rosaceae**
- a Hawthorne
- b other genus

9 **Ulmaceae** (Elms)
- a cultivars
- b Eurasian
- c North American

10 **Conifers**
- a Cupressus, Pinus
- b Callitris, Cupressus
- c Araucaria, Cedar, Pinus, Podocarpus
- d Cupressus, Juniperus

11 **Economically Useful**
- a Chestnut, Ginko
- b Pecan, Pistachio, Walnut
- c Pomes (Apples, Pears, Quince,)
- d Persimmon
- e Tamarind, Carob, Citrus, Olives, Fig, Bay Laurel, Owenia, Harpephyllum

12 **Laurels**

13 **Legumes**

14 **Maples and Sweet Gums**

15 **Myrtles**

16 **Palms**
- a Butia Grove
- b Phoenix Grove
- c Washingtonia Grove

17 **Regional Communities**
- a Local Ecosystems
  riverine woodland,
  Ironbark woodland,
  Black Cypress woodland,
  box woodland,
  mallee woodland,
  montane woodland,
  wetlands,
- b Australian tablelands and plains
- c Associated world regions

THEME PLANTING

A Black Cypress Pine Grove

B Concentric Poplar Forest

C Radial Avenues

D Demonstration Gardens
- Ethno-botanic collection - aboriginal and settler
- Conservation issues
- Amenity and ornamental horticulture
- Gardening in specific local environments

E Grassland Appreciation

F Sensory Gardens
- 1 Sound
- 2 Touch
- 3 Taste
- 4 Aroma
- 5 Colour

G Japanese Garden
Sister City Minakomo

H Formal Topiary and Maze Garden

I Vine Arbours

0 25 50 75 100m

Drawing extracted from the 1998 Master Plan report

Elizabeth Park Regional Botanic Gardens - Dubbo

MASTER PLAN – Original Plant Collection

LANDPLAN landscape architects ph 0411228900 2100902 February 2011 scale as shown

Figure **4.02**

NORTH SECTOR
- **20.** Specimen Trees
- **21.** Urban Forest
- **22.** Exotic Gardens
- **23.** Native Gardens
- **24.** Footpath buffer
- **25.** Biodiversity Garden
- **26.** Gymnosperm
- **27.** Myrtaceae
- **28.** Screens & hedges
- **29.** Vine Arbour

EAST SECTOR
- **15.** Oasis Valley
- **16.** Oasis Avenue
- **17.** Gymnosperm
- **18.** Myrtaceae
- **19.** Footpath buffer

SOUTH SECTOR
- **9.** Shoyoen Garden
- **10.** Shoyoen Forecourt
- **11.** Flowering Trees
- **12.** Sensory Garden
- **13.** Memorial Avenue
- **14.** Footpath buffer

WEST SECTOR
- **1.** Formal Forest
- **2.** Carpark Trees
- **3.** Events Precinct
- **4.** Botanic Play
- **5.** Orientation Garden
- **6.** Urban Forest
- **7.** Gingko Avenue
- **8.** Footpath buffer

