Investigation into the Regional Planning Context and Future Land Use Options for the Gnangara Mound

Stage 1 Report

Department for Planning and Infrastructure

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1. Overview

1.1 Introduction

A large proportion of Perth’s population and urban development is situated over the groundwater resources of the Gnangara mound. Most of the urbanisation over the mound is restricted to the coastal areas as shown in the North-West Corridor Structure Plan and in the south-east as shown in the North-East Corridor Structure Plan. The Gnangara Mound contains substantial supplies of water which are required to meet current and future public water demands. It is also a vital ecological resource contributing to biodiversity, providing for limited recreational uses and supporting many natural features such as wetlands, wildlife populations and ecological processes.

Urban development is rapidly occurring on existing urban zoned land in the East Wanneroo area and there are increasing land use conflicts and pressure for further change. Community uncertainty, climate change, declining water levels over the mound, impacts on the groundwater dependent ecosystems, declining public and private water supply and changing agricultural economies are all causes of concern for future land uses and water resource management. Future development of the city will be dependent on the availability of adequate potable groundwater supplies while the long-term protection of the Gnangara mound water resource from contamination is a high priority for the Government.

1.2 The Gnangara Sustainability Strategy (GSS)

The Government of Western Australia has committed to developing Statutory Water Plans for over-allocated systems to meet their obligations under the National Water Initiative (NWI). The most urgent of these is the Gnangara System where water supply, land use and environmental issues have reached a critical point.

The Gnangara Sustainability Strategy is a multi-agency approach to management of water and land issues on the Gnangara Mound. The State Government has committed $7.5 million to develop the GSS which will recommend options to ensure the sustainable use of water for drinking and commercial purposes and to protect the environment. This consultative approach will ensure that land, water and biodiversity issues on the Gnangara Mound will be addressed through a transparent and cooperative framework.

In 2009, a number of proposed land use options will be presented to the community in a draft strategy. These include: alternative land uses once pine forests have been cleared; establishment of a horticulture precinct using treated wastewater; recycling wastewater for other uses; changing vegetation management to increase recharge and maintain biodiversity values; revising groundwater allocation to public and private water supplies; or a combination of these and other options.

As part of the Gnangara Sustainability Strategy, the Department for Planning and Infrastructure has undertaken a Regional Planning Context and Future Land Uses Project. The project aims to identify possible land-use change on the Gnangara Mound in the medium- to long-term as an option only if there is:

- A proven net environmental, social and economic benefit; and/or
- A significant change in the current government policy, statutory regime and government position on the role of the Gnangara Mound as a water future water source for Perth to justify a change in the defined boundaries of the Underground Water Pollution Classification Control Area (UWPCA) and Priority 1, 2 and 3 source protection area boundaries.

These boundaries were included in the Metropolitan Regional Scheme (MRS) in 2004 (MRS Amendment 1076/33) to protect the UWPCA public drinking water source from possible contamination from inappropriate land-uses. They were ratified recently.
There is a wide range of state and local government planning and environmental policies that regulate land-use and development over the Gnangara Mound. Future options depend on a full understanding and review of all the strategic and statutory policies that govern land-use planning on the mound.

The outcomes of the other GSS projects into the hydrogeological and biodiversity resources and values of the mound will also provide essential information on the feasibility of alternative land-uses.

The primary objectives of the project are to:

− Review current state and local government policies and strategic land-use and infrastructure planning over the Gnangara study area;
− Provide an overview of the Gnangara System study area in the context of land-use planning policies, environment and water planning policies and frameworks;
− Consider strategic planning and policy issues in relation to future potential land-use change and, taking into account the outcomes of other GSS projects, review possible alternative land-uses for identified areas of State Forest 65 and relevant surrounding areas after removal of pine plantations;
− Investigate how land-use change can be used to improve recharge into the mound and what land-uses may have net beneficial effects;
− Understand the processes affecting acidification of shallow groundwater and connected lakes (potential and actual occurrences are apparent in the superficial aquifer) and develop an objective methodology to distinguish between ‘natural’ acidity and that caused by human activity or climate change;
− If necessary, carry out more detailed site analysis and concept planning (conceptual spatial structure planning) of specific areas identified for possible future alternative land uses;
− An intensive and targeted investigation of hydrogeological and geochemical processes within a prescribed land-use area will be conducted;

1.3 Objectives of this Report

It is the intent of this report to examine the potential future land use opportunities of land on and around the Gnangara Mound within the study area (Figure 1) and to investigate the regional planning context of these opportunities.

This report also considers - at a broad strategic level - the planned and probable development of the metropolitan area and north-west and north-east corridors over time and relates that to urban land demand and the potential to develop the Gnangara Mound.

Overall demand for urban land to meet growth requirements is documented as part of this context analysis. A time component for the ultimate development scenario of these corridors has also been produced to broadly represent take up and direction of growth in the current zoned areas. It is evident from existing research that there is a large supply of land currently zoned for residential purposes in these corridors.

While this report investigates opportunities and constraints in terms of land use in the study area, it is important to note that there is no presumption by the Department of Planning and Infrastructure that the land will necessarily be developed.
Figure 1 Map Showing the Gnangara Sustainability Strategy Study Area
2. Literature Review

Section 2.1 below provides a summary of the literature reviewed. Individual document reviews then follow.

2.1 Summary of Literature Review

Key Points

- The Gnangara Mound is the largest and most important shallow underground water resource in the Perth Region and Statewide (Kalgoorlie);
- A projected increase in population, increasing demand for water, and decreasing water recharge are causes of concern for future land uses and water resource management;
- Pine harvesting and removal is facilitated by but also constrained by a State Agreement (Wood Processing (Wesbeam) Agreement Act 2002) which commits the State Government to provide wood to the Laminated Veneer Lumber Plant in the period to 2090; and
- Development however can affect the drainage, can impact wetlands, and can lead to groundwater contamination therefore effective policies and planning need to be put in place.

A large proportion of Perth’s population and urban development is situated over the groundwater resources of the Gnangara mound (SPP No. 2.2 Gnangara Groundwater Protection) whereby most existing urbanisation over mound is restricted to the coastal areas as shown in the North-West Corridor Structure Plan and in the south-east of the mound as shown in the North-East Corridor Structure Plan. The Gnangara mound extends over an area of approximately 2,200km² from Gingin Brook to the north, the Gingin Scarp to the east, the coastline to the west and the Swan River to the South; and is the largest and most important shallow underground water resource in the Perth region (WAPC, 2001). It contains substantial supplies of water which are required to meet current and future public water demands (WAPC, 2001), is a vital ecological resource contributing to biodiversity, providing for limited recreational uses and supporting many natural features such as wetlands, wildlife populations and ecological processes (WAPC, 2005a).

Urban development is rapidly occurring on existing urban zoned land in the east Wanneroo area and there is increasing land use conflict and pressure for further change. Community uncertainty, climate change, declining water levels over the mound impacting on the groundwater dependent ecosystems, declining public and private water supply; and changing agricultural economies are all causes of concern for future land uses and water resource management (WAPC, 2007). Declines in groundwater levels are considered to be a response to variations in the climate regime, upon which abstraction and land use impacts are superimposed (DoW, 2008). Future development of the city will be dependent on the availability of adequate potable groundwater supplies while the long-term protection of the Gnangara mound water resource from contamination is a high priority for the government (WAPC, 2001; WAPC, 2005a).

Research indicates that land use, such as pine plantations, and land management practices, such as alterations in the burning frequency of native vegetation, also impede recharge (DoW, 2008). A study conducted by Harbor (1994) investigated impacts of land-use changes on surface run-off, groundwater recharge and wetland hydrology in the Akron area, Ohio, United States of America. For the range of natural recharge rates in the example area, conversion of woodland to low density residential uses gives an 11 % to 30 % reduction in groundwater recharge; conversion of woodland to high density residential uses gives a 52 % to 100 % reduction in groundwater recharge; and conversion of woodland to commercial uses gives a 94 % to 100 % reduction in groundwater recharge. It is apparent that land-use change, especially conversion to high density residential and commercial uses, can have a devastating effect on natural groundwater recharge (Harbor, 1994). However, this does not mean that all land-use change is detrimental.
Harbor (1994) suggests that local and regional groundwater maps should be developed or consulted to assess whether recharge at the site is actually important for water supply and wetland hydrology. If it is shown that recharge at the site is important for other areas, then a more detailed hydrologic budget analysis would be required to refine the estimate of recharge impacts. This more detailed estimate would then be the basis for requiring modifications in the land-use plan to include management practices that maintain recharge at previous levels.

Conversely, maintaining the plantations at leaf areas below the point where maximum productivity is achieved, and thinning of the pine plantations allows some recharge to occur. Pine harvesting and removal is facilitated by but also constrained by a State Agreement (Wood Processing (Wesbeam) Agreement Act 2002) which commits the State Government to provide at least 4.1 million cubic metres of wood to the Laminated Veneer Lumber Plant in the period to 2090. Another constraint is an extensive infestation of the potentially damaging European house borer, a destructive pest of seasoned coniferous timber, from the Gnangara plantations has further reduced the options for modifying the overall management of the plantations.

The effects of development are well documented. It can impact on both water quality and quantity of water; can result in a rise in water table as a result of clearing vegetation and provision of impervious surfaces (EPA, 1994). Development can also result in a lowering of the water table where naturally high water tables need to be lowered to enable development to proceed and drainage is introduced (EPA, 1994). Changes in water levels can have a significant impact on wetland ecology and therefore effective drainage management would be necessary to ensure that such impacts do not occur or are minimised (EPA, 1994). The nature and extent of contamination of groundwater are often indicated by the nature and distribution of land uses e.g. Intensive horticulture may lead to contamination of groundwater by nutrients, fertilizers and pesticides; service stations can lead to contamination with hydrocarbons; but contamination is unlikely to occur in areas of natural vegetation (WAPC, 2001).

The projected increases in population in both the existing defined NW and NE corridors will drive increasing demand for land on the borders of the Gnangara Mound and study area. These pressures for changes in land use coupled with the environmental issues discussed, mean that it is imperative that planning legislation and policies are designed and implemented correctly to ensure that the complex web of competing interests are appropriately managed for the continuing health of the mound and ensuring that future development is based on sustainable practices for this necessary resource.

The literature reviewed aims to identify various opportunities and constraints in relation to the various land uses and characteristics in the Study area. These include bushland; wetlands; Bush Forever sites; heritage sites; freight networks; acid sulphate soils; public infrastructure. A wide range of government documents have been reviewed as to their impacts and constraints on the Study Area. One significant point to note is that Local Government Planning Schemes and Policies only apply to zoned land in the Study Area as opposed to land Reserved under the Metropolitan Region Scheme (MRS). Thus Local Government policies and scheme provisions impose limited strategic constraints on land within the study area. However, this would change should land become zoned in the MRS.

### 2.2 State Planning Strategy (1997)

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<th>Key Points:</th>
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<tr>
<td>• This strategy prepares for significant population growth, and expanding economy, a changing and vibrant community and a sustainable future;</td>
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<tr>
<td>• The strategy is not a fixed blueprint, but provides a framework for strategic planning; and</td>
</tr>
<tr>
<td>• The strategy aims to protect and enhance key natural and cultural assets; respond to social changes; facilitate strategic development and assist the development of regional Western Australia.</td>
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The State Planning Strategy provides the basis for long-term State and regional land use planning and coordinates a whole-of-government approach to planning.

The State Planning Strategy is a land use planning strategy for Western Australia’s development up to our bicentenary in 2029. The Strategy prepares for significant population growth, an expanding economy, a changing and vibrant community and a sustainable future. It provides a vision to assist strategic decision-making and a set of principles by which coordinated, sustainable development will be implemented. It is a plan to meet community needs and aspirations, and facilitate wealth creation, the provision of public infrastructure and the protection and improvement of the environment.

The Strategy is not a fixed blueprint, but provides a framework for strategic planning which will assist in creating the kind of society we want to live in by the year 2029. The identified strategic actions will need to be evaluated and accorded priority in the context of budgetary constraints and changing circumstances.

The principles set out below are the core of the Strategy:

**Environmental principle:** To protect and enhance the key natural and cultural assets of the State and deliver to all Western Australians a high quality of life which is based on environmentally sustainable principles.

**Community principle:** To respond to social changes and facilitate the creation of vibrant, accessible, safe and self-reliant communities.

**Economic principle:** To actively assist in the creation of regional wealth, support the development of new industries and encourage economic activity in accordance with sustainable development principles.

**Infrastructure principle:** To facilitate strategic development by ensuring land use, transport and public utilities are mutually supportive.

**Regional development principle:** To assist the development of regional Western Australia by taking account of the region’s special assets and accommodating the individual requirements of each region.

### 2.3 National Water Initiative (NWI)

**Key Points:**
- NWI is Australia’s blueprint for national water reform;
- Signed by the Australian Government and all state and territory governments; and
- The Government of Western Australia has committed to developing Statutory Water Plans for over-allocated systems to meet their obligations under the National Water Initiative (NWI)

NWI is Australia’s blueprint for national water reform. It builds on the previous Council of Australian Governments (COAG) framework for water reform signed by the Australian Government and all state and territory governments in 1994. The overall objective of the NWI is to achieve a nationally compatible market, regulatory and planning based system of managing surface and groundwater resources for rural and urban use that optimises economic, social and environmental outcomes. At the highest level, implementation of the NWI will achieve:

- Clear and nationally-compatible characteristics for secure water access entitlements;
- Transparent, statutory-based water planning;
- Statutory provision for environmental and other public benefit outcomes, and improved management practices;
- Complete the return of all currently over-allocated or overused systems to environmentally-sustainable levels of extraction;
- Progressive removal of barriers to trade in water and meeting other requirements to facilitate the broadening and deepening of the water market, with an open trading market to be in place;
Clarify around the assignment to risk arising from changes in the availability of water for the consumptive pool;

- Water accounting which is able to meet the information needs of different water systems in respect to planning, monitoring, trading, environmental management and on-farm management;
- Policy settings which facilitate water use efficiency and innovative in urban and rural areas;
- Addressing future adjustment issues that may impact on water users and communities; and
- Recognition of the connectivity between surface and groundwater resources and connected systems managed as a single resource.

The agreed actions to be undertaken by governments across eight inter-related elements of water management include:

- Water access entitlements and planning framework;
- Water markets and trading;
- Best practice water pricing;
- Integrated management of water for environmental and other benefit outcomes;
- Water resource accounting;
- Urban water reform;
- Knowledge and capacity building; and
- Community partnerships and adjustment.

### 2.4 The Coastal Catchments Initiative (CCI) – Swan Catchment Council

**Key Points:**

- CCI is a national programme designed to improve and protect water quality in coastal water quality hotspots through improved Natural Resource Management.

The Coastal Catchments Initiative (CCI) is a national programme designed to improve and protect water quality in coastal water quality hotspots, by promoting competent water quality planning.

The Swan Catchment Council was established to deliver Natural Resource Management (NRM) activities for the Swan Region. The Swan Catchment Council addresses community needs by working closely with Government agencies and other bodies to promote collaboration on key environmental issues.

The Council aims to improve NRM by:

- Better integration of programs, strategies and statutory processes;
- Increasing understanding in community, government and industry;
- Influencing government policy; and
- Linking local catchment activities to regional priorities.

### 2.5 State Water Plan 2007

**Key Points:**

- The State Water Plan establishes the Water Planning Framework as a mechanism to improve certainty for the environment, the community and all water users; and
- Statutory Water Management Plans will communicate decisions that have legal obligations and can be enforced. They will be prescriptive to facilitate certainty.
This Plan outlines Government’s commitment to strategic and effective management of our limited and vital water resources. It provides the foundation for the community, water users and stakeholders to understand, engage and assess progress towards the vision for water resource management in Western Australia. A whole of water cycle approach has been adopted.

The State Water Plan establishes the Water Planning Framework as a mechanism to improve certainty for the environment, the community and all water users.

State Water Plan 2007, Regional Water Plans and Strategic Water Issue Plans are strategic in nature. They are intended to be informative and seek to optimize all aspects of the water cycle. Strategic water plans will be informed by plans prepared by water users (such as for mining or public water supply) and natural resource management groups.

Statutory Water Management Plans will communicate decisions that have legal obligations and can be enforced. They will be prescriptive to facilitate certainty.

### 2.6 A State Water Strategy for Western Australia 2003

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<tr>
<td>• The document commits the State to a range of specific objectives relating to water conservation and efficiency; water reuse; new supplies and total water cycle management; innovation research and education; and resource protection and management.</td>
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The objective of the Strategy is to ensure a sustainable water future for all Western Australians by:

- Improving water use efficiency in all sectors;
- Achieving significant advances in water reuse;
- Fostering innovation and research;
- Planning and developing new sources of water in a timely manner; and
- Protecting the value of our water resources.

The document commits the State to a range of specific objectives relating to Water Conservation and efficiency; Water reuse; New supplies and total water cycle management; Innovation research and education; and Resource protection and management.

### 2.7 Blueprint for Water Reform

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<td>• Provides the State Government with detailed advice on progressing water reform in Western Australia; and</td>
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<tr>
<td>• Approaches for longer term protection of irrigated agricultural land could include: developing integrated plans and strategies to guide future land-use decisions, leasing Crown land for agricultural practices, and purchasing development rights.</td>
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Provides the State Government with detailed advice on progressing water reform in Western Australia. The recommendations in the report are viewed by the Water Reform Implementation Committee as a comprehensive package where each component is integral to the success of the entire reform agenda and for water resources management going forward.

With Western Australia becoming a signatory to the National Water Initiative in April 2006, much greater direction has been provided on the nature and pace of the water reforms that will be implemented in Western Australia. In its final advice to the Western Australian Government, the Water...
Reform Implementation Committee has addressed the requirements of the Government Response, the requirements of the National Water Initiative and the Western Australian setting and situation.

Section 8 of the report entitled “Integrate Land and Water Planning” is a Key Direction of the document. It states that “the two key elements for irrigated agriculture are suitable and capable land and water supply”. To this end, there are various options available to Government to support the longer term protection of irrigated agricultural land. Approaches could include:

- Developing integrated plans and strategies to guide future land-use decisions;
- Leasing Crown land for agricultural practices; and
- Purchasing development rights.

These options should be applied on a case-by-case basis to reflect local circumstances.

2.8 Statements of Planning Policy

2.8.1 State and Regional Provisions

The State Planning Framework (Statement of Planning Policy No.1 - State Planning Framework Policy) includes Statements of Planning Policy as well as regional strategies, regional and sub-regional structure plans, strategic policies and operational policies prepared from time to time and endorsed by the Commission. The most relevant policies and strategies in the context of the Gnangara Mound include:

**Statements of Planning Policy**
- SPP2 Environment and Natural Resources Policy (2003)
- SPP2.4 Basic Raw Materials (2000)
- SPP2.5 Agriculture and Rural Land Use Planning (2002)
- SPP2.8 Bushland Policy for the Perth Metropolitan Region (2004)
- SPP3 Urban Growth and Settlement - Final (2005)
- SPP3.5 Historic Heritage Conservation (2007)
- SPP4.2 Metropolitan Centres Policy Statement for the Perth Metropolitan Region (2000)
- SPP Metropolitan Freight Network (Draft) (2005)

**Regional Strategies**
- Network City (2004)
- Gnangara Land Use and Water Management Strategy (2001)
- The future of East Wanneroo - Land use and water management in the context of Network City (2007)

**Regional and Sub-regional Structure Plans**
- North West Corridor Structure Plan (1992)
- North West Corridor Structure Plan - Yanchep (1993)
- North East Corridor Structure Plan (1994)
- North East Corridor Extension strategy (2003)
2.8.2 State Planning Framework Policy

Key Points:
- Statement of Planning Policy No.1 – State Planning Framework Policy identifies five key principles which describe the considerations which influence good decision-making in land use planning and development. These five principles include:
  - **Environment**: The protection of environmental assets and the wise use and management of resources;
  - **Community**: Planning should recognise the need for and contribute towards more sustainable communities;
  - **Economy**: Planning should contribute to the economic well-being of the State, regions and local communities;
  - **Infrastructure**: Planning should ensure that physical and community infrastructure by both public and private agencies is coordinated; and
  - **Regional Development**: Planning should assist communities of the outlying regions in achieving the opportunities comparable with towns of the southwest.

The **Statement of Planning Policy No.1 - State Planning Framework Policy** identifies the five key principles which define the primary aim and describe the considerations which influence good decision-making in land use planning and development. These five principles include:

**Environment**
The protection of environmental assets and the wise use and management of resources are essential to encourage more ecologically sustainable land use and development. Planning should contribute to a more sustainable future by:
- Promoting the conservation of ecological systems and the biodiversity they support;
- Assisting in the conservation and management of natural resources;
- Protecting areas and sites with significant historic, architectural, aesthetic, scientific and cultural values from inappropriate land use and development;
- Adopting a risk-management approach which aims to avoid or minimise environmental degradation and hazards; and
- Preventing environmental problems which might arise as a result of siting incompatible land uses close together.

**Community**
Planning anticipates and responds to the needs of existing and future communities through the provision of zoned and serviced land for housing, employment, recreation and open space, commercial and community facilities. Planning should recognise the need for and, as far as practicable, contribute towards more sustainable communities by:
- Accommodating future population growth and providing housing choice and diversity to suit the needs of different households;
- Providing land for a range of accessible community resources;
- Integrating land use and transport planning and promoting patterns of land use which reduce the need for transport, promote the use of public transport and reduce the dependence on private cars;
- Encouraging safe environments, high standards of urban design and a sense of neighbourhood and community identity;
- Promoting commercial areas; and
- Providing effective systems of community consultation.

**Economy**
Planning should contribute to the economic well-being of the State, regions and local communities by supporting economic development through the provision of land, facilitating decisions and resolving land use conflicts. In particular, planning should provide for economic development by:
Stage 1 Report

- Providing suitable zoned and serviced land for industry, business and other employment and wealth generating activities;
- Protecting agricultural land resources from inappropriate uses;
- Avoiding land use conflicts;
- Promoting local employment opportunities;
- Providing sites for tourism accommodation and facilities; and
- Ensuring that plans and policies are clear and certain, decisions are made in accordance with plans and policies, and decisions are made expeditiously.

Infrastructure
Planning should ensure that physical and community infrastructure by both public and private agencies is coordinated and provided in a way that is efficient, equitable, accessible and timely. This means:
- Planning for land use and development in a manner that allows for the logical and efficient provision and maintenance of infrastructure;
- Protecting key infrastructure;
- Facilitating the efficient use of existing urban infrastructure and human services and preventing development in areas which are not well serviced; and
- Encouraging consultation with providers of infrastructure.

Regional Development
Planning should assist communities of the outlying regions in achieving the opportunities comparable with towns of the southwest. This will mean better co-ordination of land uses, high standards of development and the availability of land, physical and social services to make regional communities sustainable in the long term. In the vast areas between settlements, mineral and agricultural resources and new industrial facilities will need to be developed in harmony with conservation of the natural.