Elizabeth Park Regional Botanic Gardens - Dubbo

MASTER PLAN – Site Sectors & Precincts

LANDPLAN landscape architects ph 0411228900 2100902 February 2011 scale as shown

Figure **4.03**

ELIZABETH PARK REGIONAL BOTANIC GARDENS, Dubbo - Master Plan 2011

PRELIMINARY COST ESTIMATE

	ITEM			linm	QTY	UNIT	RATE	VALUE	SUB.TOTAL		PHASE one	PHASE two	PHASE three	PHASE four	PHASE five	PHASE six	PHASE seven	PHASE eight	PHASE nine	PHASE ten
											11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
											531,000	1,942,000	2,330,500	1,246,500	1,023,000	778,000	437,500	365,000	259,000	126,000
	CIRCULATION								**$ 1,706,000**											
		PRIMARY CIRCULATION																		
	1		Memorial Avenue	230	690	sqm	200	$ 138,000					60,000	78,000						
	2		Gingko Avenue	200	600	sqm	200	$ 120,000						60,000	60,000					
	3		Arboretum Walkway	175	525	sqm	200	$ 105,000							55,000	50,000				
	4		Vine Arbour	125	375	sqm	200	$ 75,000								75,000				
	5		Oasis Avenue	130	390	sqm	200	$ 78,000								78,000				
		SECONDARY CIRCUALTION																		
	6		Coronation Walkway	275	688	sqm	200	$ 137,500									137,500			
	7		Myrtaceae Walkway	250	625	sqm	200	$ 125,000										125,000		
	8		Gymnosperm Walkway	200	500	sqm	200	$ 100,000											100,000	
	9		Sculpture Walkway	250	625	sqm	200	$ 125,000						125,000						
	10		Orientation Walkway	100	250	sqm	200	$ 50,000						50,000						
	11		Viceroy Walkway	100	250	sqm	200	$ 50,000			50,000									
	12		Urban Forest Walkway	100	250	sqm	200	$ 50,000			50,000									
		TERTIARY CIRCULATION																		
	13		Bus Bay pathway	150	330	sqm	200	$ 66,000							66,000					
	14		Amenity Horticulture Pathway	250	550	sqm	200	$ 110,000						110,000						
	15		Oasis Valley Pathway & bridges	180	360	sqm	400	$ 144,000					144,000							
	16		Shoeyoen pathways (existing)		0	sqm	200	$ -												
	17		Biodiversity Garden pathways (existing)		0	sqm	200	$ -												
		GATEWAYS																		
	18		Memorail Gate		600	sqm	100	$ 60,000					60,000							
	19		Ginkgo Gate		300	sqm	100	$ 30,000						30,000						
	20		Viceroy Gate		100	sqm	100	$ 10,000			10,000									
	21		Royal Gate		100	sqm	100	$ 10,000								10,000				
	22		Oasis Gate		300	sqm	100	$ 30,000								30,000				
	23		Shoyoen Forecourt		225	sqm	100	$ 22,500						22,500						
	24		Vine Arbour Forecourt		100	sqm	100	$ 10,000					10,000							
	25		Orientation Forecourt		600	sqm	100	$ 60,000						60,000						
	CONSTRUCTION								**$ 6,675,000**											
		GENERAL CONSTRUCTION																		
	26		Centre of Excellence - building & surrounds		1	item	3,000,000	$ 3,000,000				1,500,000	1,500,000							
	27		Amenity Horticulture Garden		1	item	100,000	$ 100,000						100,000						
	28		Vine Arbours x 5		5	item	60,000	$ 300,000							300,000					
	29		Oasis Valley landform & rocks		1	item	250,000	$ 250,000			250,000									
	30		Oasis Valley Waterway		1	item	150,000	$ 150,000				150,000								
	31		Sensory Garden		1	item	200,000	$ 200,000					200,000							
	32		Events Precinct, services & facilities		1	item	150,000	$ 150,000							150,000					
	33		Events Stage		1	item	80,000	$ 80,000							80,000					
	34		Botanic Play Garden		1	item	300,000	$ 300,000								300,000				
	35		Shelters x 6		6	item	50,000	$ 300,000			50,000			50,000	50,000	50,000	50,000	50,000		
	36		Sculptures allowance		1	item	100,000	$ 100,000								20,000	20,000	20,000	20,000	20,000
	37		Windsor Road Carpark		1	item	400,000	$ 400,000				200,000	200,000							
	38		Formal Forest - landform		1	item	50,000	$ 50,000			50,000									
	39		Windsor Road Bus Bay		1	item	300,000	$ 300,000						300,000						
	40		Fencing - Amenity Horticulture Garden		250	linm	400	$ 100,000						100,000						
	41		Fencing - site perimeter		1,200	linm	300	$ 360,000									120,000	100,000	80,000	60,000
		ASSOCIATED LANDSCAPE & GARDENS CONSTRUCTION																		
	42		Memorial Avenue		1,000	sqm	50	$ 50,000					25,000	25,000						
	43		Formal Forest		400	sqm	50	$ 20,000				20,000								