2.8.3 SPP 2 Environment and Natural Resources Policy

Key Points:
- This policy addresses planning issues in terms of environment and natural resources;
- Looks at various attributes to meet its objectives. These include general measures; water resources; air quality; soil and land quality; biodiversity; agricultural land and rangelands; minerals, petroleum and basic raw material resources; marine resources and aquaculture; landscape; greenhouse gas emissions and energy efficiency.

The environment and natural resources policy defines the principles and considerations that represent good and responsible planning in terms of environment and natural resource issues within the framework of the State Planning Strategy. The policy is supplemented by more detailed planning policies on particular natural resources matters that require additional information and guidance (see below). These supplementary policies may also be statements of planning policy and should be implemented in conjunction with this policy. The objectives of the policy are to:
- Integrate environment and natural resource management with broader land use planning and decision-making;
- Protect, conserve and enhance the natural environment; and
- Promote and assist in the wise and sustainable use and management of natural resources.

In order to meet these objectives, the policy looks into various attributes which include:

General measures
- Avoid development that may result in unacceptable environmental damage;
- Actively seek opportunities for improved environmental outcomes;
- Take account of the availability and condition of natural resources;
- Protect significant natural, indigenous and cultural features;
Take into account the potential for economic, environmental and social (including cultural) effects on natural resources;
- Recognise that certain natural resources are restricted to particular areas and may need to be identified accordingly;
- Take account of the potential for on-site and off-site impacts of land use on the environment, natural resources and natural systems;
- Ensure use and development on or adjacent to the coast is compatible;
- Support conservation, protection and management of native remnant vegetation where possible;
- Consider alternatives to land acquisition for conservation and landscape protection; and
- Take into account the potential for impacts from changes in climate and weather on human activities and cultural heritage.

Water Resources
- Consider mechanisms to protect, manage, conserve and enhance wetlands, waterways, estuaries, marine environments, gazetted public drinking water source areas and other water catchments;
- Take account of the availability of water resources;
- Encourage urban water management through water sensitive design;
- Ensure the provision of adequate setbacks between development and the foreshores of wetlands, waterways, estuaries and the coast;
- Consider flood risk; and
- Consider the risks associated with nuisance or disease vector insects.

Air Quality
- Promote urban development patterns, densities and form that support reduced travel demand; and
- Have regard to the potential for conflict between sensitive land uses and activities with air emission impacts.

Soil and Land Quality
- Have regard to the capability of land to accommodate different land uses and developments;
- Facilitate the rehabilitation or remediation of degraded or contaminated lands;
- Ensure that land uses that may result in land contamination are not permitted; and
- Identify existing and potential areas affected by salinity, acid sulphate soils or other severe land degradation problems.

Biodiversity
- Consider mechanisms to protect areas of high biodiversity and/or conservation value;
- Seek to avoid or minimise any adverse impacts on areas of high biodiversity or conservation value as a result of changes in land use or development;
- Assist in establishing a comprehensive, adequate and representative conservation reserve system throughout the State for flora, fauna habitat, landscapes, waterways, estuaries and wetlands;
- Safeguard and enhance linkages between terrestrial and aquatic habitats which have become isolated, including the re-establishment of habitat corridors;
- Assist the return of areas of high biodiversity conservation value to the public estate; and
- Support the use of management plans to protect areas of high biodiversity conservation value in the long term.

Agricultural Land and Rangelands
- Protect and enhance areas of agricultural significance;
- Consider the natural resource capability of rangelands and agricultural lands; and
- Diversify compatible land use activities in agricultural areas and rangelands.
Minerals, Petroleum and Basic Raw Material Resources

- Identify and protect important and economic mineral resources;
- Identify and protect important basic raw material resources and provide for their extraction and use;
- Support sequencing of land uses where appropriate; and
- Support and improved efficiencies in the production and consumption of mineral and basic raw material resources.

Marine Resources and Aquaculture

- Take account of the location of areas of significance for recreational and commercial fishing and aquaculture; and
- Seek to avoid or minimise any adverse impacts, directly or indirectly, on areas of significance for commercial and recreational fishing and aquaculture.

Landscape

- Identify and safeguard landscapes with high geological, geomorphological or ecological values, as well as those of aesthetic, cultural or historical value to the community, and encourage the restoration of those that are degraded;
- Consider the level or capacity of the landscape to absorb new activities; and
- Consider the need for a landscape, cultural or visual impact assessment for land use or development proposals.

Greenhouse Gas Emissions and Energy Efficiency

- Promote energy efficient development and urban design;
- Support the retention of existing vegetation and revegetation in subdivision and development proposals;
- Support the use of alternative energy generation, including renewable energy, where appropriate; and
- Support the adoption of adaptation measures to climate change.

2.8.4 SPP 2.2 Gnangara Groundwater Protection

Key Points:

- This policy aims to control and manage development and land uses on the Gnangara Mound to prevent detrimental impacts on the quality and quantity of groundwater available for extraction;
- Referring to the DoE Water Quality Protection note compatible land uses can be deduced depending whether they fall under the priority one, two or three classification; and
- 77% of the policy area falls under the priority 1 classification (State forest) which may limit future land use and development in the area.

The main purpose of the policy is to prevent, control, manage development and land use changes in the policy area that are likely to cause detrimental effects to the groundwater resource quality and quantity. The policy aims to make the change in land use and development more compatible with the mound’s long-term use for public consumption (domestic human use, industry, agriculture, recreation and aesthetics), ensures that ecosystems, ecological values and the integrity of wetlands and native vegetation are conserved. Before any rezoning, development, or subdivision can proceed in the policy area, this policy must be reviewed to determine what category of source protection area the proposed change falls within and whether this it is a permissible change in that category. These categories are based on the Public drinking water source protection classifications and public drinking water guidelines whereby an area could be part of the Public Drinking Water Source Area (PDWSA) as a:
• **Priority 1 classification**: This is characterised by low risk and low intensity land use such as forestry. It focuses predominantly on risk avoidance where protection of the public water supply outweighs virtually all other considerations in respect to the use of this land. There is a presumption against the zoning of land for residential, special residential, industrial or commercial uses or the subdivision of land. Any other zones incompatible with priority 1 objectives should not be considered;

• **Priority 2 classification**: This ensures that there is no increased risk of pollution to the water source where low-risk development already exists. Conditional development would then be allowed to proceed if this demand is met. In priority 2 areas, subdivision of land use development proposals can be approved if they don’t jeopardise water quality and have a conservation focus; and

• **Priority 3 classification**: This manages the risk of pollution to the water source in areas where water supply sources needs to co-exist with other land uses. Management is essential whereby contamination may need to be treated or an alternative source found.

Figure 2 compares the Study Area with the PDWSA priority classifications. It can be seen that the area covered by the Gnangara mound falls predominantly under the priority 1 classification (77%), with pine plantations (State Forest No. 65) as the major land use, which limits the amount and type of development or land use in the area.
Figure 2 Map Showing the Public Drinking Water Source Areas within the Study Area
2.8.5 SPP 2.4 Basic Raw Materials

Key Points

- The Gnangara mound has significant deposits of sand and limestone;
- The basic raw materials area are classified as being a Priority Resource Area, Key Extraction Area or Extraction Area;
- On-site and off-site impacts need to be assessed to ensure there are no detrimental costs to the environment;
- Mining is a compatible with conditions according to the PDWSA land use classification table, and SPP 2.4 would determine whether mining can proceed or not; and
- Sequential land use planning should also be a requirement.

Basic raw materials are produced relatively cheaply, with the major cost being the transport to the construction site. A ready supply of basic raw materials close to established and developing parts of the metropolitan region is, therefore, essential in keeping down the costs of land development and contributing to affordable housing. In the study area, limestone extraction is located mostly in Neerabup and sand mining is concentrated in Gnangara and Landsdale whereas the north-east portion of Carabooda/Nowergup will remain zoned rural and be available for agricultural/horticultural production and the protection of the significant deposits of sand and limestone in the area (WAPC, 2007). Sand and limestone mining can occur in the Wanneroo groundwater area, subject to stringent conditions (WAPC, 2007).

The policy is designed to facilitate the extraction of basic raw materials close to the major markets in the metropolitan region and to avoid sensitive development close to basic raw material resources which could otherwise inhibit extraction of the resource. The State Planning Policy 2.4 aims to identify and protect basic raw material resource locations, key extraction areas and future extraction areas from being developed for incompatible land uses which could limit future exploitation, and ensure that the extraction of basic raw materials does not have an adverse effects/environmental consequences in the locality of the operation during or after extraction.

Extraction of basic raw materials on Crown Land (National Parks, State Forests and other Crown reserves) are subject to Section 24 of the Mining Act, 1978, and require the approvals of the relevant Ministers and Government authorities. Based on SPP No 2.2, it is evident that most of the state forest falls under the Priority 1 classification, and extraction on these areas would therefore need to be critically reviewed. Extraction in these areas is likely to be subject to assessment under Part 4 of the Environmental Protection Act, 1986. The policy identifies areas with the following classifications:

- **Priority Resource Locations (PRL):** These are the locations of regionally significant resources which should be recognised for future basic raw materials extraction and not be constrained by incompatible uses or development;
- **Key Extraction Areas (KEA):** These are areas of recognised regional resources providing for the long-term supply of basic raw materials. These areas should be protected in relevant town planning schemes; and
- **Extraction Areas (EA):** These are existing extractive industries operating under the Mining Act 1978, the Local Government Act 1996, a regional planning scheme or a town planning scheme. They should be protected in the short term but will eventually be replaced by other uses or reserves.

According to the policy, proposals in local planning schemes, prohibiting extractive industries in zones that permit broad rural land uses (in future referred to as a Rural zone), will not be supported without adequate justification being provided. Extractive industry could also be a permitted use in other zones, subject to the location of these zones in relation to sensitive uses. Key extraction areas should be protected by appropriate zones in town planning schemes, while priority resource areas and extraction areas should be identified as a Special Control Area in local planning schemes.
Before determining an application for an extractive industry operation the Commission and/or local government should consider what is appropriate. Figure 3 provides a summary of some aspects that need to be considered in determining applications.

Figure 3: Some relevant consideration in determining applications. These would include identifying the areas as either a Key Extraction Area (KEA), Extraction Area (EA) or a Priority Resource Location (PRL). There needs to be an investigation into the like on-site and off-site impacts before extraction can commence.

In addition to the issues summarised in Figure 3, it is important to identify the effect of the proposed extractive industry on agricultural land; the ability to rehabilitate the land to a form or for a use which is compatible with the long-term planning for the site and surrounding area; the availability and suitability of road access; the ability to stage the extraction operations to avoid conflicts with adjacent land uses.

Figure 4 shows the mining tenements in relation to the PDWSA classifications on the Gnangara Mound. Mining leases exist in Wilbinga, Nowergup, Carabooda, Pinjar, Jandabup, Melaleuca and Lexia, with various Prospecting Licences for future extraction. Under the PDWSA Land Use Table 1-Land use compatibility guidelines in public drinking water source areas, extractive (includes construction/mining camps), mining (includes mineral and energy exploration, decontamination for transport, construction and mining camps) are compatible with conditions. It is evident that there are various mining exploration licences in the study area, however SPP 2.4 and PDWSA policy will determine whether mining can proceed or not. In order to facilitate the exploitation of basic raw materials whilst supporting future long-term development for urban and other purposes, sequential land use planning should also be a requirement whereby extraction and rehabilitation can take place on a programmed basis in advance of longer-term use and development. This policy hence aims for a more sustainable outcome in terms of the extraction of basic raw materials on the mound, and should be used in conjunction with the other relevant State Planning Policies.
Figure 4 Mining Tenements in the Study Area in relation to the PDWSA classifications of the Gnangara Mound
2.8.6 SPP 2.5 Agricultural and Rural Land Use Planning

**Key Points:**
- The main objectives of this Policy are to protect agricultural land resources, plan and provide for rural settlement, minimize the potential for land use conflict, and carefully manage natural resources;
- Rezoning applications must be accompanied by information identifying environmental values and risks, the potential for land use conflict, the potential impact and restrictions on permitted uses on adjacent land, and any potential buffers that may need to be provided for a potentially incompatible land use.

The main objectives of this Policy are to protect agricultural land resources, plan and provide for rural settlement, minimize the potential for land use conflict, and carefully manage natural resources. The policy applies to all rural land in Western Australia.

In setting requirements for local government planning schemes, the Policy makes reference to ensuring that town planning schemes have provisions to avoid land use conflict. Rezoning applications, for example, must be accompanied by information identifying environmental values and risks, the potential for land use conflict, the potential impact and restrictions on permitted uses on adjacent land, and any potential buffers that may need to be provided for a potentially incompatible land use.

Policy measures are set out that are implemented through various local government instruments: local government planning strategies and policies, town planning scheme provisions for agricultural land, rural settlement, and managing natural resources.

2.8.7 SPP 2.7 Public Drinking Water Source Policy

**Key Points**
- The policy aims to ensure that land use and development within the PDWSAs is compatible with the protection and long-term management of water resources for public water supply;
- Well-head protection zones and reservoir protection zones need to be identified to create buffer zones; and
- Need for a Water Catchments reservations in the MRS.

The objective of this policy is to ensure that land use and development within PDWSAs is compatible with the protection and long-term management of water resources for public water supply. In addition with the PDWSA classification of priority 1, 2 or 3, DoE has identified well-head protection zones and reservoir protection zones to protect the drinking water source from direct contamination in the immediate vicinity of production wells and reservoirs. Land use and activities within these areas need to be managed to prevent, restrict or control uses or activities such that contamination of the water resource is prevented at its abstraction point. Figure 5 and Figure 6 shows the various buffers for the protection zones of well-heads and reservoirs.
Figure 5 Well-head protection zones are usually circular, with a radius of 500m in Priority 1 areas and 300m in Priority 2 and Priority 3 areas.

Figure 6 Reservoir protection zones for primary reservoirs usually consist of a 2km buffer area around the top water level of a reservoir and include the reservoir itself. Reservoir protection zones are normally over Crown land and generally prohibit public access to prevent contamination of the resource.

Within the Perth Metropolitan Region, the Water Catchments reservation and more recently, the Rural Water Protection zone have been introduced into the Metropolitan Region Scheme (MRS) to identify surface and ground water catchments and to ensure that local government town planning schemes give effect to strategies for the protection of public water supply sources. The Water Catchments reservation in the MRS is, in fact, similar to a special control area, being an overlay above the underlying reserve.

Within the Perth Metropolitan Region, Priority 1 and 2 source protection areas should be included in the Water Catchments reservation, or the Rural Water Protection zone respectively, or covered by a special control area for water protection in the MRS and corresponding town planning scheme. Priority 3 source protection areas in the Perth Metropolitan Region are not generally required to be subject to
specific provisions in town planning schemes for protection of public water supplies. Outside the Perth Metropolitan Region, all priority source protection areas in PDWSAs should be shown as special control areas in region schemes and in local government schemes in accordance with the recommendations of any relevant land use and water management strategy published by the WAPC, or any water source protection plan approved by the WRC. Land uses and developments in all priority source protection areas that have the potential to impact detrimentally on the quality and quantity of public drinking water supplies should not be permitted unless it can be demonstrated.

Figure 7 below shows the location of bores in relation to the PDWSA protection classifications.
Figure 7 Map showing the location of bores within the Study Area where EC is an Existing public water supply well (confined); EU is an Existing public water supply well (unconfined); PC is a Proposed public water supply well (confined); and PU is a Proposed public water supply well (unconfined).
2.8.8 SPP 2.8 Bushland Policy for the Perth Metropolitan Region (Draft)

Key Points:
- This policy applies to all bushland within the Perth Metropolitan Region (PMR) and, more specifically Bush Forever Protection Areas and Local Bushland;
- The aim of this policy is to provide a statutory policy and implementation framework that will ensure bushland protection and management issues in the PMR.

The aim of this policy is to provide a statutory policy and implementation framework that will ensure bushland protection and management issues in the Perth Metropolitan Region (PMR) are appropriately addressed. More specifically, it addresses the protection and management of regionally significant bushland identified for protection in Bush Forever sites on the Swan Coastal Plain portion of the PMR, as identified in Bush Forever.

The policy and implementation framework adopted in this Policy can be applied to other bushland or biodiversity areas of significance outside Bush Forever Protection Areas and identified for protection as part of local or regional bushland or biodiversity protection strategies, or similar. Such strategies should be set in the context of local or regional planning strategies and wider social and economic considerations.

The policy applies to all bushland within the PMR and, more specifically Bush Forever Protection Areas and Local Bushland. Figure 8 shows the areas within the Study Area which may be applicable to this policy based on threatened ecological communities; declared high priority flora; native vegetation; and Bush Forever sites.

Planning Bulletin No. 68 Proposed Bush Forever protection areas advises of a package of statutory planning measures that are being introduced to ensure that bushland protection and management issues are appropriately considered and addressed in planning decisions and actions in the Perth Metropolitan Region. This planning bulletin works closely with SPP 2.8 Bushland Policy for the Perth Metropolitan Area.
Figure 8 Map showing the Declared Rare Priority Flora; Threatened Ecological Communities; Native Vegetation; and Bush Forever sites within the Study Area
2.8.9 SPP 2.9 Water Resources

Key Points:
- Provides clarification and additional guidance to planning decision-makers for consideration of water resources in land use planning;
- Various policy measures have been put in place which include general measures; surface and groundwater resources; wetlands, waterways and estuaries; and total water cycle management.

This policy is directly related to the overarching sector policy SPP 2 Environment and Natural Resources policy and provides clarification and additional guidance to planning decision-makers for consideration of water resources in land use planning.

The objectives of this policy are to:
- Protect, conserve and enhance water resources that are identified as having significant economic, social, cultural and/or environmental values;
- Assist in ensuring the availability of suitable water resources to maintain essential requirements for human and all other biological life with attention to maintaining or improving the quality and quantity of water resources; and
- Promote and assist in the management and sustainable use of water resources.

To meet these objectives, there has been various policy measures put in place. These include:

General Measures
- Protect significant environmental, recreational and cultural values of water resources;
- Aim to prevent or, ameliorate the following potential impacts:
  - water quality and quantity;
  - increased nutrient loads into receiving waters;
  - increased acidity and leaching of acid sulphate soils;
  - the removal of associated native vegetation important for long-term management of the water resource;
  - increased erosion, sedimentation and turbidity;
  - any potential adverse effects on environmental water requirements;
  - excessive build-up of organic matter;
  - pollution and contamination;
  - salinity over and above the natural levels; and
  - any potential cumulative impacts.
- Promote improved outcomes such as:
  - environmental repair and rehabilitation of the water resource;
  - improved water quality;
  - reduction in nutrient export to receiving waters to a level lower than existing;
  - restoration of natural flow regimes and variability; and
  - use of site works such as fencing, revegetation or water monitoring.
- Inform planning actions by identifying all water resources above and below ground in the subject area;
- Take into account potential impacts the water resource may have on a land use when determining the compatibility of locating a land use near natural or artificial water resources;
- Recognise and take into account State Government management strategies for water resource issues;
- Recognise and take into account water resource management plans; and
- Recognise and take into account relevant accredited natural resource management strategies.
Surface and Groundwater Resources

- Recognise the hydrological importance of groundwater and surface catchments;
- Protect, manage, conserve and enhance surface and groundwater catchments and recharge areas supporting significant ecological features or having identified environmental values;
- Ensure the availability of water resources is compatible with the future requirements of the proposed and surrounding land use; and
- Take into account the potential adverse impacts that development may have on catchment areas.

Wetlands, Waterways and Estuaries

- Protect, manage, conserve and enhance the environmental functions and values of waterways and estuaries;
- Protect, manage, conserve and enhance the environmental attributes, functions and values of significant wetlands (e.g. RAMSAR wetlands, conservation category wetlands);
- Manage, conserve and, where possible, restore the environmental attributes, functions and values of resource enhancement wetlands;
- Ensure use of best management practices in the development and use of multiple use wetlands; and
- Ensure adequate and appropriate buffering of wetlands, waterways and estuaries.

Total Water Cycle Management

- Take into account total water cycle management and water-sensitive urban design principles.
- Seek to achieve no net difference in water quality and quantity, unless necessary to meet identified environmental water requirements.
- Promote management of the urban water cycle as a single system.
- Maximise the opportunities for compliance with best practice stormwater management.
- Promote water conservation mechanisms that increase the efficiency of the use of water, including stormwater.
- Incorporate the re-use and recycling of water.
- Promote the retention and use of local native vegetation in developments to minimise water use and maximise filtration.

2.8.10 SPP 3 Urban Growth and Settlement

Key Points:

- This policy should be taken into account in preparing regional and local planning strategies, and planning schemes and amendments, and given weight in statutory decision making in relation to urban growth and settlement; and
- The policy aims to promote a sustainable and well planned pattern of settlement across the State, build on existing communities with established local and regional economies, manage the growth and development of urban areas, promote the development of a sustainable and liveable neighbourhood form, and coordinate new development with the efficient, economic and timely provision of infrastructure and services.

The overall aim of the policy is to facilitate sustainable patterns of urban growth and settlement through broad policy in accommodating growth and change. This policy should be taken into account in preparing regional and local planning strategies, and planning schemes and amendments, and given weight in statutory decision making in relation to urban growth and settlement.

The objectives of this policy are:

- To promote a sustainable and well planned pattern of settlement across the State, with sufficient and suitable land to provide for a wide variety of housing, employment, recreation facilities and open space;
To build on existing communities with established local and regional economies, concentrate investment in the improvement of services and infrastructure and enhance the quality of life in those communities;

To manage the growth and development of urban areas in response to the social and economic needs of the community and in recognition of relevant climatic, environmental, heritage and community values and constraints;

To promote the development of a sustainable and liveable neighbourhood form which reduces energy, water and travel demand whilst ensuring safe and convenient access to employment and services by all modes, provides choice and affordability of housing and creates an identifiable sense of place for each community; and

To coordinate new development with the efficient, economic and timely provision of infrastructure and services.

In order to meet these objectives, the policy focuses on the following areas:

- Creating sustainable communities;
- Managing urban growth and settlement across Western Australia;
- Managing urban growth in Metropolitan Perth;
- Planning for liveable neighbourhoods;
- Coordination of services and infrastructure;
- Managing rural-residential growth; and
- Planning for Aboriginal communities.

### 2.8.11 European and Historic Heritage values

#### Key Points:

- The study area contains a variety of rural land uses, heritage features and landscapes and it is important to identify, protect, enhance and promote its cultural and rural landscape characteristics; and
- A permit is required to be granted by the Minister under section 64 of the *Heritage of Western Australia Act 1990* authorising implementation of the proposal or the carrying out of works:
  - which may involve disturbance to vegetation or the surface of the land; or
  - for the construction, renovation, alteration or extension of; or
  - which may cause damage to any building, or of demolition or either development to the cultural heritage characteristics of that place listed on the Register of Heritage Places.

According to WAPC (2007b) and the *State Register of Heritage Places* (2008), the study area contains a variety of rural land uses, heritage features and landscapes and it is important to identify, protect, enhance and promote its cultural and rural landscape characteristics.

Carabooda and Nowergup have some significant rural karst landscapes, containing large remnant tuarts, wetlands and other native vegetation, along with built heritage features and values, such as the historic lime kilns (WAPC, 2007b). The value of this rural area as a recreational and tourism resource will be enhanced further by the urbanisation of the north-west corridor (WAPC, 2007b).

Horticulture and agriculture are significant contributors to the economic and social fabric of the Wanneroo area. These traditional land uses and the association with early migrant settlement have given areas such as Wanneroo a rich history and cultural and community identity (WAPC, 2007b).

Under the *Heritage of Western Australia Act 1990*, the Register of Heritage Places carries out legal implications for other government departments, municipal councils, developers and individual property owners and a person found to be in breach of the Act may be fined (WAPC, 2007b).
A permit is required to be granted by the Minister under section 64 of the Act authorising the implementation of the proposal or the carrying out of any works:

- Which may involve disturbance to vegetation or of the surface of the land; or
- For the construction, renovation, alteration or extension of; or
- Which may cause damage to any building, or of demolition or other development to the cultural heritage characteristics of that place listed on the register.

Figure 9, Figure 10 and Figure 11 shows the proposed and existing Heritage sites which are relevant to the Gnangara Mound Study Area.

The relevant Statement of Planning Policy to Heritage values is discussed below.
Figure 9 Location Plan - Heritage Sites (Girrawheen to Carramar); Source: City of Wanneroo (2005)
Figure 10 Location Plan - Heritage Sites (Carramar to Eglinton); Source: City of Wanneroo (2005)
Figure 11 Location Plan - Heritage Sites (Eglinton to Two Rocks); Source: City of Wanneroo (2005)
SPP 3.5 Historic Heritage Conservation

Key Points:

- This policy applies to historic cultural heritage including heritage areas, buildings and structures, historic cemeteries and gardens, and man-made landscapes and historic archaeological sites with or without built features; and
- The aim of this policy is to conserve places and areas of historic heritage significance through identification and assessment, planning schemes and strategies, development control and more.

This policy sets out the principles of sound and responsible planning for the conservation and protection of Western Australia’s historic heritage.

This policy applies principally to:

- Historic cultural heritage including heritage areas;
- Buildings and structures;
- Historic cemeteries and gardens; and
- Man-made landscapes and historic or archaeological sites with or without built features.

This policy however does not apply to:

- Conservation of Aboriginal heritage, except in cases where Aboriginal heritage places or areas are entered in the state register, a local heritage list or are located within a designated area; and
- Conservation of natural heritage except in cases where natural heritage forms part of a place of historic cultural heritage significance.

The objectives of this policy are:

- To conserve places and areas of historic heritage significance;
- To ensure that development does not adversely affect the significance of heritage places and areas;
- To ensure that heritage significance at both the State and local levels is given due weight in planning decision-making; and
- To provide improved certainty to landowners and the community about the planning processes for heritage identification, conservation and protection.

In order to meet these objectives, this state planning policy implements the following policy measures:

- Identification and assessment;
- Designation of heritage areas;
- The difference between heritage areas and urban character areas;
- Establishment of heritage lists;
- Relevant considerations for development assessment;
- Development control principles; and
- Planning schemes and strategies

Planning Bulletin 88 Historic Heritage Conservation introduces State Planning Policy 3.5 Historic Heritage Conservation and provides a summary of this document

2.8.12 SPP 4.1 State Industrial Buffer Policy

Key Points:

- This Policy applies to any industrial activity that may have amenity and health impacts, or risk to urban and other sensitive land uses; and
- Where emissions are not able to be contained on site, an appropriate buffer would be required and determined through technical analysis of the site.
The purpose of the State Industrial Buffer Policy is to provide a consistent approach to the protection and security of industrial zones, transport terminals, ports, other utilities and special use zones. It also provides for the safety and amenity of surrounding land uses while having regard to the rights of landowners who may be affected by residual emissions and risk. The policy is based on the assumption that routine industrial emissions and risk factors are identified during planning and environmental assessment procedures and managed in accordance with statutory licences and conditions.

In determining the application of buffer areas, the WAPC liaises with the Dept of Environment and Conservation, Dept of Health, Dept for Industry and Resources and the Environmental Protection Authority.

This Policy applies to any industrial activity that may have amenity and health impacts, or risk to urban and other sensitive land uses, and the WAPC will have regard to the Policy when considering planning, subdivision and rezoning applications. Where emissions are not able to be contained on site, a technical analysis of the site, undertaken by the proponent, would usually determine the nature and level of emissions from a site (noise, smoke, dust, odour, air and water quality), and the appropriate buffer that would be required.

2.8.13 SPP 4.2 Metropolitan Centres Policy Statement for the Perth Metropolitan

Key Point:
- The policy is intended to provide a guide for centre development that is flexible enough to enable commercial development to respond to market conditions.

The principal purpose of the policy is to provide a broad regional planning framework to coordinate the location and development of retail and commercial activities in the metropolitan region. It is mainly concerned with the location, distribution and broad design criteria for the development of commercial activities at the regional and district level. Local Planning Strategies prepared by local governments will provide more detailed guidance for planning and development control at the local level.

The policy is intended to provide a guide for centre development that is flexible enough to enable commercial development to respond to market conditions and has a degree of certainty to assist in commercial investment decisions.

The objectives of this policy statement are to:
- Establish a hierarchy of well-located centres in the metropolitan region;
- Encourage centres to be developed as the focus of the community and employment activities comprising a range of appropriate commercial and community uses;
- Ensure that centres are highly accessible, of a high standard of urban design and developed with due regard to the residential amenity of the locality;
- Encourage local governments to develop Local Planning Strategies to provide detailed planning mechanisms to implement the objectives of this policy; and
- Provide policy measures and guidelines for the planning and design of centre developments.

2.8.14 Statement of Planning Policy: Metropolitan Freight Network (Draft)

Key Points:
- The intent of this policy is to identify and protect the metropolitan freight road and rail network as well as minimise the adverse impact of freight transport noise on adjacent development;
- There has been a push for the location of a new eastern regional transport corridor with one of the options involving aligning it through the State Forest No.65; and
- This policy applies if a freight road network will be constructed in the Study Area.
The intent of this policy is to identify and protect the metropolitan freight road and rail network as well as minimise the adverse impact of freight transport noise on adjacent development. The policy is relevant when there is:

- An existing freight route or freight handling facility which abuts future urban development;
- A proposed freight route or freight handling facility which abuts existing urban development; and
- A proposed freight route or freight handling facility which abuts future urban development.

The objectives of the policy are to:

- Facilitate the development and operation of an efficient freight network, based on strategic co-location of freight handling facilities serviced by an integrated network of freight transport facilities;
- Protect the primary freight network from avoidable encroachment by any incompatible or noise sensitive development with the potential to compromise freight handling and/or transport operations;
- Minimise adverse environmental and social impacts associated with the handling and movement of freight on noise sensitive development, such as housing; and
- Inform local government and landowners of the designation of existing and proposed freight network.

In order to meet the objectives, the following measures should be looked at:

- Location of freight handling facilities;
- Development within freight route areas of influence; and
- Freight network operational and infrastructure measures.

According to WAPC (2007b), there has been a push for the location of a new eastern regional transport corridor with one of the options involving aligning it through the State Forest No.65. While this option is favoured by the community and would require modification to the priority 1 source protection area designation and is dependent on Government decisions in relation to the future importance of this area for public water supply and the location of existing and future public water supply bores in the area (WAPC, 2007b). SPP 2.2 does mention that transport infrastructure and most public uses in the national and regional parks and nature reserves (priority 1 areas) may be acceptable in the policy area provided best management of roads and other transport infrastructure and public use facilities in consultation with the Department of Environment (DoE). A freight network road on a Priority 1 classification area in the Gnangara Study area would need to be investigated further for potential impacts on the environment and water quality. Section 3.5.1 discusses the road network in the study area in greater detail.
2.9 Regional Strategies

2.9.1 Network City (2004)

Key Points:

- Network City aims to “establish clear, concise directions and objectives for the future.”
- Urban Development, transportation and commercial activities are focused on identified activity corridors and nodes.
- Urban form expansion to be constrained with a target of 60% of all new dwellings to be contained within the constructed urban perimeter of the City as of 2005.
- Protection and enhancement of the environment and natural assets is emphasised in all future planning.
- Greater integration of public transportation and activity centres along activity corridors.
- Urban development should not occur over the study area as shown in Fig 12.

Network City, the latest 25-year planning strategy for metropolitan Perth, is designed to realise the integration of land use and transport networks within established and new areas (Curtis, 2006). The Network City concept aims to integrate the transport network and the city it serves.

The main themes of this policy include:

- Managing growth by sharing responsibility between industry, communities and government;
- Making full use of urban land;
- Planning with the communities;
- Nurturing the environment;
- Encouraging public over private transport;
- Strengthening local sense of place;
- Developing strategies which deliver local jobs; and
- Providing for affordable housing.

Network City aims to achieve its goals by creating Activity centres along activity corridors which would focus on daily activity needs including small scale employment, shopping and services, and medium to higher density housing all placed within walking distance of the public transport stop at the centre (Curtis, 2006). Transport corridors would be paired with one or more activity corridors to provide routes for high speed traffic, in particular truck routes and express bus services.

The key relevant chapters that apply to the Gnangara Mound study area include:

Chapter 1: Spatial Plan & strategy

The Spatial Plan and Strategy Section of Network City sets out three key Planning Principles for Network City:

- Deliver urban growth management by implementing urban growth management processes. This will allow us to extend the lifetime of the city's current land bank.
- Accommodate urban growth primarily within a Network city pattern, incorporating communities by developing a Network city.
- Protect and enhance the natural environment, open spaces and heritage.

These objectives are proposed to ensure that the growth of the Network city does not occur at the expense of our natural assets.
Chapter 5: Environment and Heritage

This chapter contains strategies that are designed to give the environment a sharper focus and role in decision-making.

Environmental issues are key concerns within the community: environmental protection is of equal importance to economic growth; a clean and green city with access for all to open spaces, rivers, forests, beaches and protection of groundwater catchments is important; and natural waterways and wetlands must be protected from development that could be damaging in the long term.

Strategic and statutory planning offer opportunities to encourage the benefits of industrial ecology (where localised clusters of similar producers can share resources to minimise waste production), better urban water management, energy efficiency, biodiversity and heritage conservation and other measures that contribute to a sustainable city.

The key elements of the objectives in this chapter include:

− Protect the natural environment, open spaces and heritage by conserving and managing our natural, cultural and built heritage, including Indigenous heritage. Environmental and heritage issues, including Indigenous spirituality, must be integrated into land use planning, management and development decision-making in the earliest stages; and
− Provide a city plan that will be implemented, provide certainty and deliver results.

The planning system must operate to support local government in adopting a strategic approach. This is to be reinforced by the new partnership arrangement between state and local, which includes environmental and heritage management.

The strategies this chapter focuses on include:

1. Refocus planning decision-making procedures to bring environmental and heritage issues into equal partnership with social and economic factors.
2. Empower local government and the communities to promote and defend environmental and heritage issues.
3. Protect biodiversity.
4. Protect areas of environmental significance.
5. Interlink recreational areas, environmental reserves, greenways and other natural open-space areas, so as to provide a continuous and meaningful greenway from the Moore River, through the heart of the city to Busselton.
6. Protect and manage water resources.
7. Improve coastal planning and management to maintain amenity and biodiversity values of Perth’s public foreshore reserve system.
8. Reduce the ecological footprint of Perth, Mandurah and Murray.
9. Develop legislation and policy to reduce energy use, resource consumption and waste.

Chapter 6: Transport

This chapter takes a closer look at what is required to align the transport system more closely with the land use pattern.

The key elements of the objectives in this chapter include:

− Accommodate urban growth primarily within a Network city pattern, incorporating communities;
− Align transport systems and land use to optimise accessibility and amenity; and
− Deliver a safe, reliable and energy-efficient transport system that provides travel choice.
Stage 1 Report

The strategies this chapter focuses on include:

1. Integrate local and longer distance transport needs to support the *Network city* with a view to decreasing car dependency.
2. Ensure that transport within activity corridors compliments and links activity centres and supports the corridor concept.
3. Enhance the safety and efficiency of the transport corridors, especially for freight and longer distance public transport.
4. Enhance the efficiency and effectiveness of the freight transport system.
5. Expand the public transport system and enhance the road network to handle the mobility and access needs of people living in outer urban areas.
6. Enhance accessibility to facilities and services, and to employment and recreational opportunities, through a balanced transport system that provides choice in transport modes, prioritises public transport, walking and cycling wherever possible, and does not inequitably limit accessibility based on location or access to a private car.
7. Improve the viability of the public transport system by encouraging balanced ridership between activity centres, to reduce the extent of unused system capacity.
8. Ensure aviation and airport infrastructure is protected and developed.

### Chapter 7: Infrastructure co-ordination

This chapter looks at how investment in infrastructure can be used to help shape the *Network city*.

Physical infrastructure refers collectively to assets such as roads, bridges, ports, rail tracks, pipes, power lines and other public works and the resources carried by these assets such as water, gas, electricity and transport. Social infrastructure refers to those elements of the urban environment that facilitate the functioning of society such as schools, hospitals, police and fire stations, libraries and cultural facilities. In the context of the study area, the physical infrastructure would be the more relevant aspect that needs to be looked into.

The key element of the objective in this chapter includes ensuring employment is created in centres by providing for adequate and efficient delivery of key utility services.

The strategies this chapter focuses on include:

1. Use the provision of infrastructure to influence the timing and location of growth.
2. Maximise service efficiency and equity through better utilisation and coordination.
3. Use technological change to enhance service provision.
4. Minimise infrastructure costs by managing urban growth and encouraging stakeholder partnerships.
Figure 12 Network City Framework
2.9.2 Gnangara Land Use and Water Management Strategy (2001)

Key Points:
- The Strategy examines existing land uses and the impacts on water quality and potential risks of contamination;
- It makes recommendations on the types of land uses and zonings that are appropriate in the strategy area;
- The Strategy covers the Underground Water Pollution Control Areas of the central Gnangara Mound (which corresponds with the study area of this report); and
- Recognizes the proposed reservation of the Gnangara Park which could replace the pine plantation areas as they are progressively harvested over the next 20 years.

The WAPC prepared the Gnangara Land Use and Water Management Strategy which covers the Underground Water Pollution Control Areas of the central Gnangara Mound (note: that area corresponds very closely with the study area of this report). The Strategy examines existing land uses and the impacts on water quality and potential risks of contamination. It makes recommendations on the types of land uses and zonings that are appropriate in the strategy area.

The overall aim of this Strategy is to protect the important groundwater and environmental features of the Gnangara Mound while allowing compatible development of the land for the benefit of the community.

The principal objectives are to:
- Protect the public groundwater supplies by promoting land use and development which are consistent with the objectives for the protection and management of the UWPCA and key environmental features;
- Provide a planning framework for landowners, local and State government for land use decision-making which complements groundwater protection;
- Preserve wetlands and significant vegetation; and
- Sustain compatible economic and recreational activities and other environmental values.

Existing Urban, Urban Deferred and Industrial areas are recognised as Priority 3 source protection areas and existing Special Rural zones as Priority 2 source protection areas. It recommends no further development or expansion of high-risk land use activities in Priority 1 source protection areas and recommends the Government purchase land in Priority 1 areas if landowners wish to sell.

Other relevant features of this Strategy include:
- The recognition and proposed reservation of the Gnangara Park which could replace the pine plantation areas as they are progressively harvested over the next 20 years. Gnangara Park will protect water quality on the Mound and offer new, nature-based recreation opportunities with a lessened fire risk in Perth’s rapidly developing northern corridor. These activities will be compatible with the Priority 1 source protection;
- The implementation of the Strategy involves an amendment to the MRS to include a Water Catchments reservation over Priority 1 source protection areas and a Rural-Water Protection zone over Priority 2 source protection areas; and
- A need for local governments to incorporate groundwater protection areas and appropriate land use controls in local town planning schemes.
2.9.3 The Future of East Wanneroo- Land use and water management in the context of Network City (2007)

Key Point:
- The aim of this Strategy is to identify the future of east Wanneroo in the context of Network City and to prepare a concept for sustainable land use and water management.

Community uncertainty, climate change, declining water table levels over the Gnangara Mound, impacts on the groundwater dependent ecosystems, declining public and private water supply and changing agricultural economics, have all led to this review of future land uses and water resource management issues in east Wanneroo.

The aim of this Strategy is to identify the future of east Wanneroo in the context of Network City and to prepare a concept for sustainable land use and water management by integrating land use planning and future development with water resource planning objectives, the allocation of land for agricultural uses, the protection of basic raw materials, environmental values and landscape features, for the benefit of the whole community.

2.10 Regional and Sub-regional Structure Plans

2.10.1 North West Corridor Structure Plan (1992)
This corridor is strategically located adjacent to the northern beaches, providing it with a powerful market force (Hill, 2005). Forming part of the Noongar country, the Corridor consists of two cities: Joondalup and Wanneroo (DOIR, 2007). Major investments in the City of Wanneroo Offices, the Wanneroo Hospital, and other significant services have been key in bringing residential development to the Sub-Regional Centre of Joondalup (Hill, 2005).

2.10.2 North East Corridor Structure Plan (1994)
The North East Corridor was identified in the 1990 Metroplan (Department of Planning and Urban Development, 1990) including regional open space, rural/non-urban uses, major industry and future urban development. Subsequently, the North-East Corridor Structure Plan (Ministry for Planning, 1994) provided more detail and guidance on planning in the corridor. The structure plan is an advisory document only which can be modified in the future if conditions or requirements change. The localities included in the study area are the northern part of Caversham, West Swan, Henley Brook, Ellenbrook, including the Vines and the eastern part of Eden Hill, and Bassendean.

2.10.3 North-East Corridor Extension Strategy (2003)
The strategy looks forward to 2090 and provides a context in which planning can be made. The strategy aims to safeguard the rural character and amenity of the study area: a major attractor that draws people to live in the area.

Since the early 1990s, the north-east corridor of the Perth metropolitan region has been identified in planning documents as an area with the potential for urban growth. The State Planning Strategy, released in 1997, proposed an extension to the north-east corridor with the intention of providing for increased urbanisation and employment opportunities. Development interest in the area north of Ellenbrook has been increasing since the late 1990s and it became apparent that a more detailed planning strategy was required. There are a number of substantial issues in the area and long lead times may be needed to ensure that land is put to its most effective and acceptable use. With this in mind, this planning strategy is needed in order to:

- Translate the State Planning Strategy into a land use and transportation strategy, spatially and temporally;
- Establish guidelines to facilitate the most effective use of land;
Stage 1 Report

- help in resolving planning and environmental issues, in particular nutrient discharges to the Swan River system;
- Provide a basis for transport and utilities authorities to plan future requirements;
- Ensure that subdivision and development proposals do not compromise long-term planning objectives for the area; and
- Allow for the orderly and progressive implementation of any new development areas.

2.11 Western Australian State Sustainability Strategy (2003)

Key Points:
- The State Sustainability Strategy is designed to provide background to the concept of sustainability as well as establish illustrative actions for sustainability in Western Australia.
- Forty-two priority areas for government actions have been outlined whereby opportunities to progress sustainability are identified and illustrative government actions, to be implemented over the next five to ten years, are described.

This strategy, Australia’s first comprehensive sustainability strategy at the State Level, was developed by the Western Australian Government. The purpose of the State Sustainability Strategy is to illustrate how the State government will respond to the sustainability agenda by adopting the sustainability framework and highlighting actions across government that give meaning to the framework. The State Sustainability Strategy is designed to provide background to the concept of sustainability as well as establish illustrative actions for sustainability in Western Australia.

The majority of the Strategy document outlines forty-two priority areas for government action in six sections:
1. Sustainability and governance
2. Contributing to global sustainability
3. Sustainable natural resource management
4. Sustainability and settlements
5. Sustainability and community, and

For each priority area opportunities to progress sustainability are identified and illustrative government actions, to be implemented over the next five to ten years, are described.

2.12 Department of Environment (DoE) Water Quality Protection Note: Land Use Capability in Public Drinking Water Source Areas

Key Points:
- Defines the Public Drinking Water Source Areas (PDWSAs);
- The PDWSA protection framework consists of three management classification areas and two types of protection zones which form the basis of some State Planning Policies; and
- Based on the priority classifications, compatibly of land uses within the PDWSAs can be determined.

This note provides advice on the acceptability of land uses and activities within specific catchments that are the water source for schemes supplying cities and towns. These are termed Public Drinking Water Source Areas (PDWSAs). The note also forms an integral part of the Western Australian Planning Commission’s Statement of Planning Policy No. 2.7- Public Drinking Water Source Policy 2003 and SPP 2.2 Gnangara Groundwater Protection. It is also intended to support the proposed Statement of Planning Policy for Water Resources designed to guide planning decisions in future PDWSAs. This note should be used by Local Government when developing local planning strategies, structure plans and town planning schemes. It should also be used in the assessment of subdivision.
and other development applications. The note will also assist the development of formal guidelines on land use activities in PDWSA prepared in liaison with key stakeholders such as the Water Corporation, Department of Health, Department of Conservation and Land Management, Department of Agriculture, Department of Industry and Resources, Department for Planning and Infrastructure and local government.