ELIZABETH PARK REGIONAL BOTANIC GARDENS, Dubbo - Master Plan 2011

PRELIMINARY COST ESTIMATE

ITEM		linm	QTY	UNIT	RATE	VALUE	SUB.TOTAL	PHASE one	PHASE two	PHASE three	PHASE four	PHASE five	PHASE six	PHASE seven	PHASE eight	PHASE nine	PHASE ten
								11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
								531,000	1,942,000	2,330,500	1,246,500	1,023,000	778,000	437,500	365,000	259,000	126,000
44	Events Precinct		200	sqm	50	$ 10,000						10,000					
45	Windsor Road Carpark		500	sqm	50	$ 25,000				25,000							
46	Botanic Play		200	sqm	50	$ 10,000							10,000				
47	Urban Forest Walkway		500	sqm	50	$ 25,000		25,000									
48	Gingko Avenue		300	sqm	50	$ 15,000						15,000					
49	Windsor Road Bus Bay		300	sqm	50	$ 15,000						15,000					
50	Orientation Garden		400	sqm	50	$ 20,000					20,000						
51	Amenity Horticulture Gardens		2,000	sqm	50	$ 100,000						100,000					
52	Biodiversity Garden (expansion)		100	sqm	50	$ 5,000				5,000							
53	Arboretum		500	sqm	50	$ 25,000							5,000	5,000	5,000	5,000	5,000
54	Screens & Hedges		300	sqm	50	$ 15,000						5,000	5,000	5,000			
55	Oasis Valley Forest		3,000	sqm	50	$ 150,000					30,000	40,000	50,000	30,000			
56	Oasis Avenue		400	sqm	50	$ 20,000							20,000				
57	Flowering Deciduous Trees		300	sqm	50	$ 15,000								7,000	8,000		
58	Sensory Garden		300	sqm	50	$ 15,000				15,000							
SERVICES							**$ 400,000**										
59	Subsurface and SW drainage		1	allow	100,000	$ 100,000		10,000	15,000	20,000	10,000	10,000	10,000	10,000	5,000	5,000	5,000
60	Sewerage extension		1	allow	50,000	$ 50,000		5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
61	Power and lighting		1	allow	50,000	$ 50,000		5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
62	Irrigation		1	allow	200,000	$ 200,000		10,000	10,000	20,000	30,000	30,000	30,000	20,000	20,000	20,000	10,000
VEGETATION							**$ 257,500**										
63	Turfing allowance		2,000	sqm	20	$ 40,000		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
64	Massed planting - shrubs / groundcovers		9,000	sqm	15	$ 135,000		9,000	9,000	12,000	15,000	20,000	18,000	16,000	15,000	12,000	9,000
65	Massed planting - trees		1	allow	30,000	$ 30,000		3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
66	Specimen tree planting																
67	Amenity Horticulture		20	no	700	$ 14,000					14,000						
68	Gingko Avenue		30	no	700	$ 21,000			21,000								
69	Oasis Avenue		25	no	700	$ 17,500				17,500							
SUBTOTAL							**$ 9,038,500**	531,000	1,942,000	2,330,500	1,246,500	1,023,000	778,000	437,500	365,000	259,000	126,000
OTHER ASSOCIATED COSTS							**$ 1,717,315**										
70	Project Management and Operations	*percentage of overall costs*			7%	$ 632,695		37,170	135,940	163,135	87,255	71,610	54,460	30,625	25,550	18,130	8,820
71	General contingency	*percentage of overall costs*			3%	$ 271,155		15,930	58,260	69,915	37,395	30,690	23,340	13,125	10,950	7,770	3,780
72	Consultancy fees	*percentage of overall costs*			9%	$ 813,465		47,790	174,780	209,745	112,185	92,070	70,020	39,375	32,850	23,310	11,340
TOTAL							**$ 10,755,815**	631,890	2,310,980	2,773,295	1,483,335	1,217,370	925,820	520,625	434,350	308,210	149,940

Notes:

1. Costs have been estimated at 2010 prices without adjustment for CPI to later phases

2. Costs have been estimated exclusive of GST

5. Voluntary and educational institutional input through work experience schemes could lead to considerable savings in plant supply, propagation, and planting cost

6. The costings are allocated to an indicative phased 10 year programme. The actual programme will be dependant upon available funding and may extend over a considerably greater time span.

7. Consultancy fees include costs of architecture, landscape architecture, and engineering - design and supervision services for consultants and Council staff