Public Drinking Water Source Area in Western Australia is the collective description for:
- Underground Water Pollution Control Areas;
- Water Reserves; and
- Catchment Areas.

declared under the Metropolitan Water Supply, Sewerage and Drainage Act 1909 or the Country Areas Water Supply Act 1947. The PDWSA protection framework consists of three risk management based priority classification areas and two types of protection zones which form the basis for the State Planning Policies discussed in Section 2.7. Based on the priority classifications, compatibility of land uses within PDWSAs can be identified as either ‘Incompatible’, ‘Compatible with Conditions’ or ‘Acceptable’ (Table 1).
<table>
<thead>
<tr>
<th>Model Scheme Text and Interpreted type of land use</th>
<th>P1 areas</th>
<th>P2 areas</th>
<th>P3 areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture- extensive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• pastoral leases</td>
<td>Compatible with conditions</td>
<td>Acceptable</td>
<td>Acceptable</td>
</tr>
<tr>
<td>Animal establishment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• apiaries</td>
<td>Compatible with conditions</td>
<td>Acceptable</td>
<td>Acceptable</td>
</tr>
<tr>
<td>Bed and breakfast</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• accommodation a maximum of 6 guests</td>
<td>Compatible with conditions(^1), (^2)</td>
<td>Acceptable(^3)</td>
<td>Acceptable</td>
</tr>
<tr>
<td>• Farm stay accommodation, rural chalets</td>
<td>Compatible with conditions(^1), (^2)</td>
<td>Acceptable(^4)</td>
<td>Acceptable</td>
</tr>
<tr>
<td>Caretakers dwelling</td>
<td>Compatible with conditions(^5)</td>
<td>Compatible with conditions</td>
<td>Acceptable</td>
</tr>
<tr>
<td>Educational establishment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Community education centres, scientific research institution</td>
<td>Compatible with conditions(^5)</td>
<td>Compatible with conditions(^6)</td>
<td>Acceptable(^6)</td>
</tr>
<tr>
<td>Forestry (native forestry/siviculture/treefarming)</td>
<td>Compatible with conditions(^7)</td>
<td>Compatible with conditions(^7)</td>
<td>Acceptable</td>
</tr>
<tr>
<td>Home Occupation</td>
<td>Compatible with conditions(^8)</td>
<td>Acceptable(^9)</td>
<td>Acceptable(^6)</td>
</tr>
<tr>
<td>Home Office</td>
<td>Compatible with conditions(^8)</td>
<td>Acceptable</td>
<td>Acceptable</td>
</tr>
<tr>
<td>Industry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cottage</td>
<td>Compatible with conditions</td>
<td>Compatible with conditions</td>
<td>Acceptable</td>
</tr>
<tr>
<td>• Drinking water treatment plant</td>
<td>Compatible with conditions</td>
<td>Compatible with conditions</td>
<td>Acceptable</td>
</tr>
<tr>
<td>• Extractive, includes construction/mining camps(^10)</td>
<td>Compatible with conditions</td>
<td>Compatible with conditions</td>
<td>Acceptable</td>
</tr>
<tr>
<td>National and regional parks and nature reserves</td>
<td>Acceptable</td>
<td>Acceptable</td>
<td>Acceptable</td>
</tr>
<tr>
<td>Plantation</td>
<td>Compatible with conditions(^7)</td>
<td>Compatible with conditions(^7)</td>
<td>Acceptable</td>
</tr>
<tr>
<td>Residential building</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• house</td>
<td>Compatible with conditions(^2)</td>
<td>Acceptable(^4)</td>
<td>Acceptable(^6)</td>
</tr>
<tr>
<td>Telecommunications infrastructure</td>
<td>Compatible with conditions</td>
<td>Compatible with conditions</td>
<td>Compatible with conditions</td>
</tr>
<tr>
<td>Toilet blocks and change rooms</td>
<td>Compatible with conditions(^5)</td>
<td>Compatible with conditions</td>
<td>Compatible with conditions</td>
</tr>
</tbody>
</table>

\(^1\) May be approved if occupancy is of equivalent size to a single dwelling household (i.e. less than 10 people– defined by capacity of a septic tank based on-site wastewater treatment system).

\(^2\) Limited to one residential building per property.

\(^3\) As defined in the Model Scheme Text (1997) or the Residential Design Codes of Western Australia (2002) prepared by the Western Australian Planning Commission, and covering local government planning schemes.

\(^4\) In Priority 2 areas: conditions may apply to density of dwellings (i.e. hectares per dwelling).

\(^5\) The land use is normally incompatible, but may be conditionally approved where this facility is consistent with approved State and local government planning strategies or schemes.

\(^6\) Must be connected to deep sewerage, except where exemptions apply under State Government Sewerage Policy. The Policy recognises that sewer connection may be impractical in some areas. Under these circumstances maximum wastewater loadings (based on people/hectare) apply linked to the management priority of the site.

\(^7\) Conditions apply to regulate fertiliser and pesticide application.

\(^8\) May only be approved if Home Occupation relates to an existing residence.

\(^9\) Employees shall be members of the household, and the home business occupies an area of up to 20 square metres. No provision for refuelling, repair or maintenance of commercial/business vehicles or on-site use or storage of chemicals.

\(^10\) Conditions apply to the storage of fuels and chemicals, the depth of excavation related to the water table and rehabilitation criteria. Underground fuel or chemical storage tanks are prohibited via DOE by-laws in Priority 1 and 2 areas within Underground Water Pollution Control Areas.
2.13 Planning Bulletins

**Key Point:**
- Planning bulletins canvas proposed policy changes or highlight information about WAPC and DPI policies and procedures on a variety of planning matters;

Planning bulletins canvas proposed policy changes or highlight information about Western Australian Planning Commission and Department for Planning and Infrastructure policies and procedures on a variety of planning matters. The relevant bulletins in the context of the Gnangara mound include the following:

### 2.13.1 No 53 Development by Public Authorities on Land Reserved Under the Metropolitan Region Scheme (2002)

**Key Points:**
- The purpose of this Bulletin is to clarify where public authorities, local government and the Commission stand in terms of what kind of development needs to be approved.

This bulletin outlines recent changes to the procedures to be followed by public authorities in carrying out development on reserved land under the Metropolitan Region Scheme (MRS). This Planning Bulletin supersedes Planning Bulletin No. 42.

Clause 13 of the MRS States:

“No person shall commence or carry out any development on reserved land, other than the erection of a boundary fence, without first applying for and obtaining the written approval of the Commission to do so.”

The purpose of this Bulletin is to clarify where public authorities, local government and the Commission stand in terms of what kind of development needs to be approved in accordance to Clause 16 which states:

“Reserved land owned by or vested in a public authority may be used without the written approval of the Commission referred to in Clause 13 if the land is used:
- For the purpose for which it is reserved under the Scheme;
- For any purpose for which it was lawfully used before the coming into force of the Scheme; or
- For any purpose for which the land may be lawfully used by the public authority.

Development on reserved land owned by or vested in a public authority may be commenced or carried out without the written approval of the Commission if the development is:
- Permitted development that does not involve the clearing of regionally significant vegetation on a site specified as a *Bush Forever* site in the *Bush Forever Final Report* published by the Commission in December 2000; or
- Expressly authorized under an Act to be commenced or carried out without the approval of the Commission.

Reserved land owned by or vested in a public authority may be used or developed for any other purpose approved by the Commission with or without conditions.
In this clause:

“permitted development” means:

- Works on land reserved for Primary Regional Roads or Other Regional Roads for the purpose of or in connection with a road within the meaning of the Main Roads Acts 1930;
- Works on land reserved for Port Installations for the purpose of or in connection with a port;
- Works for the purpose of or in connection with the supply of water, electricity or gas, or the drainage or treatment of waste, water or sewerage;
- Works on land reserved for Railways for the purpose of or in connection with a railway, but this does not include the construction or alteration of a railway station or any related car parks, public transport interchange facilities, or associated means of pedestrian or vehicular access;
- Works on land reserved for Parks and Recreation where the works are in accordance with a management plan endorsed by the Commission;
- Works on land reserved for Public Purposes - High School for the purpose of or incidental to a high school; and
- Operational works on land reserved for State Forests for the purpose of or incidental to a State Forest.

“reserved land owned by or vested in a public authority” includes reserved land in relation to which a public authority has an easement, right of way, right of occupation, or any other interest or right, privilege or concession”.

2.13.2 No 61 Urban Stormwater Management

The purpose of this bulletin is to advise the WAPC on current policy and practices regarding urban stormwater management; and considerations that need to be taken into account when dealing with urban stormwater management for new residential subdivisions.

In the context of the Gnangara Mound, there are various factors which may influence the quality and quantity of stormwater. These include the duration and intensity of rainfall, soil type, proportion of impervious surfaces, contours of the land, land use, and the design and management of stormwater systems. Stormwater is also a source of contamination. In addition to contaminants from the atmosphere, stormwater has the potential to transport accumulated surface material including litter, dust, oils, grease, fertilisers and other nutrients into waterways.

A number of current WAPC policies are reviewed in this document. The following are general implementations that need to be regarded (by the WAPC) in urban water management for new subdivisions, and in scheme provisions and structure plans:

- The relevant provisions of policies DC No.1.1 Subdivision of Land – General Principles, DC No. 2.3 Public Open Space in Residential Areas and DC No. 6.3 Planning Considerations in the Metropolitan Region for Sources of Public Water Supply and Sensitive Water Resource;
- The provisions of Liveable Neighbourhoods with specific reference to Element 4 (public parkland) and Element 5 (urban water management);
- Any relevant land use and water management strategy;
- The extent to which the proposed system of stormwater management improves the quality of storm water, minimises pollutants, retains and restores existing valuable elements of the natural drainage system, and minimises run-off and maximises capture of rainwater for re-use.

The outcomes need to be sustainable while the drainage authority has the ultimate responsibility for the maintenance of the urban stormwater infrastructure. Systems that are implemented need to find
the appropriate balance between environmental benefit and long-term cost. It is also noted that
stormwater management design is dependent on the local soil, water table and drainage
characteristics of any particular area and thus will vary depending on location.

2.13.3 No 63 Policy for Dealing with Potential Conflicts between Residential
Subdivision and Market Gardens in East Wanneroo

<table>
<thead>
<tr>
<th>Key Points:</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Wanneroo is a major growth area and land designated for urban development has progressively been rezoned from Rural to Urban in the MRS to accommodate future housing;</td>
</tr>
<tr>
<td>Urban development will result in the progressive phasing out and relocation of existing market gardens in large parts of East Wanneroo; and</td>
</tr>
<tr>
<td>For market gardens in areas zoned Urban or Urban Deferred in the MRS, the primary objective is to minimise the impact of existing market gardens on residential development.</td>
</tr>
</tbody>
</table>

East Wanneroo is identified as a major growth area in the *North West Corridor Structure Plan* and land designated for urban development has progressively been rezoned from Rural to Urban in the MRS to accommodate future housing. Urban development will result in the progressive phasing out and relocation of existing market gardens in large parts of East Wanneroo. The continued use of land for market gardens in the land remaining in the Rural zone is however recognised.

The objectives of the policy, in relation to market gardens on land zoned Rural in the MRS are to:
- Minimise the effects of residential development on market gardens which are practiced in accordance with the relevant legislation, codes of practice and associated industry-specific guidelines;
- Minimise the potential for complaints about market gardens from residential areas; and
- Provide residents with acceptable standards of amenity in residential areas that are located in proximity to market gardens.

With regard to market gardens in areas zoned Urban or Urban Deferred in the MRS, the primary objective is to minimise the impact of existing market gardens on residential development and to encourage the progressive relocation and phasing out of market gardens by urban development.

To meet the objectives, the following policy measures have been put in place:

For *residential subdivision in the vicinity of market gardens on land zoned Rural in the MRS, the WAPC will accept:*
- A separation distance of 300m which can be reduced to a protected and maintained vegetated buffer strip ≥ 20m in width, together with adequate additional land for access for maintenance and firebreaks, and specially designed fencing of the type specified below;
- Prospective purchasers within 300m of the boundary of the market garden to be advised of the existence of the market garden on the contract of sale; and
- Memorials to be included on titles of all residential lots within 300m of the boundary of the market garden advising of the location and impacts of the market garden on amenity.

For *residential subdivision and development in the vicinity of market gardens on land zoned Urban or Urban Deferred in the MRS, the WAPC will accept:*
- For residential lots abutting a market garden, specially designed fencing of the type specified below, together with a protected and maintained vegetation buffer of one line of evergreen trees or bushes (≥ 1.5m high) for residential lots abutting a market garden;
- For roads and open space abutting a market garden, suitable rural fencing of good standard on the boundary of the market garden;
- Prospective purchasers within 300m of the boundary of the market garden being advised of the existence of the market garden on the contract of sale;
Memorials to be included on titles of all residential lots within 300m of the boundary of the market garden advising of the location and potential impacts of the market garden on amenity; or

Other measures which it can be demonstrated meet the objectives of the policy to the satisfaction of the WAPC.

The specially designed fencing should be 1.8m high and constructed from semi-porous material such as shade cloth or similar to allow airflow. Where a solid fence is preferred, the fence should be 1.8m high with the top 300mm constructed from porous materials (such as lattice work) to allow free air flow through the fence, with the balance of the fence constructed from solid materials.

Where practical, the opportunity should be taken of increasing the separation between market gardens and residential uses by:

- Retaining natural features free from development to act as buffers between newly developing areas and market gardens;
- Designing residential areas so that features such as public open spaces, road reserves and other compatible uses provide the required separation;
- Locating large residential lots incorporating the required buffer area on the boundary between the residential subdivision and the market garden allowing an adequate balance of the lot to be available for the house and normal residential use; and
- Staging residential subdivision to coincide with the relocation of market gardens.

2.13.4 No 64 Acid Sulphate Soils

Key Points:

- The purpose of this Planning Bulletin is to provide advice and guidance on matters that should be taken into account in the rezoning, subdivision and development of land that contains acid sulphate soils (ASS);
- ASS are an important issue that need to be addressed in planning as they can cause significant harm to the environment and infrastructure; and
- There are large areas within the Gnangara Mound study area where moderate to low risk ASS may occur, as well as areas of potential high to moderate ASS. The presence or possible presence of acid sulphate soils is a development constraint that should be subject to an appropriate risk assessment.

According to Sommer and Horwitz (2001), the effects of climate change and/or atmospheric loading are exacerbated by changes in land-use within the catchment of the waterbodies. Extensive extraction of groundwater to meet agricultural, industrial and domestic water demand in industrialized regions can lower regional water tables, particularly during periods of below-average rainfall (Kamers et al., 1998; cited in Sommer and Horwitz, 2001).

The purpose of this Planning Bulletin is to provide advice and guidance on matters that should be taken into account in the rezoning, subdivision and development of land that contains acid sulphate soils.

Acid sulphate soils (ASS) are an important issue that need to be addressed in planning as they can cause significant harm to the environment and infrastructure. The principal environmental, social and economic impacts of acid sulphate soils have been documented includes:

- Adverse changes to soils and water quality;
- Deterioration of ecosystems and the ecosystem services associated with soils, groundwater, wetlands, watercourses and estuarine environments;
- Local and regional loss of biodiversity in areas affected by acid sulphate soils leachate;
- Loss of groundwater and surface water resources used for irrigation and other purposes;
- Reduction in opportunities for agriculture and aquaculture;
Human health concerns particularly from arsenic contamination of groundwater in areas affected by acid sulphate soils;

Corrosion of engineering works and infrastructure;

Conflict between activities that depend on healthy surface and groundwater regimes and activities that may have resulted in disturbance to acid sulphate;

Loss of visual amenity from plant deaths, weed growth and invasion by acid tolerant waterplants and algae; and

Costs to the community in terms of financial outlays and the community’s and government’s time and effort in minimising impacts and rehabilitating disturbed areas.

Figure 13 shows areas where ASS are likely to be found on the Gnangara Mound. It can be noted that there are large areas within the Gnangara Mound study area where moderate to low risk ASS may occur, as well as areas of potential high to moderate ASS. While the presence or possible presence of acid sulphate soils is a development constraint that should be subject to an appropriate risk assessment, the current lack of detailed knowledge as to the location of acid sulphate soils in Western Australia makes it difficult to provide a comprehensive planning response to the issue. Nevertheless developers, planners and the community need to be aware of the implications of the presence of acid sulfate soils and, perhaps more importantly, the management processes required to avoid their potential adverse effects on the environment and infrastructure.

A summary of the guidelines this bulletin provides include:

- Any change of zoning that will lead to any intensification of land use in areas which show evidence of a significant risk of disturbing acid sulphate soils should be accompanied by a Preliminary Site Assessment;

- Where the presence of acid sulphate soils has been confirmed by a Preliminary Site Assessment, the change of zoning should also be accompanied by a Detailed Site Assessment and Acid Sulphate Soil Management Plan that determines the capacity of the land affected by the change to sustain the proposed land use;

- Any change of zoning that will lead to any intensification of land use on such land should be referred to the relevant government authorities, for advice prior to a decision being made; and

- The rehabilitation of disturbed acid sulphate soils and acid drainage should be encouraged.
Figure 13 Map showing the location of potential acid sulphate soils on the Gnangara Mound
2.13.5 No 80 Swan Valley Planning Legislation Amendment Act 2006

Key Points:
- The Swan Valley Planning Act ensures the special character of the Swan Valley will be protected and provide a magnificent recreational asset for all of Perth;
- The changes in the Act will ensure a minimum four-hectare lot size in the Herne Hill and Middle Swan precincts.

The Act ensures the special character of the Swan Valley will be protected and provide a magnificent recreational asset for all of Perth. The Swan Valley Planning (SVP) Act as introduced established four planning areas, each with specific planning objectives.

These four areas were:
- **area A**: predominantly for rural living purposes with a minimum lot size of one hectare;
- **area B**: for productive agricultural uses with a minimum lot size of four hectares;
- **area C**: for rural living with a minimum lot size of four hectares; and
- **area D**: rural villages with lot sizes of 2000 m² to 4000 m².

Upon reviewing the Act, it was deduced that the SVP Act has functioned effectively in encouraging traditional uses in the Swan Valley; protecting the environment and the rural character of the valley; and promoting tourism. This had one exemption being the area D precinct whereby the SVP Act permitted rural villages to be developed in this location. The inclusion of area D precincts in the SVP Act was a compromise position stemming from initial plans for urban development in the Swan Valley in the early 1990s.

There were three such locations: Herne Hill, Middle Swan and Caversham. The rural village concept was problematic. A ‘rural village’ was not defined in the SVP Act and the SVP Act did not detail the size of or number of rural villages that could be approved for each of the three area D precincts.

The amendment to the Act will ensure that the rural character of the valley will be preserved by the reclassification of the Herne Hill and Middle Swan area D precincts to area C and the deletion of references to rural villages in the Act. The changes will ensure a minimum four-hectare lot size in the Herne Hill and Middle Swan precincts.

2.13.6 No 87 High Pressure Gas Transmission Pipelines in the Perth Metropolitan Region

Key Points:
- This planning bulletin applies to the Perth metropolitan region as defined by the Metropolitan Region Scheme (MRS);
- It applies to schemes, scheme amendments, structure planning, subdivision or development, except for conventional agricultural or rural pursuits, within the vicinity of the Dampier to Bunbury Natural Gas Pipeline corridor and the Parmelia Gas Pipeline easement;
- Setback distances from the edge of the corridor/easements have been identified for sensitive development as well as residential, commercial and industrial development; and
- Notification areas have been created to ensure that any changes to the pipeline location classification in accordance with Australian Standard 2885 Pipelines-Gas and Petroleum High pressure gas transmission pipelines have a level of risk, which must be assessed when considering local planning schemes, scheme amendments, structure plans, land use, subdivision and development of land in the vicinity of the pipelines, to ensure that risk to people and property is within acceptable levels. Pipelines are susceptible to third party damage and landowners in the vicinity of these pipelines must be aware of this possibility.
Stage 1 Report

This planning bulletin applies to the Perth metropolitan region as defined by the Metropolitan Region Scheme (MRS). It applies to schemes, scheme amendments, structure planning, subdivision or development, except for conventional agricultural or rural pursuits, within the vicinity of the Dampier to Bunbury Natural Gas Pipeline corridor and the Parmelia Gas Pipeline easement.

The need for this planning bulletin has arisen because the pipelines traverse parts of the metropolitan region that have been identified for future urban development. Accordingly, improved planning mechanisms are needed to ensure people and property are not put at unacceptable risk levels and that the future potential of the pipeline corridor/easements are not constrained, including the possibility for additional pipelines within the Dampier to Bunbury Natural Gas Pipeline corridor.

The bulletin makes two main recommendations on what needs to be done in areas where a high pressure transmission pipeline exists. Several quantitative risk assessments of the Dampier to Bunbury Natural Gas Pipeline and the Parmelia Gas Pipeline in the Perth metropolitan region have been undertaken, which have indentified setback distances from the edge of the corridor/easements for sensitive development as well as residential, commercial and industrial development. The distances are based on the Environmental Protection Authority’s (EPA) criteria for individual fatality risk from hazardous industrial plants.

For proposals within the setback distances, a pipeline risk management plan will be required to demonstrate that the risk from the pipeline is within acceptable risk levels.

The second main recommendation is the creation of a notification area which sets out the distances within which rezoning proposals require notification to the pipeline owners by the planning authority. A notification area has been defined to ensure that consultation occurs with the pipeline owners regarding certain rezoning proposals in the vicinity of a high pressure gas transmission pipeline to ensure that any changes to the pipeline location classification in accordance with Australian Standard 2885 Pipelines-Gas and Petroleum are identified.

2.14 Bush Forever

<table>
<thead>
<tr>
<th>Key Points:</th>
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<tbody>
<tr>
<td>• The Bush Forever plan identifies 51,200 hectares of regionally significant bushland for protection; and</td>
</tr>
<tr>
<td>• 30% of the study area contains Bush Forever sites.</td>
</tr>
</tbody>
</table>

Bush Forever is a document that aims to implement many of the objectives in Perth’s Bushplan, and replaces the MRS System 6 Report. The plan identifies 51,200 hectares of regionally significant bushland for protection. The plan attempts to preserve at least 10 percent of each of the 26 significant vegetation complexes. This initiative is being headed by the Department of Planning and Infrastructure, but is a coordinated effort of many different agencies and interest groups as it is a national policy.

Bush forever sites are found throughout the study area and occupy much of the study area (30%) that is not affected by areas designated Groundwater Source Protection Areas 1 and 2.

2.15 Environmental Protection (Gnangara Mound Crown Land) Policy 1992

<table>
<thead>
<tr>
<th>Key Points:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The purpose of this policy is to protect the level and quality of groundwater on or under the policy area, and native vegetation and wetlands in the policy area; and</td>
</tr>
<tr>
<td>• Discharge of contaminants; mining and excavation; abstraction of groundwater; filling of wetlands; clearing, destruction or removal of native vegetation cannot proceed under this policy area unless authorized under the Environmental Protection Act 1986 or any other written law.</td>
</tr>
</tbody>
</table>
The purpose of this policy is to protect:

- The level and quality of groundwater on or under the policy area; and
- Native vegetation and wetlands in the policy area.

Under the policy, the following uses of groundwater on or under the policy area are declared to be beneficial uses to be protected:

- Use of the groundwater to support native vegetation and wetlands in the policy area;
- Use of the groundwater for public and private supply and use; and
- Use of groundwater to support the pine plantations.

The following uses of native vegetation and wetlands in the policy area are deemed beneficial if protected under the policy:

- A tool for monitoring groundwater levels and quantity;
- A refuge for many rare, endangered, and geographically restricted species of flora and fauna;
- A focus of cultural and heritage values for communities living in the area before European settlement;
- An important aesthetic element of the natural landscape; and
- Providing a biologically productive and genetically diverse natural environment.

The policy identifies the discharge of contaminants in the policy area; the filling in of wetlands in the policy area; excavation or mining operations in the policy area; clearing/destruction of native vegetation on or from the policy area; and the excessive abstraction of groundwater from the policy area as potential activities that may affect the quality and quantity of groundwater in the policy area.

The achievement and maintenance of the environmental quality objectives and the protection of groundwater, native vegetation and wetlands in the policy area are to be effected by:

- Local authorities and the State Planning Commission giving effect of the Planning Policy;
- Management, development and use of Whiteman Park being carried out in accordance with the Whiteman Park Development Strategy;
- Management, development and use of Yanchep National Park being carried out in accordance with the Yanchep National Park Management Plan;
- Management of pine plantations being carried out in such a manner as to ensure that use of groundwater by the pine plantation is no greater than the use of groundwater by native vegetation; and
- Controlling activities in the policy area that may affect the quality and quantity of groundwater.

Discharge of contaminants; mining and excavation; abstraction of groundwater; filling of wetlands; clearing, destruction or removal of native vegetation cannot proceed under this policy area unless authorized under the Environmental Protection Act 1986 or any other written law.

2.16 Guideline for the Determination of Wetland Buffer Requirements (2005) (Draft)

Key Points:

- This policy should be used where a change in land use or development is proposed in the immediate vicinity of a wetland where the future use or development is likely to conflict with the established wetland management objective;
- Buffering provides an important tool in achieving and maintaining the desired values, processes, functions and attributes of wetlands; and
- Silvicultural activities can significantly affect groundwater recharge rates and impact on wetland water levels therefore setting up appropriate buffers is important to ensure that the impacts on wetlands are minimised.
This guideline has been developed to assist landowners, developers, planners and architects to identify an appropriate buffer between wetlands and land uses that will enhance or maintain the significant attributes and values of the wetland. It should be used where a change in land use or development is proposed in the immediate vicinity of a wetland (i.e. within a lot containing a wetland or adjacent to a wetland) where the future use or development is likely to conflict with the established wetland management objective.

This guideline recognises that the planning process must consider other relevant factors, together with environmental factors, in decision-making. Importantly, planning is guided by sustainability principles, as established in the Western Australian State Sustainability Strategy, 2003.

The role that catchment management plays in dealing with wetland issues such as pollution, particularly groundwater pollution, must also be recognised. Groundwater pollution and its impact on wetlands, water regime issues, the terrestrial habitat requirements of many fauna species that inhabit wetlands and the management of mosquitoes and midges extend beyond the influence of wetland buffering. These aspects need to be considered as land planning and management issues in their own right and therefore are beyond the scope of this guideline.

Buffering provides an important tool in achieving and maintaining the desired values, processes, functions and attributes of wetlands. Figure 14 shows the wetlands in the Study area while Figure 15 shows the proposed buffering concept in terms of the three basic areas requiring definition to provide separation for the wetland:

- The wetland water body;
- The wetland function area; and
- The separation requirement.
Figure 14 Map showing the Wetlands, Rivers and Floodplains in and around the Study Area
In order to determine the most suitable buffer, there are seven steps to follow. These include:

- **Step 1** Acknowledge existence of wetland;
- **Step 2** Identify wetland attributes wetland management category and establish management objective;
- **Step 3** Define wetland function area;
- **Step 4** Identify threatening processes;
- **Step 5** Identify role of separation;
- **Step 6** Establish separation requirement; and
- **Step 7** Apply separation requirement to proposal and assess its ability to achieve management objective.

Silvicultural activities can significantly affect groundwater recharge rates and impact on wetland water levels. The State Forest 65 pine plantations at Gnangara are attributed with causing a significant reduction in recharge below natural levels in areas not subjected to periodic thinning to meet target basal densities set to achieve groundwater management objectives. Setting up appropriate buffers is therefore important to ensure that the impacts of silviculture on wetlands are minimised.


**Key Points:**

- The primary aim of this policy document is to protect the ‘drinking water’ environmental value of PDWSAs on Crown land, in the interest of public health;
- The PDWSAs priority classifications of priority 1, priority 2 and priority 3 are applied in this policy; and
- Guidelines for recreation within Public Drinking Water Source Areas on Crown land are supported by the document which includes: land based recreation, water based recreation, and catchment management.

The primary aim of this policy document is to protect the ‘drinking water’ environmental value of PDWSAs on Crown land, in the interest of public health. This will be achieved by protecting drinking water sources from contamination that may be caused by inappropriate recreational activities. The
PDWSAs priority classifications of priority 1, priority 2 and priority 3 are applied in this policy. This policy document provides a clear statement of the Commission’s position regarding recreational activities within Priority 1 PDWSAs on Crown land.

The most significant risk to water quality from recreational activities is direct or indirect contamination with the micro-organisms contained in human and animal excreta (NHMRC, 1996). The 1996 Australian Drinking Water Guidelines (ADWG) recommends a “multiple barrier” approach to public drinking water protection. This involves a range of protection measures which form barriers to entry or transmission of contaminants, and includes:

- Developing strategies, policies and guidelines to manage land use and activities in PDWSAs;
- Protecting water sources from contamination (especially from human and animal faeces);
- Maintaining an active protection surveillance program in PDWSAs;
- Providing special protection for sensitive areas such as water reservoirs, streams and groundwater wellheads;
- Registering and managing the use of manufactured products such as chemicals in PDWSAs; and
- Treating raw water as a barrier to ensure a healthy supply.

The following guidelines for recreation within Public Drinking Water Source Areas on Crown land are supported by the document:

**Land based recreation**

- Acceptable recreational activities on Crown land within PDWSAs will be determined on the basis of the assigned Priority classification;
- Within surface water catchments a Reservoir Protection Zone (RPZ) may be delineated. For the majority of circumstances, the RPZ contains mostly crown land, but occasionally may also contain private land;
- Within groundwater catchments, Wellhead Protection Zones may be delineated around the production bores supplying drinking water; and
- Vehicles will not be permitted on Crown land within Public Drinking Water Source Areas except on public roads and designated access roads.

**Water based recreation**

Water based recreational activities will not be permitted on drinking water supply reservoirs and feeder rivers and streams unless specific permission has been obtained from the DoE. Such permission will generally not be granted in undeveloped catchments where the existing land use poses minimal risk to the quality of the water source (risk avoidance approach).

**Proposed future water supply sources**

Recreational activities may be permitted in proposed future water supply source areas, subject to conditions to ensure the integrity of the source for its intended future use.

**Catchment management**

- Approval for formal recreational activities will be subject to the development of an environmental management plan;
- There will be ongoing water quality and catchment environmental monitoring associated with recreational use in Public Drinking Water Source Areas; and
- Recreational activities within Public Drinking Water Source Areas requiring a permit or written endorsement will only be approved if there is minimal risk to water quality and an appropriate level of supervision, monitoring and management is in place.

Table 1 and 2 in Statewide policy No 13 Policy and Guidelines for Recreation within Public Drinking Water Source Areas on Crown Land (2003) contains what recreational activity is compatible (land and water) in Reservoir Protection Zones, Wellhead Protection Zones, Proclaimed Priority 1 PDWSAs and Proposed Priority 1 PDWSAs.

Key Points:
- The report assisted in the development of appropriate strategic land use planning policies relating to transport for the Perth Metropolitan Region and assist in the implementation of the State Planning Strategy; and
- Three groups of initiatives are suggested in order to ensure integrated land use and transport policies are implemented: planning process, policy issues and future research.

This report reviewed the then current metropolitan planning strategies against the wider context of international examples of integrated land use and transport planning practice. The report assisted in the development of appropriate strategic land use planning policies relating to transport for the Perth Metropolitan Region and assist in the implementation of the State Planning Strategy.

Three groups of initiatives are suggested in order to ensure integrated land use and transport policies are implemented:

Planning Process
- Suggests the need for clear policy guidance in order to direct local government and other players;
- An implementation plan for each action in the strategy with guidance on existing and new areas;
- Use of transport impact statements; and
- Investigation of financial incentives.

Policy Issues
- Identify actions and policies in relation to journey purposes as well as land use;
- Apply initiatives to existing areas as well as new greenfield sites;
- Include more details on recreation and leisure trips/uses;
- High density employment at stations;
- Introduce an integrated package of measures; and
- Pursue a parking strategy.

Further research
- Undertake a travel audit to establish what deficiencies there are in existing areas.

2.19 Transport Assessment Guidelines for Developments (2006)

The purpose of the guidelines are to clearly identify which developments require supporting transport information, the level of information required and the format in which it should be presented. Each guideline in this document has a different role in the development planning process and the guidelines have been structured to accommodate this as well as the differing levels of land use planning. ie. structure plans, subdivisions and individual developments.

2.20 Guidance Statement No 33. Environmental Guidance for Planning and Development (Draft)

The main purposes of this EPA Guidance Statement are:
- To provide an overview of environmental protection processes and information, to assist land use planning and development in Western Australia;
- To describe referral and environmental impact assessment processes under Part IV of the Environmental Protection Act 1986 and, in particular, the procedures applied to schemes; and
- To provide the EPA’s advice on a range of environmental factors in order to assist participants in land use planning and development to protect, conserve and enhance the environment.
The document provides the following information:

- An overview on environmental protection processes in Western Australia;
- Advice on protecting a range of biophysical factors, to assist land use planning;
- Advice on managing potential pollutants, waste and water, to assist in land use planning; and
- Advice on protecting aspects of the biophysical environment of cultural and social significance to the community.

### 2.21 Aboriginal Heritage Values

#### 2.21.1 Aboriginal Land Trust (ALT): Land Use and Development Policy

**Key Points:**

- There has been documented Aboriginal activity on groundwater features on the mound;
- Any land use development activities must be negotiated, planned and undertaken in good faith with inputs from indigenous stakeholders; and
- There should be no detrimental environmental consequences for development to proceed.

According to WAPC (2007), the Nyungar people belonging to this portion of land were called the Bibbulmum and evidence of their lifestyle and sites of significance are well documented in Wanneroo particularly around the lakes and wetlands. It is therefore of utmost importance that Aboriginal heritage sites are taken into consideration during all stages of the planning process and to avoid breaches of the Native Title Act 1993 or dispute during development (WAPC, 2007).

The ALT policy states that land use and development activities must be negotiated, planned and undertaken in good faith, and with a meaningful input from indigenous stakeholders. The ALT will not approve land use and development that compromises the health and safety of nearby residents. Proponents must ensure that a suitable buffer distances between conflicting land use is established and that buffer distances are consistent with the recommendations of the Department of Water, Department of Environment and Conservation, and the WAPC. Developments must be undertaken in an environmentally sound manner, and during the course of development proponents must protect drinking water, water bodies and the natural environment, undertake dust suppression measures, minimise earthworks and removal of native vegetation, and clean up the development site.

#### 2.21.2 Study of Groundwater-Related Aboriginal Cultural Values on the Gnangara Mound, Western Australia (2005)

**Key Points:**

- The historical, ethnographic and archaeological evidence collected over recent decades, mainly during development-led heritage surveys, highlights the intensity of Aboriginal activity around lakes, rivers, swamps and springs;
- The report makes a number of recommendations aimed at avoiding further negative impacts on groundwater-dependent cultural values including: limiting drawdown of groundwater, preserving and restoring wetlands, and preserving water flow;
- Aboriginal involvement is of great significance in the development of the Management Plan and ongoing management of the water resources; and
- Areas within the pine plantations may have never been surveyed for Aboriginal sites, and therefore this needs to be carried out before any development or change in land use can occur within the study area.

A study conducted for DoE (2005a) demonstrated the close historical associations the Nyungar people have with the groundwater features of the Gnangara Mound including its lakes, rivers, swamps and springs. The historical, ethnographic and archaeological evidence collected over recent decades,
mainly during development-led heritage surveys, highlights the intensity of Aboriginal activity around such places (DoE, 2005a).

Although most Nyungar people recognise that climate change is a contributing factor in this decline, they consider residential and industrial development as a greater and more immediate cause because these activities, coupled with the Gnangara Pine Plantation, are causing an unsustainable drawdown effect on increasingly limited groundwater resources.

The report makes a number of recommendations aimed at avoiding further negative impacts on groundwater-dependent cultural values including:

− Limiting drawdown of groundwater;
− Preserving and restoring wetlands; and
− Preserving water flow.

The objectives of the study were to:

− Consider the groundwater and surface water resources of the study area in terms of the Aboriginal cultural values associated with groundwater dependent environmental features and ecological processes;
− Describe the Aboriginal cultural values and assess the significance of the identified values and identify the most significant or representative areas in terms of those values;
− Identify any registered Aboriginal heritage sites linked to the groundwater dependent environmental features and ecological processes;
− Identify how the Aboriginal cultural values will be affected by water level changes;
− Involve the Aboriginal groups with knowledge of and traditional links to the land in the study area and associated with the potentially affected resources outside the study area;
− Provide advice on Aboriginal involvement in the development of the Management Plan and ongoing management of the water resources;
− Make specific recommendations on avoidance of negative impacts on the water dependent Aboriginal cultural values; and
− Include consideration of the ways in which Aboriginal people can be involved in future monitoring, assessment and management of the resource.

Based on the findings of this study, and information provided by the Department of Indigenous Affairs, a map (Figure 16) showing the areas related to aboriginal values on the Gnangara Mound was produced, which may provide constraints in the term of land use and development.

Other findings and recommendations from this study include:

− Most listings on the Register of Aboriginal Sites were identified during heritage surveys arising from land development and, therefore, broadly reflect development patterns. Significant portions within the study area may have never been surveyed for Aboriginal sites (for example, the Pine Plantation and much of the Yeal Swamp area) and this in part accounts for the apparent absence of sites in some areas.

− Few Aboriginal sites are recorded within the pine plantation. Although this may be partly due to survey patterns, it has been suggested that the disturbed pine plantation areas, and the waterless areas of banksia bush with thick undergrowth, [are] unlikely to yield any Aboriginal sites of great import. Nevertheless, sites such as artefact scatters have been reported within the plantation.

− The Register does not contain all Aboriginal heritage sites within the study area, nor does it contain all available information for each site that is registered. Information is continuously added to the site files and the Register is, therefore, a constantly growing resource.
There is need to incorporate the values of all groups, including those of Indigenous peoples, into the planning processes;

There is a need to protect sites of Aboriginal heritage value and this should be reflected in NRM plans and the implementation of those plans;

Indigenous people have a right to be represented on regional decision-making committees;

The South West Yarragadee report recommended continuing consultation between the Water and Rivers Commission (now Department of Water) and the Aboriginal community including identifying roles for Aboriginal people in the management and monitoring of water resources and

It is important to recognise that some, perhaps many sites of Aboriginal Heritage significance may not be indentified in current surveys. It is known that the locations of some sites remain undisclosed due to privacy concerns of the relevant Aboriginal communities.
Figure 16 Study of Groundwater related aboriginal cultural values on the Gnangara Mound (DoE, 2005a)
2.22 Review of Ministerial Conditions on the Groundwater Resources of the Gnangara Mound (Draft) 2008

Key Points:
- This review considered: the ecological values and management objectives and Ministerial criteria set at each site; an assessment of compliance with Ministerial criteria; a review of current ecological condition; and technical work, which assessed the ecological condition of criteria sites based on more recent water levels recommended by ecologists.
- The Department of Water is requesting changes to a number of conditions on the Gnangara Mound; and
- The review of all attributes impacting the mound along with the relevant applicable government legislation will then lead to the development of a Water Management Plan, a Gnangara Sustainability Study, and a Revised Water management plan.

The review of Ministerial conditions was initiated in 2001 and was to be completed in two stages. Stage I was finalised in 2004 with further work undertaken as part of Stage II. Following the announcement of the Gnangara Sustainability Strategy (GSS), it was recognised that a full review of the existing environmental conditions would be better undertaken when the GSS process is completed. Therefore this review document has been prepared to finalise Stage II and will update existing conditions for both environmental and administrative criteria.

In this document, the Department of Water is requesting changes to a number of conditions. These include:

- To remove criteria for sites where the ecological values have been shown to no longer exist generally because the site has been cleared;
- To remove criteria for sites where the impacts on groundwater levels have been shown to be predominantly driven not by abstraction, but by climate or land use and land management practices that are outside the control of the department; and
- To rationalise the administrative criteria for conditions and commitments that have previously been met which will simplify reporting and auditing processes.

These changes were recommended following a detailed review of each criteria site. This review considered: the ecological values and management objectives and Ministerial criteria set at each site; an assessment of compliance with Ministerial criteria; a review of current ecological condition; and technical work, which assessed the ecological condition of criteria sites based on more recent water levels recommended by ecologists.

The review of all attributes impacting the mound along with the relevant applicable government legislation will then lead to the development of:

- A Water management plan for the Gnangara groundwater areas, scheduled for release for comment in early 2008, which will set new allocation limits and establish a clear framework for the department’s management of water abstraction in the current land use and climate context.
- A Gnangara Sustainability Study, a multi-agency study led by the department to resolve a number of land use and land management issues that are currently impacting on recharge and hence water availability on the mound – due for release in 2009.
- A Revised Water management plan for the Gnangara groundwater areas under the proposed water reform legislation. This plan will be a comprehensive statutory plan that will formalise the findings of the Gnangara Sustainability Strategy and will incorporate requirements of water planning under the National Water Initiative.
Protecting environmental values forms a key component of each of these elements, and will be addressed in the following ways:

- The Water management plan for the Gnangara groundwater areas will include an initial review of the current Ministerial conditions and criteria sites;
- The Gnangara Sustainability Strategy will establish the overall environmental objectives to which the mound will be managed over the next 20 years; and
- The Revised Water management plan for the Gnangara groundwater areas will incorporate revised climate relevant environmental water allocations, targeted to the environmental objectives determined through the Gnangara Sustainability Strategy, and based on comprehensive ecological and hydrogeological studies.

This review will form a component of the Water management plan for the Gnangara groundwater areas. In addition to this review, and the Gnangara Sustainability Strategy, the department has invested in a number of research projects that will lead to a better understanding and improved management of the Gnangara groundwater resources. These projects will inform future management and planning decisions in a number of ways.

### 2.23 Local Government Strategies and Policies

The Strategies and Land Use policies of Local Governments with zoned land within the study area were reviewed to establish their impact on land use options within the study area. The four relevant Local Authorities have limited constraints on the zoned land other than their general Scheme provisions as detailed below (Figure 17):

- Shire of Gingin – land within the study area is zoned ‘Rural’ in the Local Scheme. However, there is no applicable strategy to guide land use provision in the Study Area other than general Scheme provisions.

- Shire of Chittering – land in the Study Area is zoned ‘Rural’. The Shire’s interim Local Planning Strategy identifies the portion of the Study Area in the Shire as Water Source Protection Area which reflects the requirements of the Water Authority and EPA.

- City of Swan – zoned land in the Study Area is limited to the area known as Cullacabardee. The area is zoned ‘Rural’ in the Scheme. However, there is no Rural Land Use Strategy for the area nor other relevant policies guiding land use other than the Scheme. Therefore typical Scheme provisions apply. All other land within the study area also within the City of Swan is reserved in the MRS as either State Forrest or Public Purposes.

- City of Wanneroo – Primarily land zoned in the MRS and within the Study Area is located in Nowergup, Carabooda and Pinjar to the central western side of the study area. This area is addressed in the City of Wanneroo’s District Planning Scheme No.2. Land in these areas is predominantly zoned ‘Rural Resource Zone’, with smaller areas zoned ‘Rural’, ‘Special Rural’ and ‘State Forest’. Priority land uses such as intensive agriculture, horticulture and basic raw materials are favoured in the ‘Rural Resource Area’. Proposals that adversely impact on any designated Bush Forever site, conservation category wetlands and their buffers, important heritage sites and important site of Aboriginal significance will not be supported. District Planning Scheme No.2 identifies the portion of the Study Area as Water Source Protection Area which reflects the requirements of the Water Authority and EPA.
Zoned 'Rural' and the Local Planning Strategy identifies the portion as a Water Source Protection Area which reflects the requirements of the Water Authority and EPA.

There is no applicable strategy to guide land use provision other than general TPS provisions for rural land.

Zoned 'Rural' in the Scheme. However there is no Rural Land Use Strategy for the area nor other relevant policies. All other land within the study area also within the City of Swan is reserved in the MRS as either 'State Forrest' or Public Purposes.
Figure 18 The Gnangara Mound showing Groundwater management areas, groundwater Management sub areas and Ministerial criteria sites.
2.24 Summary of Key Documents Reviewed

Table 2 lists the documents reviewed and identifies the governing agencies responsible for their implementation and management. The table also provides an indication of the types of constraints that the document places on land use and development within the study area. Where a document, be it legislation, policy or guideline imposes a constraint on land use and development then a tick is placed in the applicable Constraint box. Examples of locational constraints are Borehole well head protection zones, or DoE Water Quality Protection Note. An identified Legislative constraint is derived directly from legislation applying to the Study Area such as WAPC Statement of Planning Policy 2.2. A Management constraint is not a constraint that in itself prevents a particular land use or development in an identified area but rather imposes additional requirements on any land use or development such as ongoing water quality monitoring or management of Acid Sulphate soils.

<table>
<thead>
<tr>
<th>Document Reviewed</th>
<th>Governing Agency</th>
<th>Type of Constraint</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Planning Strategy</td>
<td>WAPC, Government of Western Australia</td>
<td>Locational</td>
<td>Provides a framework for strategic planning and is based on 5 key principles.</td>
</tr>
<tr>
<td>The Coastal Catchments Initiative</td>
<td>Swan Catchment Council, Government agencies</td>
<td>Legislative</td>
<td>National programme designed to improve and protect water quality in coastal quality hotspots.</td>
</tr>
<tr>
<td>State Water Plan</td>
<td>Government of Western Australia</td>
<td>Management</td>
<td>Provides a strategic framework to plan and manage water resources in Western Australia. Statutory Water Management Plans will communicate decisions that have legal obligations and can be enforced.</td>
</tr>
<tr>
<td>A State Water Strategy for Western Australia</td>
<td>Government of Western Australia</td>
<td></td>
<td>The document commits the State to a range of specific objectives relating to Water Conservation and efficiency; water reuse; new supplies and total water cycle management; and resource protection and management.</td>
</tr>
<tr>
<td>Blueprint for Water Reform</td>
<td>Government of Western Australia, Water Reform Implementation Committee</td>
<td></td>
<td>Provides the State government with detailed advice on progressing water reform in Western Australia.</td>
</tr>
<tr>
<td>Bush Forever</td>
<td>Government of Western Australia, WAPC, EPA, DPI, DEC and local government</td>
<td>Locational</td>
<td>The Bush Forever plan identifies 51,200 hectares of regionally significant bushland for protection. Significant areas in the Study Area contain Bush Forever sites which is a major constraint.</td>
</tr>
<tr>
<td>Western Australian Sustainability Strategy</td>
<td>State Government of Western Australia, multi-agency</td>
<td></td>
<td>This Strategy is designed to provide background to the concept of sustainability as well as establish illustrative actions for sustainability in Western Australia.</td>
</tr>
<tr>
<td>DoE Water Quality Protection Note: Land Use Capability in Public Drinking Water Source Areas</td>
<td>WAPC, DEC, local government, DoW, Water Corporation, Department of Health, Department of Agriculture and Food, DOIR, DPI</td>
<td></td>
<td>The note provides advice on the acceptability of land uses and activities within specific catchments that are the water source for schemes supplying cities and towns. The note forms an integral part of SPP 2.7.</td>
</tr>
<tr>
<td>Environmental Protection (Gnangara Mound Crown Land) Policy 1992</td>
<td>Government of Western Australia, multi-agency</td>
<td></td>
<td>The purpose of this policy is to protect the level and quality of groundwater on or under the policy area, and protect native vegetation and wetlands in the policy area.</td>
</tr>
<tr>
<td>Guideline for the Determination of Wetland Buffer Requirements (Draft)</td>
<td>Government of Western Australia, WAPC, DPI, DEC, EPA and local governments</td>
<td></td>
<td>The guideline has been developed to assist landowners, developers, planners and architects to identify an appropriate buffer between wetlands and land uses that will enhance or maintain the significant attributes and values of the wetland. The Study area consists of various wetlands which pose as a major constraint of development/change in land use.</td>
</tr>
<tr>
<td>State-wide policy No 13 Policy and Guidelines for Recreation within Public Drinking Water Source Areas on Crown Land</td>
<td>Government of Western Australia, DoW, DEC, EPA, DPI, Department of Health and local governments</td>
<td></td>
<td>The primary aim of this policy document is to protect the 'drinking' water environmental value of PDWSAs on Crown land, in the interest of public health. This policy document provides a clear statement of the Commission's position regarding recreational activities within Priority 1 PDWSAs on Crown land</td>
</tr>
<tr>
<td>Integrated Land Use and Transport Planning Policies</td>
<td>Government of Western Australia, WAPC, DPI, LandCorp, DEC, Department of Transport and various other agencies</td>
<td></td>
<td>The report assisted in the development of appropriate strategic land use planning policies relating to transport for the Metropolitan Region and assist in the implementation of the State Planning Strategy.</td>
</tr>
<tr>
<td>Transport Assessment Guidelines for Developments</td>
<td>Government of Western Australia, WAPC, DPI.</td>
<td></td>
<td>The purpose of the guidelines are to clearly identify which developments require supporting transport information, the level of information required and the format it should be presented.</td>
</tr>
<tr>
<td>Guidance Statement No 33 Environmental Guidance for Planning and Development (Draft)</td>
<td>Government of Western Australia, EPA, DPI, FESA, WAPC, DoW, DEC and local government</td>
<td></td>
<td>The statement provides an overview on environmental protection process in Western Australia, advice on protecting a range of biophysical factors, to assist land use planning, advice on managing potential pollutants, waste and water, to assist in land use planning.</td>
</tr>
<tr>
<td>Aboriginal Land Trust: Land Use and Development Policy</td>
<td>Government of Western Australia, DIA, DoW, DEC, WAPC and local government.</td>
<td></td>
<td>The policy states that land use and development activities must be negotiated, planned and undertaken in good faith, and with a meaningful input from indigenous stakeholders.</td>
</tr>
<tr>
<td>Statements of Planning Policy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPP1 Statement Planning Framework Policy</td>
<td>Government of Western Australia, WAPC</td>
<td></td>
<td>This document identifies 5 key principles which describe the considerations which influence good decision-making in land use planning and development.</td>
</tr>
<tr>
<td>SPP2 Environmental and Natural Resources Policy</td>
<td>Government of Western Australia, WAPC, DEC, DOIR,</td>
<td></td>
<td>This policy defines the principles and considerations that represent good and responsible planning in terms of environment and natural resource issues within the framework of the State Planning Strategy.</td>
</tr>
<tr>
<td>SPP2.2 Gnangara Groundwater Protection Policy (Draft)</td>
<td>Government of Western Australia, WAPC, DoE, the Health Department, EPA, local government and other relevant decision-making authorities</td>
<td></td>
<td>The main purpose of the policy is to prevent, control, manage development and land use changes in the policy area that are likely to cause detrimental effects to the groundwater resource quality and quantity. PDWSA categorises most of the study area as Priority 1 which is the biggest constraint in terms of planning and land uses.</td>
</tr>
<tr>
<td>SPP2.4 Basic Raw Material</td>
<td>WAPC, EPA, DOCEP, DoW, DEC and local governments</td>
<td></td>
<td>The policy is designed to facilitate the extraction of basic raw materials close to the major markets in the metropolitan region and to avoid sensitive development close to basic raw material resources which could otherwise inhibit extraction of the resource. While basic raw materials exist in the Study Area, these are constrained by the PDWSA Priority 1 land use capability.</td>
</tr>
<tr>
<td>Policy Reference</td>
<td>Responsible Bodies</td>
<td>Applicability</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>-------------------</td>
<td>---------------</td>
<td>-------------</td>
</tr>
<tr>
<td>SPP2.5 Agricultural and Rural Land Use Planning</td>
<td>WAPC, Department of Agriculture and Food, DEC, DOIR, Fire and Emergency Services Authority and local governments</td>
<td>✔️</td>
<td>This policy aims to protect agricultural land resources, plan and provide for rural settlement, minimize the potential for land use conflict, and carefully manage natural resources. The policy applies to all rural land in Western Australia.</td>
</tr>
<tr>
<td>SPP2.7 Public Drinking Water Source Policy</td>
<td>WAPC, DEC, DoW, local governments and State agencies</td>
<td>✔️</td>
<td>In addition to the PDWSA classification of Priority 1, 2 and 3, DoE has identified well-head zones and reservoir protection zones to protect the drinking water source from direct contamination in the immediate vicinity of production wells and reservoirs. The study area is scattered with a number of production wells, which is another major constraint for development/change in land use.</td>
</tr>
<tr>
<td>SPP2.8 Bushland Policy for the Perth Metropolitan Region</td>
<td>Government of Western Australia, WAPC, EPA, DPI, DEC and local government</td>
<td>✔️</td>
<td>This policy aims to provide a statutory policy and implementation framework that will ensure bushland protection and management issues in the Perth Metropolitan Region are appropriately addressed, and integrated with broader land use planning and decision-making to secure long-term protection of biodiversity and associated environmental values.</td>
</tr>
<tr>
<td>SPP2.9 Water Resources (Draft)</td>
<td>Government of Western Australia, WAPC, DEC, DoW, DPI, local government and the State Administrative Tribunal</td>
<td>✔️</td>
<td>This policy is directly related to the overarching sector policy SPP2 and provides clarification and additional guidance to planning decision-makers for consideration of water resources in land use planning.</td>
</tr>
<tr>
<td>SPP3 Urban Growth and Settlement</td>
<td>Government of Western Australia, WAPC, DPI, local government</td>
<td>✔️</td>
<td>The overall aim of the policy is to facilitate patterns of urban growth and settlement through broad policy in accommodating growth and change. This policy should be taken into account in preparing regional and local planning strategies, and planning schemes and amendments, and given weight in statutory decision making in relation to urban growth and settlement.</td>
</tr>
<tr>
<td>SPP3.5 Historic Heritage Conservation</td>
<td>Government of Western Australia, WAPC, Heritage Council, local government</td>
<td>✔️</td>
<td>The policy sets out the principles of sound and responsible planning for the conservation and protection of Western Australia’s historic heritage. Based on the State Register of Heritage Places and the DIA, there is evidence of hundreds of heritage sites throughout the study area which is a major constraint.</td>
</tr>
<tr>
<td>SPP4.1 State Industrial Buffer Policy (Review) (Draft)</td>
<td>WAPC, DPI, EPA, DEC, Department of Health, DOIR and local government</td>
<td>✔️</td>
<td>The purpose of this policy is to provide a consistent approach to the protection and security of industrial zones, transport terminals, ports, other utilities and special use zones.</td>
</tr>
<tr>
<td>SPP4.2 Metropolitan Centres Policy Statement for the Perth Metropolitan Region</td>
<td>Government of Western Australia, WAPC, DPI, Town Planning Appeal Tribunal and local government</td>
<td>✔️</td>
<td>The principle purpose is to provide a broad regional planning framework to coordinate the location and development of retail and commercial activities in the metropolitan region.</td>
</tr>
<tr>
<td>SPP Metropolitan Freight Network (Draft)</td>
<td>Government of Western Australia, WAPC, DEC, DPI and local government</td>
<td>✔️</td>
<td>The intent of this policy is to identify and protect the metropolitan freight road and rail network as well as minimise the adverse impact of freight transport noise on adjacent development. The policy is relevant where an existing or proposed freight route of freight handling facility abuts future urban development.</td>
</tr>
</tbody>
</table>
### Regional Strategies

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Collaborators</th>
<th>✓</th>
<th>✓</th>
<th>✓</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network City</td>
<td>Multi-agency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gnangara Land Use and Water Management Strategy</td>
<td>State and Commonwealth government, WAPC, DoW, DPI, DEC, Water Corporation, Western Power, EPA, City of Wanneroo, City of Swan, Shire of Chittering, Shire of Gingin, City of Joondalup, Health Department, Main Roads Western Australia</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>The Future of East Wanneroo-Land use and water management in the context of Network City</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

This is the latest 25-year planning strategy for metropolitan Perth. It is designed to realise the integration of land use and transport networks within established and new areas.

The Strategy examines existing land uses and the impacts on water quality and potential risks of contamination. It makes recommendations on the types of land uses and zonings that are appropriate in the strategy area (which covers the Underground Water Pollution Control Areas).

The aim of this Strategy is to identify the future of east Wanneroo in the context of Network City and to prepare a concept for sustainable land use and water management by integrating land use planning and future development with water resource planning objectives, the allocation of land for agricultural uses, the protection of basic raw materials, environmental values and landscape features, for the benefit of the whole community.

### Regional and Sun-regional Structure Plans

<table>
<thead>
<tr>
<th>Plan</th>
<th>Collaborators</th>
<th>✓</th>
<th>✓</th>
<th>✓</th>
</tr>
</thead>
<tbody>
<tr>
<td>North West Corridor Structure Plan</td>
<td>WAPC, Government of Western Australia, City of Wanneroo and the City of Joondalup.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>North East Corridor Structure Plan</td>
<td>WAPC, Government of Western Australia, City of Swan, City of Wanneroo</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>North-East Corridor Extension Strategy</td>
<td>WAPC, Government of Western Australia, City of Swan, City of Wanneroo</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

The corridor is strategically located adjacent to the northern beaches, providing it with a powerful market force. The Corridor consists of two cities: Joondalup and Wanneroo.

The North East Corridor was identified in the 1990 Metroplan including regional open space, rural/non-urban uses, major industry and future urban development.

The Strategy looks forward to 2090 and provides a context in which planning can be made. The strategy aims to safe-guard the rural character and amenity of the study area.

### Planning Bulletins

- No 53 Development by Public Authorities on Land Reserved Under the Metropolitan Region Scheme
- No 61 Urban Stormwater Management
- No 63 Policy for Dealing with Potential Conflicts between Residential Subdivision and Market Gardens in East Wanneroo
- No 64 Acid Sulphate Soils
- No 80 Swan Planning Legislation Amendment Act 2006
- No 87 High Pressure Gas Transmission Pipelines in the Perth Metropolitan Region
3. Land Use Assessment

3.1 Strategic Planning Overview

3.1.1 Overview

Key Points:

- At a certain distance from the centre, it becomes viable to establish a centre with an economic life that is not totally dependent upon the activity at the main centre and this requires a strategic level of planning;
- The centres do not compete with the primary CBD but complement and diversify the regional economies which support the central area; and
- The economic criteria that are important in the development of secondary corridor based employment anchors include:
  - The context of future population and workforce profile
  - Distance between economic centres
  - An externally orientated economic base.

Over the last 50 years, the Perth metropolitan area has developed in a monocentric pattern. This means that it is characterised by a linear suburban layout dominated by low density residential development with the main economic concentration (accounting for almost one quarter of all employment in the metropolitan area) in the Perth CBD and associated inner areas. A network of lower key centres (strategic regional, regional, district, local and neighbourhood centres) exists in a rudimentary hierarchy based primarily on the size of retail floorspace provision rather than function or diversity of activity.

Current regional planning scenarios do not identify alternative locations for major business development outside the central Perth City. The central area has the highest concentration of economic activity and the benefits of agglomeration and the focus of the transport network have the effect of reinforcing this concentration. This results in a strong attractive force towards the centre.

There are a number of explanations for economic activity forming in clusters of like and complementary activity:

- Supply services are more efficient;
- The market has access to a wide choice within a compact area;
- Skills are shared, both formally and informally;
- Labour with specialist skills has a choice of employers – this is especially important for those who are very highly skilled and sought after; and
- The opportunity for informal interaction and networks provides business advantage.

However it is evident from international and national examples that as capital cities mature it becomes feasible and even necessary for additional major centres with a secondary CBD function to develop in a polycentric pattern. Access to labour and relative travel costs, including time costs, are key factors in determining the strength of the pull to the primary centre.

At a certain distance from the centre it becomes viable to establish a centre with an economic life that is not totally dependent upon the activity at the main centre. These centres require a strategic level of planning. They do not compete with the primary CBD but complement and diversify the regional economies which support the central area. As a guide, a distance of approximately 70 km and a travel time of approximately 1 hour appear to be the minimum and there are a number of examples to support this.

This theory is also supported by recent research into the effects of globalisation which enhances the significance of local and regional economies, due to, amongst other factors, the growing importance of regional clusters and networks, greater regional specialisation, the utilisation of “tacit” local knowledge and the need for regions to promote flexibility and adaptation when confronted with change.
There is also evidence from studies of monocentric cities such as Atlanta, USA, that where the central core is perpetuated through strategic transport and economic planning mechanisms at the expense of significant high level growth in peripheral centres, patterns of population activity in terms of economic, work and transport preferences become entrenched and inflexible.

A number of economic criteria (highlighted below) are important in the development of secondary corridor based employment anchors to the long north and south corridors, which will become the next level of agglomeration relative to the Perth CBD area.

The context of future population and workforce profile
In 2021 the population of Perth will be close to 2.5 million people with many skilled and professional workers. It would be a poor planning outcome if it were to be assumed that the majority of jobs for this population would be found in the highest proportion in the Perth Inner area.

Distance between economic centres
The Perth inner area is at least 60-70 kilometres (or 1 hour travel time) away from the periphery of the growth corridors. Contemporary planning practices in metropolitan and regional areas with rapid growth such as London, Toronto and Brisbane have developed policies and programs to encourage additional CBD activity in key regional centres. The Gold Coast is approximately this distance from Brisbane, as is Geelong from Melbourne and in Europe, as the Milton Keynes, Cambridge and Oxford arc is to London. In addition many urban planners believe that a total daily commute of more than 70 minutes is unsustainable, will lead to considerable social issues and pressure to develop more accessible employment in local areas. Above this level of daily commuting time, workers will seek (sometimes unsuccessfully) alternative work arrangements.

An externally oriented economic base
This is based upon inherent competitive advantages such as local strengths/niche markets, skilled workforce, science based industries and education establishments with a research capability. It is essential to support the strategic economic identity of the north-west and south west corridors to reduce the extent to which they are dormitory areas.

In the north-west corridor, the Yanchep-Two Rocks (Yanchep-Two Rocks (St Andrews) ) and Alkimos projects have identified a significant amount of land, land uses and potential anchor knowledge based economic development initiatives as part of their District Structure Plans.

In the southern part of the south-west corridor the appropriate location will be in the highest demand location. This implies a role for Mandurah as the high-end economic anchor to the corridor. The City of Mandurah recently presented its strategy to the Commission and is actively developing statutory and non statutory plans to support implementation.

For such nodes to develop and thrive a number of strategic actions will be required:
- A high level of strategic infrastructure must be in place or imminent; and
- A number of high amenity sites for business, industry and education uses should be identified and protected.

These nodes should be an integral part of the development of the Network City model. They are assumed within the scenario development in this study.
### 3.1.2 Population Growth

Forecast population growth is a good measure of demand for urban development. There is currently a population of 373,000 in the areas around the study area. This is forecast to grow to 600,000 by 2031. The majority of this (63%) will be in the north-west corridor, in the City of Wanneroo, with some in the north-east corridor, in the City of Swan (33% of the total). Other local government areas will have relatively small growth.

<table>
<thead>
<tr>
<th>LGA</th>
<th>Population Change 2006 - 2031</th>
<th>Proportion of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wanneroo</td>
<td>143,822</td>
<td>63%</td>
</tr>
<tr>
<td>Swan</td>
<td>75,215</td>
<td>33%</td>
</tr>
<tr>
<td>Joondalup</td>
<td>3,835</td>
<td>2%</td>
</tr>
<tr>
<td>Gingin</td>
<td>2,223</td>
<td>1%</td>
</tr>
<tr>
<td>Chittering</td>
<td>1,855</td>
<td>1%</td>
</tr>
<tr>
<td>Total</td>
<td>226,950</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: WAPC (2005) WA Tomorrow

![Figure 19: Forecast Population Growth; Source: WAPC (2005) WA Tomorrow](image)

### 3.1.3 North West Corridor Summary

**Key Points:**

- Employment self-sufficiency is very low (38.3%), with approximately only 50,000 jobs currently being available in the corridor. For an employment self-sufficiency target of 60%, approximately 79,000 would be required;
- If the North West corridor were to continue to develop with its current development format, overall employment self-sufficiency would be approximately 42%; and
- The current and projected jobs shortfall requires:
  - Immediate measures to increase employment provision in the short term; and
  - Strategies identified and initiated and progressively applied over the long term.

It is envisaged that the north-west community will have a wide range of activity nodes from CBD functions to many local centres. However one of the key issues for the north-west and for that matter...
the north-east corridor is the level of employment self sufficiency which can be achieved as new development occurs. That is, the amount of jobs which can be generated from a new development to meet the needs of the growing population is a key planning element. The current population of the north-west corridor is 273,000\textsuperscript{11}, of whom approximately 132,500 are in the workforce. Employment self-sufficiency (based on 2006 data) is very low (42\%)\textsuperscript{12}, with approximately only 56,000 jobs currently being available in the corridor. For an employment self-sufficiency target of 72\% - the target adopted by the State Parliament's North West Corridor Coordination Committee - approximately 95,400 would be immediately required, implying a current job shortfall of 39,400.

If the north west corridor were to continue to develop with its current development format and no active intervention, including full development on all currently planned industrial land, overall employment self-sufficiency would be remain at approximately 42\%. This would result in a regional job shortfall of 61,000 by 2031 and an ultimate job shortfall of 82,000 to achieve 72\% regional employment self-sufficiency. This would have very severe consequences for the transport network of the metropolitan area – the city overall would be less efficient. To attain high levels of job self-sufficiency and self-containment a range of jobs, including professional and business services jobs must be available. The vast majority of these high-level jobs are currently located in the Perth inner area, leading to large numbers of people commuting to the Perth inner area from the corridor.

The current and projected jobs shortfall requires:

- Immediate measures to increase employment provision in the short term; and
- Strategies identified and initiated and progressively applied over the long term to ensure economic activity to provide a very substantial number of additional jobs.

Projected jobs in new development projects (excluding industrial areas contained in them) are shown in Table 4.

<table>
<thead>
<tr>
<th>Development Project</th>
<th>Projected Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yanchep-Two Rocks (St Andrews) (total excl. industrial)</td>
<td>43,100</td>
</tr>
<tr>
<td>Alkimos (town centre)</td>
<td>8,500</td>
</tr>
<tr>
<td>Others\textsuperscript{13} - Total</td>
<td>5,800</td>
</tr>
<tr>
<td>Total</td>
<td>57,400</td>
</tr>
</tbody>
</table>

Source: SMCo and Draft District Structure Plans

Note that only the Yanchep-Two Rocks (Yanchep-Two Rocks (St Andrews) ) figure includes a special employment initiative which accounts for approximately 25,500 jobs beyond those that would be expected with current development patterns and local population based employment activity in that location.

The Alkimos figure assumes normal development patterns and an ultimate size roughly equivalent to the current scale of Joondalup.

The total of these employment areas indicates an additional 76,000 jobs above the 2006 total of 56,000 jobs in the corridor, to give a total of 132,000 jobs in the corridor, or an employment self-sufficiency ratio of 48\% at full build-out.

Therefore, even with a major employment centre developed at Yanchep-Two Rocks (Yanchep-Two Rocks (St Andrews) ), as planned, the corridor will still be short of the 72\% target.

\textsuperscript{11} ABS, Census, 2006, Estimated Resident Population

\textsuperscript{12} A primary objective in city planning at both State and local government levels is the provision of employment in close proximity to where people live. A measure of this is employment self-sufficiency, or the total jobs available in a particular area as a proportion of the numbers of people in the workforce living in that area. The higher the proportion, the more opportunity there is for people to work close to their home. A more detailed measure is employment self-containment, or the number of workers residing and working in an area as a ratio of the jobs available. The higher this number, the more the job mix and the skill base of the residential population coincide.

\textsuperscript{13} Banksia Grove, Carramar, Mariginiup, Butler, Jindalee, Romeo Rd
To achieve the employment target further jobs beyond those normally expected will be required in an expanded Joondalup, in other town centres and in industrial areas, particularly Neerabup, which has ultimate capacity for around 20,000 jobs.

3.1.4 North East Corridor Summary

**Key Points:**
- Demand for new land in the eastern sector is not as intense as in the northwest, southwest or Peel sectors;
- The City of Swan is currently largely self sufficient in terms of employment with a ratio of 83.5% - one of the highest rates of all of the Metropolitan region’s growth areas;
- The demand for goods and services is driven primarily by the population; and
- The City of Swan’s preferred scenario is increased densities in Greenfield urban land and intensification and renewal of established centres.

There is the equivalent of at least 20 years zoned land in the eastern Metropolitan sector which includes the urban growth corridor in the City of Swan (based on a five year average take up rate – 1,223 homes per year). In this context and in Metropolitan terms, demand for new land in the eastern sector is not as intense as in the northwest, southwest or Peel sectors. The take up of land in this sector has been slower than some coastal sectors such as the northwest and south west, which offer seaside locations with proximity to the sea breeze and the beach for recreation. However Swan has traditionally been the location for a significant quantity of relatively affordable housing in the Metropolitan area. This is likely to continue to a degree as the City is not a coastal or inner suburban location.

Other urban and peri-urban locations within the north east sector have shown an even slower absolute growth rate although the percentage change may be significant. This is reflected in the current population forecast for the region from DPI, contained in its WA Tomorrow series, which shows, for the study area that is the subject of the *North East Corridor Extension Strategy*14, a population change from 7,300 people in 2006 to 12,600 in 2026, a growth of only 5,300 in approximately 2,350 dwellings, with 60% of this growth being in the suburb of Bullsbrook. As a matter of context this pattern of low growth continues beyond the Cities of Wanneroo and Swan as development is more remote from centres of employment and services and in hotter, dryer locations.

<table>
<thead>
<tr>
<th>Table 5: Population Growth, 2001 - 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shire of Toodyay</strong></td>
</tr>
<tr>
<td><strong>Shire of Gingin</strong></td>
</tr>
<tr>
<td><strong>Shire of Chittering</strong></td>
</tr>
<tr>
<td><strong>Shire of York</strong></td>
</tr>
<tr>
<td><strong>Shire of Beverley</strong></td>
</tr>
<tr>
<td><strong>Town of Northam</strong></td>
</tr>
<tr>
<td><strong>Shire of Northam</strong></td>
</tr>
</tbody>
</table>


As relatively small scale and dispersed urban and peri-urban sector, the north east relies heavily both in suburban and semi rural environments upon the established centres of Midland and Morley for services facilities and employment. The City of Swan is currently largely self sufficient in terms of employment with a ratio of 83.5%, one of the highest rates of all of the Metropolitan region’s growth areas and more than consistent with a regional employment sustainability target of 60% (Swan urban
However employment self sufficiency is not a static condition. Economic development and balance between jobs and population must be maintained. A broad employment mix and matching skill base plays an equally important role in the economic and cultural sustainability of settlements. It is unlikely and not economically viable that all residential subdivisions will be able to achieve this level of employment development. There is also a sound rationale to maintain and enhance Midland as a regional economic and employment focus and the implications of competing forces in the urban growth corridor and adjacent regions need to be fully considered and managed.

The closest competing centres are at Morley and Mirrabooka however the retail and commercial catchment for the Ellenbrook (25,000m²) and Midland centres is significantly larger than that of Morley and Mirrabooka and extends east to capture additional demand for goods and services from the wider rural hinterland including the Avon Valley and inner Wheatbelt areas. The demand for goods and services is driven primarily by the population.

In terms of future growth a policy of growth management, the City of Swan’s preferred scenario is increased densities in greenfield urban land and intensification and renewal of established centres. There are a number of ways in which the City can accommodate an expanding population such as the:

- Conversion of under utilised brown-field sites to housing (the Midland Workshops Site Redevelopment);
- Redevelopment of existing residential areas to improve the effectiveness of land use and to take advantage of the location of existing infrastructure and services (eg. Midvale redevelopment); or
- Creation of new urban areas such as the further development of Ellenbrook and the commencement of development at Albion.

### Planning Considerations

<table>
<thead>
<tr>
<th>Key Points:</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Network City Strategy provides the policy context for developing sustainable communities and managing growth;</td>
</tr>
<tr>
<td>There would need to be a reason other than increased land supply to meet demand to justify any increase in the amount of land that is already zoned urban in the study area; and</td>
</tr>
<tr>
<td>Other sustainability issues such as the balance between population growth and job creation need to be considered</td>
</tr>
</tbody>
</table>

The Network City Strategy provides the policy context for developing sustainable communities and managing growth. The main principles and objectives of this policy which relate to the Gnangara study area can be summarised as follows:
If the Western Australian Planning Commission is to follow the implications of the Network City Strategy in its decisions, then there would need to be a reason other than increased land supply to meet demand to justify any increase in the amount of land that is already zoned urban in the study area. Other sustainability issues such as the balance between population growth and job creation need to be considered. In the Gnangara context are the established centres of Midland Morley, Joondalup and Wanneroo as well as advanced planning for future strategic centres at Ellenbrook and Yanchep-Two Rocks (Yanchep-Two Rocks (St Andrews)/Alkimos which would be diminished by residential, commercial or retail development at Gnangara. These factors are considered in more detail in the following sections of this report.

3.2 Projected demand for Residential Land in the NW and NE Corridors

Key Points:

- **Macro assumptions:**
  - Reasonable assumption that the population of Perth (1.5 million in 2006) is likely to develop to a maximum of around 2.5-3.0 million people over the next 40 years; and
  - Much of this growth will be in the north-west sector where planning and infrastructure delivery are well advanced.

- **North - West Corridor:**
  - By 2021, population growth will become increasingly concentrated in the northern part of the corridor, on the coastal strip north of Clarkson; and
  - On currently zoned land alone, the north-west corridor has capacity to accommodate over one-quarter of all population growth forecast for the Perth metro area in the longer term.

- **North - East Corridor:**
  - Majority (78%) of the growth in the City of Swan will be in Ellenbrook/Vines and Northern Growth Corridor (Albion/West Swan/Caversham) areas; and
  - At 2031, this area will be either nearing completion or have up to 7 years additional supply.

3.2.1 Macro Assumptions

Perth and parts of Western Australia will take a large proportion of Australia's growth forecasts. The Federal Department of Immigration and Multicultural Affairs (DIMA) has projected that, if current
policies and demographic trends continue, Australia's population will stabilise at 23-25 million by the middle of this century. Variations upwards (or downwards) from this figure will be produced by higher (or lower) fertility rates, larger (or smaller) average annual immigration, and greater (or lesser) increases in life expectancy, or some combination thereof. The highest rates of growth for the Australian population are projected to occur in the Northern Territory (between 84 per cent and 154 per cent), Queensland (between 76 per cent and 90 per cent) and Western Australia (between 67 per cent and 74 per cent). The populations of most capital cities are projected to increase from between 7% (Adelaide and Hobart) to around double (Brisbane 89%, Darwin 113%) with Perth experiencing around 69% (2004-2051).

It is therefore a reasonable assumption that the population of Perth (1.5 million in 2006) is likely to develop to a maximum of around 2.5-3.0 million people over the next 40 years. Much of this growth will be in the north-west sector where planning and infrastructure delivery are well advanced. The other main growth area is likely to be in the south-west, preferably under an intensification program of established centres. The north-east and south-east are less likely to grow as rapidly unless (and even if) substantial Government intervention is provided along entire corridors. Under any growth scenario the population will continue to age disproportionately and this will have implications for people’s preferences to settle in places near or with good access to health and recreation facilities and family units.

The table below sets out the assumptions for the demand assessment for residential land in the study area. The recommended planning criterion corresponds with Network City principles. However if development were to occur within the study area different criteria would need to apply. Some variations are identified for discussion purposes.

Table 7: Residential Land Planning Assumptions

<table>
<thead>
<tr>
<th>Recommended Planning Criteria</th>
<th>Variables/Alternate Scenarios</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contiguous to development front</td>
<td>Nodal development - coast or rural hinterland</td>
</tr>
<tr>
<td>Liveable Neighbourhood pattern</td>
<td>Density below 15dws/Ha gross</td>
</tr>
<tr>
<td>Reticulated/trunk services</td>
<td>Self sufficient energy/resource models</td>
</tr>
<tr>
<td>Integrated road/public transport network</td>
<td>Occasional rail or bus alternatives</td>
</tr>
<tr>
<td>Walkable catchment to facilities/timely provision</td>
<td>Self sufficient regional level centres/facilities</td>
</tr>
<tr>
<td>Employment access (30 min. commute each way max)</td>
<td>Special industry/technology nodes with accommodation</td>
</tr>
</tbody>
</table>

3.2.2 North-West Corridor

The North West corridor of the metropolitan area is one of the fastest growing areas in Australia and Perth region. It is expected that the corridor (here defined as the Cities of Wanneroo and Joondalup) will have a population of approximately 408,000 by 2021 and an ultimate capacity of approximately 580,000 persons. The population of the City of Wanneroo alone is expected to grow from 117,409 in 2006 to 250,491 in 2021 and 415,000 by 2058 up on completion of the Alkimos/Eglinton and Yanchep-Two Rocks (Yanchep-Two Rocks (St Andrews) ) settlements.

By 2021, this growth will become increasing concentrated in the northern part of the corridor, on the coastal strip north of Clarkson.

---

15 23.5 and 26.4 million by the year 2051 (series B), according to various projections released today by the Australian Bureau of Statistics
16 ID consulting forecasts for City of Wanneroo 2004 & 2006
17 Syme Marmion & Co estimate based on detailed analysis of individual project structure plans
Development there will progressively move north, so that after 2021, almost all new development is in the Alkimos-Eglinton and Yanchep-Two Rocks (Yanchep-Two Rocks (St Andrews) ) developments.

At current normal development densities there is capacity on zoned land in the Alkimos-Eglinton and Yanchep-Two Rocks (Yanchep-Two Rocks (St Andrews) ) developments to accommodate forecast population growth in the City of Wanneroo until at least 2060, with capacity for approximately 100,000 after 2031. Long term population growth estimates for Perth indicate an overall population increase of approximately 385,000 between 2031 and 2051\(^\text{18}\). On currently zoned alone, the north-west corridor therefore has capacity to accommodate over one-quarter of all population growth forecast for the Perth metro area in the longer term. By way of context, land with capacity for between 130,000 and 200,000 dwellings (to house 325,000 – 500,000 people) has been identified in the southern sector.\(^\text{19}\)

\(^{18}\) ABS Population projections, Series B

Given the capacity to house forecast population demand of land already zoned urban in the north-west corridor, it is unlikely that there will be justifiable pressure for development in the north-west corridor outside of currently zoned areas except in the very long term. Note that there are extensive areas of land in the corridor outside of the study area not currently zoned for urban development that may be potentially suitable for consideration for development in the corridor in the very long term. These would need to meet development criteria at that time (for example efficient use of existing infrastructure, support of existing economic centres). East Wanneroo and Guilderton are examples.

Concepts for the development of land at East Wanneroo\(^{20}\) show potential for 1,950 ha of future urban development in its south-east section. At standard development densities this would accommodate 15,000 – 19,000 dwellings, or 37,000 – 45,000 people. The population capacity of land currently zoned urban in the North West corridor is for approximately 293,000 additional people. Development of the possible future urban area identified in the East Wanneroo land use concept would therefore increase capacity in the corridor by approximately 16%. This would have the effect of delaying development elsewhere in the corridor and extend the time to full build-out of urban zoned land up to 12 years at current population growth rates, to approximately 2070.

### 3.2.3 North-East Corridor

The City of Swan has a current population of 94,700 (ABS 2006). This is forecast to grow by 75,000 to 169,900 by 2031, with approximately 32,700 additional dwellings. The majority (78%) of this growth (24,000 dwellings) will be in the Ellenbrook / Vines and Northern Growth Corridor (Albion / West Swan / Caversham) areas. This is graphed below.

\(^{20}\) The Future of East Wanneroo, WAPC Aug 2007
The Swan Northern Growth area has 1,468 ha of undeveloped land that is either zoned or in advanced planning for rezoning, with potential for 14,700 – 22,000 dwellings, depending on development density.

Table 8: Zoning in the City of Swan's Urban Growth Corridor

<table>
<thead>
<tr>
<th>Zoning in Swan's Growth Corridor</th>
<th>ha</th>
<th>10</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross MRS Urban (Not Constructed)</td>
<td>997.35</td>
<td>9,974</td>
<td>14,960</td>
</tr>
<tr>
<td>Urban Deferred</td>
<td>162.16</td>
<td>1,622</td>
<td>2,432</td>
</tr>
<tr>
<td>Potential Urban</td>
<td>308.91</td>
<td>3,089</td>
<td>4,634</td>
</tr>
<tr>
<td>Total</td>
<td>1,468.42</td>
<td>14,684</td>
<td>22,026</td>
</tr>
</tbody>
</table>

Source: City of Swan (2007) Swan Urban Growth Strategy, Syme Marmion & Co

In addition, Ellenbrook / Vines has capacity for 8,000 – 9,000 additional dwellings, giving a total capacity for the two areas of 23,000 – 31,000 dwellings. Therefore at 2031, this area will be either nearing completion or have up to 7 years additional supply. Additional development areas may become available for the longer term via an expansion of the northern growth areas at Marshall Road and north of Ellenbrook at Bullsbrook. Longer term expansion of settlements in the north eastern hills (for example at Mundaring and Gidgegannup) and of Chittering has also been flagged in the North East Corridor Extension Strategy\(^{21}\) and North Eastern Hills Settlement Pattern Plan.\(^{22}\)

Summary Population Growth – Study Area Region

Table 9 Summary Population Growth in the NW Corridor and NE Corridor

<table>
<thead>
<tr>
<th></th>
<th>NW</th>
<th>NE</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Population</td>
<td>270,300</td>
<td>94,700</td>
<td>365,000</td>
</tr>
<tr>
<td>Projected Population (2031)</td>
<td>418,000</td>
<td>170,000</td>
<td>588,000</td>
</tr>
<tr>
<td>Growth (persons)</td>
<td>147,700</td>
<td>75,300</td>
<td>223,000</td>
</tr>
<tr>
<td>Dwelling Demand (2031)</td>
<td>64,200</td>
<td>32,800</td>
<td>97,000</td>
</tr>
</tbody>
</table>

Capacity (dwellings)

<table>
<thead>
<tr>
<th></th>
<th>NW</th>
<th>NE</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currently zoned</td>
<td>127,400</td>
<td>37,400</td>
<td>164,800</td>
</tr>
<tr>
<td>Identified as potential</td>
<td>19,000</td>
<td>4,600</td>
<td>23,600</td>
</tr>
<tr>
<td>Total Dwelling Capacity</td>
<td>146,400</td>
<td>42,000</td>
<td>188,400</td>
</tr>
</tbody>
</table>

Additional Population Capacity

<table>
<thead>
<tr>
<th></th>
<th>NW</th>
<th>NE</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>334,000</td>
<td>97,000</td>
<td>431,000</td>
</tr>
</tbody>
</table>
It is therefore unlikely that there will be justifiable pressure for development in the north-east corridor outside of currently identified areas in any planning time frame.

3.2.4 Conclusion

Key Point:
- There is no reason to investigate the need for further land for general urban development

The analysis indicates that there is ample land either already zoned or identified for future development to cater for demand for urban development resulting from forecast population growth in the long term in the north-west and north-east sectors of the metropolitan area surrounding the study area.

The study area is approximately 98,000 ha in total area. Once urban development commenced on part of it, it would be difficult to manage its spread over time. If this were to be fully developed for urban uses, even at moderate densities it could accommodate 1.5 – 2 million people. This is far in excess of demand in any planning timeframe.

There is thus no reason to investigate the need for further land for general urban development.
### 3.3 Projected Demand for Employment Land in the NW and NE Corridors

#### 3.3.1 Overview

<table>
<thead>
<tr>
<th>Key Points:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three main activity centres of scale in the north-west corridor are Joondalup, Alkimos and St Andrews;</td>
</tr>
<tr>
<td>The combined Alkimos / Eglinton / St Andrews area is projected to reach an overall employment self-sufficiency of 72%.</td>
</tr>
</tbody>
</table>

There are three main activity centres of scale in the north-west corridor, namely Joondalup, Alkimos and Yanchep-Two Rocks (St Andrews). Each is important and will play a complementary role over time. Joondalup is available for employment intensification in the short and medium term. Alkimos may develop into the “Subiaco” of the north, an important large-scale regional centre near a large city (Yanchep-Two Rocks (St Andrews)) with a range of economic activity in the town centre, in the service commercial zone and in the waste water treatment plant buffer, the latter two supporting intensification in the town centre.

It has been noted above that this strategy requires Joondalup to approximately double in size to have approximately 16,000 – 17,000 jobs, and that rather than assume Alkimos to have an ultimate scale that is roughly the same as Joondalup now, it should have a target scale greater than that, at approximately 12,000 – 16,000 jobs. This would give the overall Alkimos/Eglinton a total of 18,000 – 22,000 jobs and a self-sufficiency ratio of approximately 65%. Yanchep-Two Rocks (St Andrews) is planned to have 55,000 jobs, with an employment self-sufficiency ratio of 78% and bringing the combined Alkimos / Eglinton / Yanchep-Two Rocks (St Andrews) area to an overall employment self-sufficiency of 72%.
3.3.2 Retail/Commercial Demand & Supply in the NW & NE Corridors

Key Points:
- In the north-west corridor, the achievement of high levels of employment self-sufficiency requires concentration of economic activity in a small number of centres to give economies of scale and clustering and agglomeration effects in each one;
- In the north-west corridor Joondalup, Alkimos and St Andrews City are the main identified centres. In the north-east corridor Midland is the main economic centre; and
- No additional retail or commercial development would be required within the Gnangara study area.

To some extent the demand for retail and commercial floorspace follows population – where the population is so are the shops and offices and associated services, including schools and health facilities. These are planned to be incorporated in the general urban development associated with the population demand outlined in Section 2.

However, in the outer growth areas of the city, and particularly in the north-west corridor, the achievement of high levels of employment self-sufficiency requires concentration of economic activity in a small number of centres to give economies of scale and clustering and agglomeration effects in each one. In the north-west corridor Joondalup, Alkimos and Yanchep-Two Rocks (St Andrews) City are the main identified centres. In the north-east corridor Midland is the main economic centre. The forecast population does not require and will not support any additional major centres. This means that there is no demand for retail and commercial development in the sector which cannot be accommodated in current development plans.
The scale of the main activity centres for the north-west corridor is shown below. It illustrated the plan for Yanchep-Two Rocks (St Andrews) Centre A (Yanchep City) to be more than twice the scale of Joondalup, making it the major centre for high level employment.

<table>
<thead>
<tr>
<th>Centre</th>
<th>Gross Floor Area (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joondalup</td>
<td>198,000 (current)</td>
</tr>
<tr>
<td>Alkimos Regional Centre</td>
<td>142,000 (planned)</td>
</tr>
<tr>
<td>St Andrews Centre A (Yanchep City)</td>
<td>460,000 (planned)</td>
</tr>
<tr>
<td>St Andrews Centre B (Two Rocks East)</td>
<td>131,000 (planned)</td>
</tr>
</tbody>
</table>

Recent studies in the north east corridor suggest that whilst there will be a significant increase in demand, the majority of retail and commercial floorspace required will be accommodated in the Midland centre and will support its role as a strategic regional centre. The following possible range of additional regional level floorspace demand for 2016 is based on population projections in the catchment including the City of Swan and the Shire of Mundaring.

Table 10 Midland Strategic Regional Centre Land Use Demand, 2016; Source: City of Swan (2005) Midland Strategic Regional Centre Land Use Demand Study, Syme Marmion & Co

<table>
<thead>
<tr>
<th>Midland Strategic Regional Centre Land Use Demand - 2016</th>
<th>Midland 2016 Indicative Total Floor Area m² - Range</th>
<th>Midland 2016 Indicative Change over 2001 – m² Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Other Retail</td>
<td>60,000</td>
<td>124,000</td>
</tr>
<tr>
<td>Shop Retail</td>
<td>101,000</td>
<td>106,000</td>
</tr>
<tr>
<td>Office Business</td>
<td>70,000</td>
<td>85,000</td>
</tr>
<tr>
<td>Health, Welfare &amp; Com Services</td>
<td>9,000</td>
<td>13,000</td>
</tr>
<tr>
<td>Entertainment, Recreation &amp; Cultural</td>
<td>14,000</td>
<td>17,000</td>
</tr>
<tr>
<td>Manufacture Process, Fabrication</td>
<td>4,000</td>
<td>6,000</td>
</tr>
<tr>
<td>Storage &amp; Distribution</td>
<td>14,000</td>
<td>21,000</td>
</tr>
<tr>
<td>Service Industry</td>
<td>12,000</td>
<td>20,000</td>
</tr>
<tr>
<td>TOTAL</td>
<td>284,000</td>
<td>392,000</td>
</tr>
</tbody>
</table>

The other main regional retail centre within the City of Swan has already been approved at Ellenbrook and stage 1 for 25,000m² is currently being implemented. The Metropolitan Centres Policy would allow up to 50,000m². This figure is also identified as the planned target in the Ellenbrook Town Centre Development Plan 2005. The justification for Ellenbrook as a major retail and employment centre includes an element of regional retail provision for adjacent catchments in the north-west corridor and Swan Valley regional hinterland.

The sustainability objectives of Network City, Metropolitan Centres Policy and the Swan urban growth strategy include the requirement to support established centres such as Midland and Morley. It therefore follows that the remaining retail provision within the corridor at the urban cells of Albion and Caversham/West Swan should be for district and local centre purposes only. It also follows that no additional retail or commercial development would be required within the Gnangara study area.

Table 11: Retail/Commercial Centre Planning Assumptions

<table>
<thead>
<tr>
<th>Recommended Planning Criteria</th>
<th>Variables/Alternate Scenarios</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centrally integrated into urban catchment/activity centres</td>
<td>Specialist/tourism activity</td>
</tr>
<tr>
<td>Strategic centre access to strategic road/public transport</td>
<td>Private vehicle dominated</td>
</tr>
<tr>
<td>Yanchep-Two Rocks (St Andrews) /Alkimos CBD/strategic regional function</td>
<td>Perth CBD centred</td>
</tr>
</tbody>
</table>

23 Floor areas shown as planned on this table are total gross floor areas indicated in the respective District Structure Plans.
### 3.3.3 Industry Demand & Supply in the NW & NE Corridors

**Key Points:**
- New industrial areas are planned, or being developed, at Neerabup, Alkimos and St Andrews, with additional specialised technology precincts at St Andrews;
- Planning is currently underway for a large new industrial estate at Muchea and this may serve to house some of the low labour intensity large lot use overflow from the corridor; and
- The implication for any potential development in the study area is that if additional land for industrial uses were available some of it (in the order of 300 – 500 ha) would be taken up in some form. Aside from the obvious issues arising from managing the environmental consequences of an industrial estate located on a water mound, it is an open question as to whether this would lead to satisfactory planning outcomes.

The main industrial areas in the north-west corridor that are currently developed are at Wangara and at Joondalup, with 5,500 jobs in total. New industrial areas are planned, or being developed, at Neerabup, Alkimos and Yanchep-Two Rocks (St Andrews), with additional specialised technology precincts at St Andrews. Combined these have ultimate capacity for approximately 31,900 additional jobs, although some, particularly parts of Neerabup, will not be available within a 20 – 30 year time frame.24

This figure has been accounted for in the calculations above and an additional 6,000 jobs in industrial areas are required to bring the corridor self-sufficiency ratio to 60%. This implies the requirement for an additional industrial estate approximately of the size of Wangara (350 ha.). This will be very difficult to find in the corridor and several remedies are possible, although each brings complications.

Planning is currently underway for a large new industrial estate at Muchea and this may serve to house some of the low labour intensity large lot use overflow from the corridor and allow more intensive land use on existing estates.

A substantial study, commissioned by DPI and LandCorp, on industrial land demand and supply generally in the metropolitan area is currently underway and due for completion in mid 2008. Preliminary findings from the early stages of this study are:

- At current usage densities and land use mix, there is a forecast shortage of zoned industrial land in Perth generally and the north-west corridor in particular in the medium term; and
- Changes in the density of use and exclusion of non-industrial uses over time could largely alleviate this shortage and these are ultimately policy issues for the government.

The implication for any potential development in the study area is that if additional land for industrial uses were available some of it (in the order of 300 – 500 ha) would be taken up in some form. Aside from the obvious issues arising from managing the environmental consequences of an industrial estate located on a water mound, it is an open question as to whether this would lead to satisfactory planning outcomes. Any general industrial estate has location, access and servicing requirements that are not easily met away from general urban development.

There are no services and limited access roads in the study area and it is remote from any labour force. The industrial land needs of Perth are likely to be met more efficiently and effectively through means other than development in the study area.

A summary of the main issues in industrial land banking for the sector is shown below.

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24 Approximately 470 ha, or 47% of the total land at Neerabup is subject to long term leases for extractive industries for limestone and sand mining.
### Table 12: Industrial Land Planning Assumptions

<table>
<thead>
<tr>
<th>Recommended Planning Criteria</th>
<th>Variables/Alternate Scenarios</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long term planning/protection required</td>
<td>Land shortage</td>
</tr>
<tr>
<td>Employment self sufficiency (60%min/corridor)</td>
<td>Dormitory suburbs/southern sector centric</td>
</tr>
<tr>
<td>Access to strategic infrastructure</td>
<td>Limited opportunity for strategic/high tech industry</td>
</tr>
<tr>
<td>Strategic industry (inc heavy) large sites</td>
<td>Limited opportunity for strategic/high tech industry</td>
</tr>
<tr>
<td>General &amp;light industry smaller sites</td>
<td>Integrate in urban/transport corridor locations</td>
</tr>
<tr>
<td>High intensification of land and floorspace uses</td>
<td>Low intensification/high land are requirement</td>
</tr>
</tbody>
</table>

### 3.3.4 Conclusion

There is no demand for additional employment centres outside of planned urban development areas. All of these are outside of the study area.

While some land for industrial uses would be taken up, it is not likely to be able to be efficiently accessed or serviced. The industrial land needs of Perth are likely to be met more efficiently and effectively through means other than development in the study area.

### 3.4 Community Facilities in the NW and NE Corridors

#### 3.4.1 Overview

The new community in the North West and north east corridors will also have specific requirements for an additional, more accessible and higher standard of facilities and services than historically has been the case. These services and facilities will include:

- Schools and tertiary institutions;
- Regional open space;
- Playing fields;
- Community facilities and services; and
- Cultural, sporting and entertainment facilities
Figure 26 Existing Facilities

- Gnangara Mound Study Area
- Local Government Boundary
- Caravan Park
- High School
- Private School
- Primary School
- Pre-School
- School (un-named)
- University
- Church
- Hospital
- Ambulance
- Post Office
- Medical Centre


3.4.2 Demand & Supply

The provision of community facilities generally follows urban development.

For example, the following information has been provided by the City of Swan to establish benchmarks for early discussion with structure plan proponents.

Albion – approx 12000 people
The City will seek as a minimum:

- 1 x district site for sport with a minimum functional area of 12 ha (for comparison that equates to the activity space at Lilac Hill);
- 2 x community sites that can accommodate buildings for community activities of a recreational/cultural/social nature and that span all ages. This would require 1.5 – 2ha dependent on synergies of parking that might be possible if very close to commercial/shopping. One could be co-located with the district site in which case it would become part of a larger multipurpose development; and
Stage 1 Report

- 2 x other functional sport spaces adjoining school sites (minimum 2-3 ha in addition to school site space) that can also accommodate a pavilion. This is also dependent on no reduction of school sites from the 4ha present standard.

West Swan/Caversham – approx 18,000 people

The City will seek as a minimum:

- 4 x functional sport spaces adjoining school sites (one at approx 3 ha and the other at 4 ha in addition to the school site space) that can also accommodate a pavilion. Also dependent on no reduction of school sites from 4 ha present standard; and
- 3 x community sites that can accommodate buildings for community activities of a recreational / cultural / arts or social nature and that span all ages. Would require a minimum 1.5 - 2 ha dependent on synergies of parking that might be possible if very close to commercial / shopping.

The following new school provision is intended to be provided in the Swan urban growth corridor for new residents and adjacent catchments.

Table 13 Schools Provision in the City of Swan Urban Growth Corridor; Source: City of Swan (2007) Swan Urban Growth Strategy, Syme Marmion & Co

<table>
<thead>
<tr>
<th>Dwellings</th>
<th>Public Primary School</th>
<th>Private Primary School</th>
<th>Public High School</th>
<th>Private High School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shawmac</td>
<td>10 lots/ha</td>
<td>15 lots/ha</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUGS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ellenbrook, Vale &amp; Vines</td>
<td>13,823</td>
<td>9</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Albion</td>
<td>5,463</td>
<td>6,600</td>
<td>9,900</td>
<td>4</td>
</tr>
<tr>
<td>West Swan/Caversham</td>
<td>5,704</td>
<td>6,010</td>
<td>9,015</td>
<td>4</td>
</tr>
</tbody>
</table>

Note: Schools calculations are based on the Shawmac and ID Forecasts dwelling numbers.

The City of Wanneroo has identified the need for large scale regional sporting facilities (at the scale of the Kingsway Sporting Complex) to service the north-west corridor. A location for this has not been finalised. These should be associated with north-west corridor urban development, but a location to the west of the study area would be suitable from a planning point of view.

3.5 Assessment of Locational Characteristics

Western Australia is experiencing strong economic and population growth which is reflected in the current high level of demand for new residential commercial and industrial land. This has the direct flow on effect of increasing demand for public infrastructure, utilities and services. Managing competition for land and access to infrastructure is a core responsibility of the WAPC.

Programs such as the Western Australian Planning Commission’s Metropolitan Development Program (MDP) provide an information base to support a core function of planning (promoting whole-of-government coordination of associated urban infrastructure). This section reviews current and proposed status of key public infrastructure and utilities within the study area. This is done primarily in the context of Network City (2006) and the MDP.

3.5.1 Road and Rail Network

The unifying theme of Network City with the support of the MDP is to interlink transport and land use by creating a network of places, connected by corridors that allow for the movement of goods and people. The concept is designed to optimise land use and transport linkages between centres and for public transport to be supported by a range of activities at the centres, as well as the land uses along corridors linking the centres (MDP, 2006). An increased population and economic growth relates to increased traffic of people and goods. This has lead to increased attention being paid to the need for strategic planning of the region’s freight network.
Main Roads Western Australia owns and manages highways and main roads in the Perth and Peel regions, including primary regional roads, while local governments manage other regional roads and local roads. The Department for Planning and Infrastructure is responsible for a number of important rail functions including safety, coordination and planning. The state Planning Policy Framework discussed in Section 2 provides a strategic guidance in terms of planning road and rail infrastructure services.

Key Major Road and Rail Infrastructure in the study area and its surround

1. Brand Highway and Great Northern Highway to the east of the Study Area;
2. Wanneroo Road (through study area), Mitchell Freeway and Marmion Avenue to the west of the Study Area;
3. Reid Highway and Tonkin Highway to the south of the Study Area;
4. Pinjar Road and Neaves Road running in a north-east direction through the study area;
5. Gnangara Road running east-west across the southern sector of the study area
6. The Westnet Railway running along Railway Parade (which connects up to Brand Highway) to the east of the Study Area; and
7. The Perth Transit Authority Railway on the lower west side of the Study area.

There are various unsealed roads in the Study area which are Forestry Access Routes. However, it is important to note that there are only three Freight Network roads (Reid Highway, Gnangara Road and Neaves Road) which are connecting the Brand and Great Northern Highway with Wanneroo Road. These are the only three connections in the study area between the NE and NW corridors. With an increasing population and increase in demand of goods and services, future land use planning for the study area will need to examine expansion of transport linkages across the study area between major activity nodes. The need to improve east-west transport connectivity across the study area will become increasingly apparent as the corridors develop northward.
Figure 27 Map showing the Road Network in the Study Area
Figure 28 Figure showing future alignment of road east of Wanneroo Rd in the south-west part of the Study Area; Source: ARRB (2008)
Figure 29 Map Showing the Road Train Network in the Study Area
Figure 30 Map showing the Rail Network and Infrastructure in the Study Area
3.5.2 Water and Wastewater

The Water Corporation is implementing and trialling new approaches for the re-use of the large volumes of treated wastewater currently discharged to the ocean, including schemes for industrial supply, park irrigation and possible aquifer replenishment. The corporation recently has upgraded and improved the environmental security of major treatment plants by odour buffer definition studies and environmental engineering improvements.

The major water/wastewater infrastructure that is relevant to the study area includes:

- Yanchep infill sewerage;
- Alkimos wastewater treatment plant- design construction (2005-2010);
- Beenyup wastewater treatment plant (upgrade 2005-2008);
- Banksia Grove high-level tower, Landsdale water main (Kingsway), and Wanneroo distribution main;
- Carabooda reservoir and outlet;
- Two Rocks- Yanchep interim wastewater treatment plant (2005-2010); and
- Quinns Main Sewer.

Yanchep and Two Rocks are the only communities serviced with scheme water in Perth that are not connected to the Integrated Water Supply Scheme (Figure 31). They are currently relying entirely on local bore fields, treatment facilities and storage. Extensive areas of special rural development also are not connected to scheme water and are reliant on rainwater tanks and bores to meet their water needs.

The major regional Beenyup Wastewater treatment plant is supplemented by a series of smaller local treatment plants that generally rely on on-site soakage for effluent disposal. These are located at Bullsbrook, Yanchep and Two Rocks. The Beenyup plant is also required to support development in Landsdale.

The Alkimos Plant on the other hand is to support the North-West Corridor initially and North-East corridor from Ellenbrook about 2050. The plant is to be serviced by Quinns main sewer from the south; Yanchep main sewer from the north; and Lord Street pressure main from Ellenbrook (Figure 33). This sewer district catchment has been identified to support additional development areas at Carabooda-Nowergup and Bullsbrook if required (Figure 34). The Alkimos Plant will also provide opportunities for water reuse for environmental benefits, Gnangara Mound, and Drinking water supplies.

There is currently no sewerage wastewater infrastructure in the Study area (Figure 32). Expansion of water and waste water infrastructure to service land uses in the study area may not be necessary for low intensity activities or activities capable of utilising on site collection and effluent treatment technologies consistent with water source protection requirements.

Figure 31 below shows the water infrastructure in the Study Area.
Figure 31 Map showing the Water Infrastructure in the Study Area
Figure 32 Map showing the Sewerage Infrastructure in the Study Area
Figure 33 North West Corridor Wastewater Services (Water Corporation, 2007)

Figure 34 Proposed Alkimos Wastewater Treatment Plant Catchment Boundary (Water Corporation, 2005)
3.5.3 Electricity

Western Australia’s biggest interconnected electricity network is the South Western Interconnected System (SWIS). The Northern Terminal load area which relates to the study area covers the north of the Perth’s metropolitan region, extending from the coast to Osborne Park and Morley in the south, to Yanchep in the north, and West Swan in the east (Western Power, 2007). At 833 MW, the load area represents approximately 26 per cent of the total load in Western Power’s SWIS. There are presently 14 substations in the load area, all with summer peaks.

According to MDP (2006), the Northern Terminal’s anticipated load growth is six per cent per annum; at least eight new substations and upgrades will be added to the existing substations over ten years; there will be transmission line upgrades.

Proposed and existing electricity utilities/infrastructure in the Northern Terminal includes the following:

- **New transmission lines** at Pinjar-Cataby-Eneabba, Pinjar-Wanneroo;
- **Existing substations** at Lansdale, Muchea, Mullaloo and Malaga;
- **New substations** at Clarkson, Padbury and Henley Brook; and
- **New Neerabup Terminal Station** which will supply **substations** at Yanchep, Wanneroo, Clarkson and Joondalup, offloading the transformers at the Northern Terminal and the 132kV transmission line supplying the Northern Terminal load area.

The energy supply network could be expanded to service uses in the study area, there appears to be no locational or technological barrier to this therefore and constraints will be based on environmental management and social/cultural concerns.

![Figure 35](image-url)
Figure 36 Neerabup - terminal establishment (Western Power, 2007)

Figure 37 Joondalup - substation establishment (Western Power, 2007)
Figure 38 Henley Brook - new substation (Western Power, 2007)

Figure 39 Padbury - new substation (Western Power, 2007)
Figure 40 Map showing the Electricity Infrastructure in and around the Study Area. A High Voltage Underground Carrier (HVUG Carrier) and a 132 kV Over Head Carrier can be found within the Study Area boundary.
3.5.4 Gas

The 1530 km Dampier to Bunbury Natural Gas Pipeline (DBNGP) (Figure 41) was built by the then State Energy Commission in 1984 as part of the development phase of the North-West Shelf Gas Project. It runs from Muchea to Ellenbrook through the study area, and then via Caversham, Welshpool, Gosnells and Forrestdale, before heading west towards Kwinana and south to Pinjarra and Bunbury. The DBNGP corridor north of Perth has recently been expanded to accommodate future pipelines sufficient to service long-term demand in Perth and the South-West of the State. The State Government facilitates access for the owners and builders of natural gas supply pipelines to secure infrastructure corridors.

Thus gas supply is nearby and already within the study area should the need arise for its use by potential future land uses in the study area. Alinta Gas is proposing a natural gas pipeline from Bullsbrook to Wanneroo along the Neaves Road reserve through the Priority 1 area (WAPC, 2001).
Figure 41: Map showing the location of the Dampier to Bunbury Natural Gas Pipeline (DBNGP) passing through the Study Area.
4. Summary of Key Findings and Conclusion

4.1 Key Findings

4.1.1 Major locational opportunities and constraints for land uses in the study area

The Public Drinking Water Source Area Priority 1 classification (and to a lesser extent Priority 2 and 3) in terms of legislative, location and management constraints, has by far the most significant impact on future land use options for the study area. Classification of uses in the P1 area severely limits the ability to change or intensify uses and build infrastructure such as roads.

There is a high level of uncertainty regarding the locations of undisclosed Aboriginal Heritage sites. There is also a very high likelihood of there being many more sites in the study area that will not be identified until further studies are undertaken. Current knowledge of sites in the study area is limited to areas within and around the development front and significant water features.

Identified Bushforever sites (within the Metropolitan Area) account for almost all of the remaining land in the study area that is not also within the PDSWA Priority 1 zone. While a Bushforever site is not absolutely exempt from development or land use change, there is a large policy and procedural impediment to changes of land use and development in these areas. Any development impacting on Bushforever sites will need to demonstrate compliance with stringent assessment requirements.

There are numerous wetlands within and adjacent to the study area that have development buffers around them that further limit land use and development options in their vicinity. These buffers in many cases are undefined at this time and will need to be established on a case by case basis.

4.1.2 Minor locational opportunities and constraints for land uses in the study area

Existing and proposed borehole and well head sites and their attendant protection zones are scattered throughout the study area. The protection zones exclude land use and development that may impact on the water quality. The protection zones would generally be considered inviolate and will be a constraint on any land use changes. While they have a high degree of protection their locations are well known.

The Dampier to Bunbury Natural Gas pipeline runs through the eastern sector of the study area. The pipeline and easement are a constraint on development having both an absolute buffer and buffer for sensitive land uses.

There are a number of other existing services and utilities that cross the study area. These services and utilities in themselves are a constraint however may also prove to be an opportunity for land use options in their vicinity.

4.1.3 Management impacts on land use

Ground water quality is the key ongoing management issue that any land use change or form of development will need to address in significant detail. There is a plethora of agencies, strategies, policies and guidelines concerned with or governing aspects of this issue. Water quality management is the key to any proposal to change a land use or develop within the study area.

A significant impact on any form of development within the study area is the management of Acid Sulphate Soils. These soil types permeate the majority of the study area. It is known that the current mapping is lacking in detail and it is likely that high risk soils will be more widespread than indicated by current mapping. Development in affected areas will be subject to more involved risk management and complicated construction issues.
Identified in some municipal heritage Inventories and the State Register of Heritage places are a few Landscape Heritage Protection zones that will impact on potential land use changes. Changes to land use in identified heritage areas will need to address these matters.

4.1.4 Economic Demand Assessment Conclusions

The discussion in the preceding chapters utilises planning, infrastructure and economic principles for efficient development that are articulated in the Perth context25. In summary:

Planning Principles
These are mostly derived from adopted policies, but particularly Network City and Liveable Neighbourhoods. In summary the principles favour:

- Compact development;
- Orientation to existing areas; and
- Facilities and services to be available within reasonable timeframe of development

Infrastructure Principles.
For efficiency, effectiveness and best value-for money:

- Development should efficiently use existing infrastructure;
- Extensions from under-used existing services and leap-frog development are not favoured; and
- Securing land for essential services is required well ahead of demand.

Economic Principles.
For the Northern Sector (north-west and north-east corridors):

- Additional employment, particularly ‘high-end’ employment (for example business and professional services) is required to maintain employment self-sufficiency;
- High-end employment requires activity to be concentrated in a limited number of locations with supporting activity and institutions;
- Scale is important and therefore this favours concentration in Yanchep-Two Rocks (St Andrews) / Alkimos, Joondalup and Midland as major economic centres.

These principles and the detailed demand and supply analysis allows several propositions to be developed:

- There is neither demand nor justification for detailed consideration of any general urban development in the study area, including major employment uses as may be found in an activity centre.
- If it were available, some additional industrial land would be utilised in the longer term, but it may not meet all of the above principles and other better solutions may be found. Environmental considerations aside, there are limited locations in the study area that would appear to be suitable for further consideration.
- Some ancillary community facilities, such as regional playing fields, are required, but their location would need to meet the above principles, in particular access to public transport. Gnangara may prove to be not a suitable location.

Given this lack of demand for intense land uses, the question is whether there are potential large land uses for the study area that take account of its proximity to a large urban population. Several can be immediately identified:

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• There is the potential to create additional passive open space and additional visitor attraction area adjoining Whiteman Park, to enable it to function as an expanded Kings Park of the north and east – an area of bushland accessible to its surrounding urban development. There is approximately 27,000 ha of remnant bushland in the study area, including the existing Whiteman Park. Retaining this and expanding it would improve the amenity of the surrounding urban areas and make more viable compact and efficient urban forms in those areas.

• The population of the Perth metropolitan and Peel regions area is forecast to increase from 1.5 million in 2006 to 2.2 million in 2031. As the population increases, there is a limited number of uses which require large land areas, most of which is buffer, could have a low environmental impact and simultaneously need access to the metropolitan area but not be part of it. These include:
  − Corrective services complexes. (A site for a large corrective services campus is already identified elsewhere in the metro area and will fulfil needs for some time. However, some extension may become necessary in the longer term);
  − Communications instillations needing line-of-sight or radio wave / microwave separation (the Telstra facility in the study area is an example);
  − Research installations (the Gravity Wave complex at Gingin is an example)

Most of the possible uses are difficult to plan for precisely and will arise with little forewarning – many uses may be considering other locations in other cities or countries - but the mere presence of available land with the characteristics of the land in the study area may make them viable. The key to access these uses is to be prepared to consider them when the opportunity arises. This will require formulation of general ‘rules on engagement’, including:
  − Identification of an agency with authority to deal in the land, if it is government ownership;
  − Formulation of general development criteria and guidelines;
  − Identification of approvals protocols, given that most of the land is outside of formal planning areas.

• A city of 2.2 million ideally has substantial food production nearby. Intensive horticulture may be viable.

4.1.5 Other Economic Issues

The study area includes approximately 23,000 ha of pine plantation. These have an immediate economic value as a timber resource. This value is now being realised in a number of ways, including via the LVL plant at Neerabup.

However, there is another economic value that is likely to be quantified at some point the in the future. The trees are a substantial store of carbon. In Australia at the moment this carbon has no easily realisable financial value. This may change quite soon. It may be that at some stage within the planning cycle removal of the trees over such a large area without replacing them may create a substantial carbon deficit. This needs to be factored into the consideration of the future of the pine plantation land.

Several questions arise beyond this study. For example, what would be financial and economic status of the land if it were revegetated with native bushland - assuming that is viable? Is there an alternative tree species that could be sustainably farmed to maintain both the economic value of the timber and maintain the net carbon store and also maintain water quality and quantity?

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26 WAPC, WA Tomorrow, 2005
4.2 Conclusion

The above key findings lead to a view that while there is a specific presumption against urbanisation of much of the Gnangara Mound within the study area, that is not to say that sensitive and compatible land use changes cannot or should not occur under the current legislative and policy framework. The following are a range of land use options for the study area that should be investigated in Stage 2 for their potential suitability based on the findings of the other studies being undertaken.

- Diversification of the existing Agroforestry use. This option, while not a change in land use, will need to be supported by land use activities allied to and supportive of it. Maintaining the use post pine plantation will be subject to identification of forestry species and practices that are consistent with maintaining groundwater quality and water retention as it is apparent that the pines are harming the quality of the ground water.

- There is potential to expand the mining of basic raw materials within the study area provided that impacts on groundwater quality and quantity are able to be appropriately managed. This is consistent with the State’s objective to identify and establish sources of basic raw materials within or in close proximity to the metropolitan area to supply the local market. Mining is an established land use within the PWSDA Priority 1 and thus could potentially be expanded in the study area with the removal of the pines. Management Plans should be a requirement for mines sites which should include sequential land planning, Acid Sulphate Soils management, and rehabilitation of native vegetation in these mined areas.

- Civic and Institutional uses require large areas that are close to but separated from more intensive residential and commercial land uses. Uses such as Prisons or sporting facilities may benefit from being in an area separated from residential development but in close proximity to residential catchments. Under the land uses within the PDWSA table, educational establishments (community education centres, scientific research institution) are compatible uses (with conditions) in Priority 1 areas. Such facilities could be designed to have small ecological footprints and need limited connection to infrastructure other than roads and power. While there is no verifiable demand for such activities (in the way that residential and commercial land demand can be established) the Study Area may have potential to accommodate such. Rather than attempt to identify demand, the next exercise should be to determine if there is a case for accommodating such activities on the Mound.

- Industrial activities and uses within the study area that have manageable impacts on groundwater quality should be further investigated. Cottage Industry, Drinking Water Treatment plant and Extractive Industry (including construction/mining camps) uses are compatible land uses (with conditions) within the Priority 1 PDWSA. While there a range of industrial nodes identified or existing in the vicinity of the Study Area they have an array of constraints that may limit the scope of uses permitted or viable. The Study Area may afford locations for industrial uses that may not otherwise be suitable in the currently identified industrial nodes.

- Tourism is a significant contributor to the economic and social fabric of the Wanneroo, Swan and Chittering areas. With a large number of known cultural and heritage sites adjacent and within the study area, bed and breakfast accommodation, farm stays and rural chalets can be compatible uses within the Priority 1 PDWSA.

There are a range of gaps in knowledge that the GSS taskforce is attempting to fill, one of these is the extent of Acid Sulphate Soils among others. With respect to the Planning field there is a significant gap in knowledge regarding Aboriginal Heritage and an apparent absence of engagement with the indigenous community regarding these matters. Identified Bushforever sites cover large tracts of the study area and while these are identified, the level of detail as to their significance will need to be established should a site be identified for a potential new land use.
Network City is a significant high level Policy driver for improving the efficiency and quality of the urban form of Perth. To this end Network City has identified logical growth/transport corridors and development nodes which build on the familiar corridor pattern of the City. Network City responds necessarily to the environmental and physical constraints of the landscape in defining these patterns of growth. One of the major environmental constraints to which Network City responds is the Gnangara Mound which it explicitly states should not be developed, due to the significance of the purpose for which the land is allocated. The Mound itself is not a physical constraint such as the Swan River and as such is ultimately able to be put to urban uses should the Government of Western Australia determine that the purpose of the land comprising the Mound be altered or changed.

Should, through the investigations being undertaken, it be determined that urban uses may be accommodated on the Mound then the entire legislative and policy structure guiding all aspects of development for the City will require reassessment and reworking to appropriately integrate urban uses on the Mound with the existing urban form of Perth. However at this time the legislative framework determining land use is clearly slanted away from urban development in the Study Area.
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